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AN ASSESSMENT OF A TEACHER LAPTOP PROGRAM IN A SOUTHWESTERN URBAN SCHOOL DISTRICT

A Dissertation APPROVED FOR THE DEPARTMENT OF EDUCATIONAL LEADERSHIP AND POLICY STUDIES

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ABSTRACT

The use of technology in schools in the United States is pervasive. It is an area that has been overlooked for assessment of effectiveness in the instructional environment compared to the amount of monetary resources dedicated to this initiative. This study explores the relationship of in-service teachers employed in a Southwestern Urban School District and their participation in a district laptop program and the effect this ready access to technology has had on the level of technology integration.

The factors that are explored in the this study include the in-service teachers' Level of Technology Implementation as measured by the LoTi Questionnaire as well as several demographic variables (age, type of school, teaching experience, teaching level, subjects taught, technology proficiency level, and number of years with a district issued laptop) that may impact the use of technology with students. The theoretical framework in this study includes both self efficacy theory and the theory of change and how these can influence the Level of Technology Implementation. Seven research questions were used to guide the foundation of this study.

Subjects in this study included 390 in-service teachers. Teachers from all grade levels participated in the study. A variety of ages and experience levels were also recorded by the subjects. The vast majority of subjects in this study reported having access to computers at some location within their school. The issues revealed through the results of this study show that the teachers are currently integrating technology at the very lowest levels in this district. Teachers also express what barriers and support systems they feel are currently available to assist them in integrating technology.

CHAPTER ONE

Introduction and Overview

Introduction

Technology usage has become an integral part of everyday life from enhancing personal efficiency to improving job performance. Educators are increasingly expected to prepare students capable of dealing with the continually evolving technological advances in the workplace. This is no easy feat for educators facing declining resources, substantial pressures of more rigorous accountability, and greater student diversity (Anderson & Becker, 2001). As teachers struggle with the integration of technology, the fact remains that using computers in the classroom has been associated with increased achievement of students both in the cognitive and non-cognitive outcomes (Quinn & Valentine, 2001; Middleton & Murray, 1999; Middleton, 1998). This alone makes it worthwhile to evaluate the progress that teachers are making in the integration of technology (James & Lamb, 2000).

To ascertain the status of technology integration into classrooms, it is impractical to evaluate each and every software or technology application available in schools. Accomplishing a broader evaluation of technology use and instruction is a more viable and practical approach and with greater benefit to educational technology research (Moersch, 2002). It is not only prudent to evaluate the use of technology in instruction but it is also important to review and understand those areas most closely linked to technology usage in schools. The following areas can influence the integration of technology in schools; accessibility of technology for students and teachers, technology spending, outcomes for students, status of teachers on integrating technology, and barriers of technology usage.

The ensuing discussion highlights the impact of these areas on educational technology use in schools. Educators have ample access to computers for the integration of technology into students' learning environment. A staggering 99% of all schools within the United States own computers and 95% of those computers are connected to the internet (National Center for Education Statistics, 1999). The student to computer ratio of 10 to 1 is at an all time low in schools within the United States (Griffin, 2003; Educational Testing Service (ETS), 1998). Computer to student ratios are declining rapidly. This categorizes students' school access to technology as a barrier conquered for many schools, but the goal for access is ongoing for districts to strive to keep up with new and emerging technologies.

The majority of public school teachers report having access to computers somewhere in their schools and over fifty percent of those same teachers have access to the internet in their classrooms (Smerdon, 2000). It is evident from this information that educational leaders and policy makers have conquered the accessibility and connectivity concerns within schools to a significant degree. The task for school officials is to shift their technology buying focus away from purchasing massive amounts of hardware to maintaining current ratios (Anderson and Becker, 2001). The challenge is with keeping technology current in classrooms while improving utilization of present technology through integration in the learning environment. As the need for huge purchases of hardware declines, spending for technology must shift into providing more teacher training in the effective use of technology and integration practices. Past spending practices of most districts have not focused on the teacher side of technology use in classrooms (Anderson and Becker, 2001). Formulating an understanding of the types of technology utilized in classrooms by teachers most effectively and the impact it has on the achievement of students should be a driving force in directing technology spending.

Technology spending in schools has a history of being lucrative and continually increasing. The history of technology spending in schools shows a consistent trend. In fiscal year 1998, $7.2 billion was spent for technology in schools. This equated to 2.7% of the total expenditures for education for that year. Schools averaged $113 per student on technology spending, with the majority falling into hardware purchasing (Anderson & Becker, 2001). Spending will likely remain in the $7 billion range for the next several months (Murray, 2004). School budgets are continually scrutinized for cost saving measures. According to Trotter (2004) and Education Week E-Journal (2005), districts that are most dedicated to technology implementation maintain or increase technology spending while districts that have less commitment cut the technology budget, professional development and training, and support systems associated with technology. It is imperative in the age of No Child Left Behind and the demand for scientifically based-research that data collection and analysis become essential tools for school administration. Without sound data analysis by educational leaders involving the impact of technology on student learning, technology budgets will be an easy target for cuts, particularly in the area of staff training.

Computer hardware accounts for almost 46% of the technology budget of schools while 20.8% of the spending goes toward software, support services, and wiring. The least amount spent on technology is teacher training and professional development

(Kane, 2002; Educational Technology News, 2000). It is recommended that 30% of the technology budget be utilized for staff training and professional development (Electronic Education Report, 2001; CEO Forum, 1999). Emergent literature reveals the lack of resources allocated to effectively train teachers. This lack of effective training for teachers appears to be at the crux of technology integration issues in classrooms.

Policy makers need to know the effects of the enormous dollars spent on technology and to what extent this spending translates to student achievement (Anderson & Becker, 2001; Heinecke, Blasi, Milman, & Washington, 1999). Technology use in classrooms has documented support showing its effectiveness with students. Research conducted on technology rich learning environments cites the benefits of computer technology in enhancing student learning and fundamentally changing the way instruction happens in classrooms (Quinn & Valentine, 2001; David, 1994). Additional benefits to students have been cited as: improved achievement; higher test scores; improved attitude, enthusiasm, and engagement; richer classroom content; and improved retention and job placement (Glennan & Melmud, 1996). A U.S. Department of Education study in1996 emphasized that a student's ability to reach higher learning standards will be inseparable from their ability to access and understand technology.

Districts and schools in which technology usage transcends basic computer use are shown to have a positive impact on students. Examples of computer use in these technology-rich, model schools show that utilizing technology can provide students with customized learning experiences, extended learning times outside of the classroom, and exposure to and interaction with experts around the world, while allowing schools to manage and guide the learning activities of students (Glennan and Melmud, 1996).

Lemke (1998) contends that under the right conditions, technology can accelerate, enrich, and deepen students' understanding of basic skills, promote critical thinking and problem solving, and connect students and teachers to rich learning resources beyond the classroom. In 1994, Kulik conducted a meta-analysis of computer-based instruction where results showed:

1. Student attitudes were more positive with the use of computers in school.
2. Students like school and their classes more when computers are used in learning.
3. Students usually learn more when computer-based instruction is used.
4. Lessons usually take less time for students who use computers.

Current research indicates that teachers who engage students effectively with computers can have an impact on student achievement (New Hampshire Technology Use Profile, 2002; Madison, 1998). Students who are engaged with computers to facilitate higher order thinking skills perform better on standardized tests than students who are not engaged with computers (National Assessment of Educational Progress, 1998). Many local, state, and national standards exist for high stakes testing where students and teachers are challenged to continually improve on standardized test scores. Effective technology usage shows promise in becoming a standard classroom learning tool, with the capability of transcending all other educational innovations.

Students can gain from technology in the classroom when it is used for more than basic skills. Computers have the ability to change the way that students learn and to prepare them to be technology savvy employees and productive citizens (Knezek & Christiansen, 2001; SCANS, 1992). Research has confirmed the benefits of technology integration in the classroom. Accessibility to technology and connectivity to the internet appear to be resolved in most schools. Therefore, a logical assumption is that the disconnect in the integration of technology appears to rest in the utilization of the computer as an effective learning tool by teachers.

Despite the availability of computers in schools, teachers are under utilizing computers in their classrooms (Glennan & Mulmud, 1996; Marcinkiewicz, 1994). Yet, according to Milken's 1999 *Survey of Technology in Schools*, 62% of teachers surveyed felt that technology was a powerful tool to improve student learning and that curriculum was enhanced when technology was integrated into the teaching and learning processes. Teachers have the computer to use as a curriculum enhancing tool. They feel that it is important to student learning, but the integration of technology in the classroom is not happening consistently and effectively. Making this transition to integrate technology will not be easy.

The effective use of technology integration will require some teachers to learn new ways of approaching instruction. In the wake of learning new teaching methods, teachers are faced with the challenge of integrating technology into classrooms with more student diversity than ever before (Griffin, 2003). Faced with such challenges, few teachers (20%) report that they feel well prepared to integrate technology into their classroom instruction (NCES, 1999). Therefore, a natural progression for investigation is to explore the disconnect that happens when teachers have ready access to technology but integration falls short in the learning environment.

Teachers have demonstrated repeatedly that they will use technology in instruction sparingly and instruction will remain very much unchanged (Zhao, Pugh, Sheldon, & Byers, 2002; Morsund & Bielefeldt, 1999; CEO Forum on Education and Technology, 1997; National Council for Accreditation of Teacher Education, 1997; Office of Technology Assessment, 1995; Hodas, 1993). Mui and Partlow (2005) from the *Washington Post* point out that in a recent study of Maryland Schools, students and teachers are using computers to handle only basic tasks of word processing and email. This same scenario is being played out in most schools across the United States. There are well-defined standards and criteria for effective use of technology in schools where all that are involved in the learning process can contribute.

The International Society for Technology in Education (ISTE) (1999) has established the National Educational Standards (NETS) for students, teachers, and parents. NETS define conditions that are essential in providing an environment that is conducive to learning technology. These conditions include:

1. Vision with support and proactive leadership;
2. Educators skilled in the use of technology for learning;
3. Content standards and curriculum resources;
4. Assessment of the effectiveness of technology learning;
5. Student-centered approaches to learning;
6. Access to contemporary technologies, software, and telecommunications networks;
7. Technical assistance for maintaining and using technology resources;
8. Community partners who provide expertise, support, and real-life interactions;
9. Ongoing financial support for sustained technology use;
10. Policies and standards supporting new learning environments.

Problem Statement

The appropriate use of technology in the curricula improves the performance of students (Quinn & Valentine, 2001; IESD, 1999; Middleton, 1998). History confirms that merely mandating new initiatives in schools, including use of computer technology, will fail without the proper support system for teachers. David (1994) contends that the implementation of new technologies in the classroom must evoke a transformation in the school organization as a whole along with the supporting systems (e.g., technical support and professional development) for change to effectively happen. To begin the process of effective change, the role of data is invaluable to move forward key initiatives. In the implementation of technology in schools, there are gaps for most districts in how technology is being integrated by teachers.

A major concern for the implementation of technology in schools is the lack of authentic teacher training (Bray, 1999; OTA 1995). It is difficult to ascertain the direction that staff development should take if a proper evaluation of where teachers are currently in their implementation of technology into instruction. The issues of time, resources, and inadequate support are also barriers to be explored in technology implementation (Bray, 1999). Without the proper information to guide school administrators, the random improvement efforts may not address the most critical needs of teachers. In order to enhance student learning, support teachers, make good decisions about where to spend resources, and to eliminate or minimize barriers to technology integration, school leaders will need to determine the current level of technology integration. This information can in turn be used to develop strategies and guide staff development that will move districts forward in their efforts to integrate technology in classrooms.

Purpose of the Study

Prudent use of school funds is imperative. Making decisions based on data that have the ability to ultimately impact student achievement is essential. The intent of this researcher is to contribute to the current body of knowledge on technology integration in classrooms and to ascertain if it is related to demographic characteristics such as age, gender, teaching experience, level of education, level and type of school, and number of years of participation in a technology initiative that is focused on distribution of hardware to teachers.

Research Questions

1. What is the level of technology implementation of teachers in a Southwestern Urban School District?
2. What is the level of personal computer use of teachers in a Southwestern Urban School District?
3. What is the level of current instructional practices of teachers in a Southwestern Urban School District?
4. Is there a relationship between personal computer use and level of technology implementation for teachers in a Southwestern Urban School District?
5. Is there a relationship between current instructional practices and level of technology implementation for teachers in a Southwestern Urban School District?

6. Is there a relationship between the number of years a teacher participates in the Southwestern Urban School District's laptop program and the level of technology implementation?
7. Is there a relationship between the following demographic characteristics of teachers and the level of technology implementation?:
    - Age
    - Years of total teaching experience
    - Gender
    - Type of school employed (Title I versus non-Title I)
    - Grade level
    - Educational level of teachers
    - Proficiency level

Significance of the Study

The Office of Technology Assessment (1995) contends that "helping schools to make connections between teachers and technology may be one of the most important steps to making the most of the past, present, and future investments in educational technology and our children's future" (p.iii). With data, the district will have the opportunity to build these connections between teachers and technology. It is also the intent of this researcher to provide the results of this study to the school district as a means for formatting staff development opportunities to support teachers in the use of technology. This study will also provide an avenue for key decisions makers on the effectiveness of this type of program and if resource allocation should continue along this line in the ensuing years.

This descriptive study will be used to reveal and report on three components of in-service teachers' computer usage. The first will be to determine the teacher's overall Level of Technology Usage (LoTi). The second is the Personal Computer Use (PCU) and the third component is Current Instructional Practices (CIP). The LoTi will approximate the degree that the teacher is including technology into the curriculum. The PCU portion of the survey will reveal the respondent's comfort and proficiency levels with using computers. The last component, CIP, will establish the teacher's inclination toward instructional practices that are either consistent with a subject matter or student-based curricular design" (State of New Hampshire Technology Use Profile, 2002).

The LoTi was available for all teachers within the designated school district. The LoTi, a 50 item survey, and a short demographic survey were both provided in an online format to be completed by current in-service teachers. The data was stored in a limited access database used solely for the purpose of this research.

This study adds to the limited research of technology integration by in-service teachers. Results of the study illustrated what the current level of technology implementation was in the Southwestern Urban School District and what barriers have hindered classroom implementation and what resources have assisted in successful implementation of technology. The goal of this study was to provide district personnel data that may be utilized when planning for more effective technology staff development and at what levels this training needs to target the majority of teachers.

Definitions

1. Technology- devices used to store and deliver information including computer, video and communication systems. The focus of this study is the computer (Moersch, 1999).
2. In-service teacher- A teacher who is currently teaching in a school at any grade level.
3. Innovation- a new concept or technology introduced into the school setting.
4. Technology integration- the purposeful use of instructional technology in the development and methodology of the curriculum delivery (Moersch, 1999).
5. Staff development- the continuing education of school personnel that includes high-quality ongoing training programs with intensive follow-up and support and other growth promoting processes such as study groups, action research, and peer coaching (NSDC, 2005).

Assumptions

1. Participants understood the questions on the survey.
2. Participants responded honestly to the survey.
3. The survey was an appropriate tool for the purposes of this study.
4. Participants responding were representative of teachers in the chosen district.
5. District selected reflects a typical urban school district.

Limitations of Study

This research was restricted to a single school district. Therefore, broad generalizations may not be possible. It was assumed that teachers had access to their district email and had the ability to submit an online survey. In-service teachers were providing their own perceptions about their integration of technology in the classroom. Results of this study were dependent on teacher self-report instruments and not on actual classroom observations.

Overview of the Method

This study used a quantitative methodology in an online survey format. The study was descriptive in nature and adds to the current body of knowledge regarding the integration of technology into the classroom by in-service teachers. Two surveys were used to collect the data via the online format. The Level of Technology Implementation (LoTiQ) is a fifty item survey that measures the level of technology integration and this was used with permission from Dr. Moersch. The second survey, consisting of thirteen questions, constituted an effort to collect general demographic and technology usage information. The data from these instruments were stored in a secured, limited access server and was used solely for the purpose of this study.

Summary

The presence of technology in schools has become pervasive. Students benefit from it, teachers think it enhances instruction, schools pay for, yet it still goes underutilized by most districts. The need to understand the level of teacher technology integration in the classroom can reveal how instruction is being delivered in the classroom and if students are receiving the full benefit of this valuable learning tool. Teachers, self efficacy and how they adapt to change provides a platform to understanding how to remove some of the barriers of technology implementation. This study may become the model for technology assessment for districts across the country to get a valid snapshot of where their teachers are currently in the integration of technology. This effort is to ensure that the benefit to gain for students in a technology rich environment is consistent with the amount of resources needed to maintain this initiative and to encourage change where appropriate.

Chapter Two- Literature Review

Background to the Problem

The focus of this study is to investigate the level of technology integration of teachers in the learning environment. The integration of technology constitutes an innovation that is new to teachers and is certainly a change in the way that teachers approach teaching and student learning. There are two theories that form the framework of how teachers learn and how teachers react to change. It is also important to include a brief discussion of how effective staff development supports the change process and the teacher's self efficacy. Bandura (1985) developed the Theory of Self Efficacy which refers to a person's belief that they can change their behavior. Marcinkiewicz (1994) agrees that Self-Efficacy Theory can be utilized to determine whether a person is capable of making a change or if they are able to attain a certain performance. The stronger one's perceived self efficacy is the more likely they are to persist with their actions (Bandura, 1985). Individuals with low self efficacy, according to Self-Efficacy Theory, are more likely to choose a level of innovation that they believe they can control which may not be the best option. In the case of technology integration, many teachers are opting for the use of the computer in basic skills for students and not actual integration which is the option that teachers are less familiar and perhaps less comfortable in implementing. Moersch (1995) relays through his research that individuals with high levels of self-efficacy are usually more able to accept change and will tend to select the best option.

Teachers who are trying to integrate technology into classroom instruction are going to be more successful if they have a high self efficacy. Teachers who have a high self efficacy are more likely to be functioning at the higher levels of technology integration.

Inferences can be drawn from the results of the LoTi questionnaire (LoTiQ) which will control for self efficacy of the teachers within the Southwestern Urban School District based upon their overall LoTi ranking. It may provide insight into the number of teachers who are functioning at the lower levels (0-2) of technology integration with a low self efficacy and perhaps indicate their resistance to change. The use of staff development can impact teachers' self efficacy.

According to Joyce and Showers (1980) staff development model that addresses five components. The first of the five components encompasses the imparting of knowledge based on a presentation of theory, a new skill, or a behavior identified as useful to a passive audience that utilizes a one-way delivery method. This is how the majority of staff development is delivered (Hord, 1994). The second component of the Joyce and Showers model includes the demonstration of modeling of a new skill through a one-way delivery model where no action is necessary from the audience. The third component brings in audience participation through initial practice during the workshop session. The fourth component elicits prompt performance feedback of the practice while the fifth component involves coaching of the participant in their classroom where the new idea or skill is being tried (Joyce and Showers, 1980). Hord (1994) cites R.N. Bush (1984) who tested the efficacy of the five components of the Joyce and Showers model and found that 10% of people were able to retain and perform a skill when only the first component was given. Two to three percent more people were gained with each successive component until the fifth component. An astounding 95% of participants were able to transfer the skill to classroom practice when coaching was utilized. This information can have an impact on how new initiatives are introduced to teachers.

Looking at the change process is also important to understand teachers' integration of technology, as technology constitutes an innovation. In the past, educational change was based on implementing a single innovation in a single classroom with a single teacher. According to Fullan (1985), this implementation style was prevalent from the 1970's into the early 1980's. Because much of this change was conducted in a linear fashion from the top down, the desired outcome did not necessarily occur (Stiegelbaurer, 1994).

The failing of many educational initiatives provided an impetus for the study of change in schools. It is important to understand how change can be facilitated in the school setting beginning from program adoption to program implementation to getting results. Out of necessity, the change model in education shifted away from first order changes where the roles of adults and students were not significantly affected by the innovation (Cuban, 1988). This type of change had an impact on only the superficial components of the classroom and did not effect the entire organization or its systems.

In light of the new research on how to more effectively implement change in schools, change has taken on a new look. Restructuring in the change process included moving away from implementation of a single innovation affecting a single classroom with a single teacher to the implementation of whole programs that elicit systemic change affecting the organization as a whole (Cuban, 1988). This new kind of change constitutes a multidimensional process that is slower and requires changing attitudes, perceptions, behaviors, relationships, and the way people collaborate (Schechter, 2000). This describes change in the second order and has implications for effective technology integration into the classroom thereby influencing current teaching practices.

The time for first order change in integrating technology into classroom instruction and improving instructional practices has passed. It is no longer good practice to continue to improve what has always been done in the implementation of technology in the classroom as this approach has not yielded desired results in most schools. With the demands placed on schools for accountability in monetary spending and student achievement, change must go deeper and permeate further into the organization, necessitating restructuring roles of all those involved in the success of education including teachers, administrators, students, and parents.

Educators are fortified with the knowledge that computer technology, when used appropriately, can have a positive effect on student achievement. This knowledge, however, has not yet translated into widespread implementation in schools. Fullan and Stiegelbaurer (1991) propose that successful change must pass through three phases; change must be initiated (deciding what must be done), implemented (put into action), and institutionalized (integrated into the daily activities of the school). Most teachers have access to the necessary tools to integrate technology, but may not have been involved in the planning phase and were steered directly to implementation. Therefore it should not be surprising that the institutionalization of technology has not happened for many districts.

Change is a process and not a single event; therefore the people who are involved in change will go through developmental stages to implement the innovation. Hall and Hord's (1987) Stages of Concern model exemplifies this process which was based on earlier work of Hall, Wallace, and Dossett (1973), known as the Concerns-Based Adaptation Model (CBAM). The component of this model that seems to be especially relevant to teacher use of computer technology in the classroom stems from the principal (person in charge of the change) having an understanding of how the teachers (clients) perceive the change and then making adjustments as necessary.

Moersch (1994) developed a framework based upon the concepts of the CBAM model that would measure the levels of technology integration. The instrument structured from the context of the CBAM framework is the LoTi (Levels of Technology Implementation). The LoTi also has conceptual alignment with the works of Hall, Loucks, Rutherford, and Beulah (1975); Thomas and Knezek (1991); and Dwyer, Ringstaff, and Sandholtz (1992). The LoTi survey defines eight levels of integration that teachers can demonstrate: Nonuse (Level 0), Awareness (Level 1), Exploration (Level 2), Infusion (Level 3), Mechanical Integration (Level 4A), Routine Integration (Level 4B), Expansion (Level 5), and Refinement (Level 6). Moersch (1994) proposes through his research that:

> As a teacher progresses from one level to the next, a series of changes to the instructional curriculum is observed. The instructional focus shifts from being teacher-centered to being learner-centered. Computer technology is employed as a tool that supports and extends students' understanding of the pertinent concepts, processes and themes involved when using databases, telecommunications, multimedia, spreadsheets, and graphing applications. Traditional verbal activities are gradually replaced by authentic hands-on inquiry related to a problem, issue, or theme. Heavy reliance on textbook and sequential instructional materials is replaced by use of extensive and diversified resources determined by the problem areas under discussion. Traditional evaluation

> practices are supplanted by multiple assessment strategies that utilize portfolios, open-ended questions, self-analysis, and peer review. (p. 41)

The LoTi instrument can be used to determine (1) the Level of Technology Integration (LoTi), (2) Personal Computer Use (PCU), and (3) Stages of Instructional Practices (CIP). Not only does the LoTi give a measure of whether teachers are using computer technology integration and how they are using it, but it will also help ascertain the degree that instructional strategies are student centered, constructivist, hands-on, and collaborative. The LoTi can also assess second order change with the section Stages of Instructional Practices (CIP). The LoTi will yield data that can be used to construct needed support systems and staff development opportunities that will facilitate technology integration in the classroom and facilitate change.

Moersch (2002) has found that the majority of educators (71%) can be identified in Levels 0-2 while only 6% identified themselves at the target level of Level 4B. This finding supports the fact that the majority of teachers are at the lowest levels of technology use. Students, however, will not fully benefit from technology integration until teachers fully adopt the new practices. Because an effective staff development model and a successful change effort have similar components, it may not matter significantly which approach is used to influence the conversion to new practices (including the use of computers) in the classroom by teachers (Hord, 1994).

Introduction

The struggle to introduce technology in classrooms continues on a daily basis for districts that have spent billions of dollars for equipment and software to expand the learning possibilities and job potential for their students. Teachers are expected to prepare students who will become productive citizens prepared for the 21st century and beyond (Dawson & Rakes, 2003). Processes used in business, transportation, communication, and many other occupations have changed drastically due to the innovations of new technologies. Because of these changes, each child's education, employment and cultural opportunities will be shaped by his/her ability to understand and manage these emerging technologies (Hasselbring, Smith, Glaser, Barron, Risko, Rakestraw et al., 2000; Scheffler & Logan, 1999). Predictions for students of today indicate that many jobs will require some type of expertise in technology. Computer experience will be required for five of the ten fastest growing jobs (College Planning Network, 1996). Educators are charged with meeting the changing needs of society by supplying a workforce that can handle these demands for technology savvy workers.

The employment outlook for students makes it clear that teachers must provide the necessary exposure of technology for students to compete in many areas of the job market. Failure of schools to adequately prepare students may result in loss of opportunities and income. For this to happen, many teachers must overcome the status quo of school organization. They must be willing to receive new innovations and adapt to changing strategies that will assist them in integrating technology into their classrooms. Teachers must be supported during change to garner the skills necessary to accomplish the integration of technology for their students.

The goal for educators is to use technology to its fullest capacity in classrooms where it can affect teaching and learning. Despite the growth of technology in schools, many questions still remain unanswered as to how effective teachers are in integrating technology into instruction. This evaluative effort must go beyond a mere count of computers in the classroom. Literature shows that just because computers are in the schools does not mean that they are being utilized effectively or utilized at all. The future of technology integration rests on the ability of districts to institute an effective evaluation of current practices of technology usage in schools. The lack of impact on the daily routines of teachers, administrators, and students in the deployment of technology in schools has been prevalent in the analysis of technology usage.

Research detailing the level of teachers' integration of technology is scant. Research that is available on various aspects of technology integration is inconsistent and difficult to compare because of variations in standards, definitions and defining criteria. There are areas where research is available regarding technology integration in schools and those areas most closely linked to the success of teachers' technology integration. These areas include; cost of technology and accessibility in schools, advantages of technology use in schools, pedagogy, change and teacher integration of technology, and barriers to implementing technology in the classroom.

Cost of technology and accessibility in school

Two areas that dominated the early movement of putting computers in schools include spending and accessibility. These were both vital to the success of the initiative of school technology and will continue to be prominent as technology integration continually evolves and changes. Spending and accessibility issues have been the focus of educational technology since the early 1980's. The importance of these areas should begin to migrate toward more of a maintenance role of the present system and how the current systems can be upgraded and effectively evaluated to drive further spending and staff development to make full use of current technology. The first area addressed will be technology spending followed by accessibility and its current status in schools within the United States.

Technology spending in schools has a history of being lucrative, continually increasing, and largely unmonitored. As the funding for technology in schools continues to increase, policy makers and members of the public are looking for results. For policymakers and taxpayers, this implies connecting substantial and ongoing investment to improved student achievement.

Research currently shows various levels of improvements in student achievement compared to the capital investments made in school technology (Schacter, 1999). As funding for schools continues to be limited and budgets get more scrutiny, policy makers are looking for more decisive evidence that technology is being effectively utilized in classrooms and does enhance student learning. A focus will be placed on the current trends of technology expenditures for K-12 schools. An overview of educational technology spending will follow which will include a brief history of technology spending, a breakdown of where money is typically being spent in school budgets, and what trends could impact educational technology spending in the future.

The history of technology spending for schools shows a consistent trend of increasing from year to year. In fiscal year 1998, $7.2 billion was spent for technology in schools, equating to 2.7% of the total expenditures for education for that year. Schools averaged $113 per student on technology spending with the majority falling into hardware purchasing (Anderson & Becker, 2001). Spending will likely remain in the $7 billion range for the next several months (Murray, 2004). Technology spending in K-12 schools has seen a steady increase each year since 1991-1992. This trend peaked in 1998-1999 due to e-rate issues and saw a slight decline the subsequent years (Scholastic, 2003; Electronic Education Report, 2001; Education Technology News, 2000). The spending, however, has remained fairly constant over the last decade. This is truly an extraordinary feat as many school districts have experienced extreme budget cuts over the last couple of years.

According to Trotter (2004), those districts that are most dedicated to technology implementation are maintaining or increasing technology spending while districts that have shown less of a commitment, where technology has not permeated the daily operations of the school, are cutting the technology budget. These districts are also cutting or eliminating the funds for professional development and training and support systems associated with technology. Without sound data involving the impact of technology on student learning, this makes technology spending an easy target for cuts, particularly in the area of staff training.

The type of technology spending may be of greater importance than the amount. Computer hardware accounts for almost 46% of the technology budget while 20.8% of the spending goes toward software, support services, and wiring. Teacher training and professional development is the area receiving the least technology spending (Kane, 2002; Education Technology News, 2000). It is recommended that 30% of the technology budget be utilized for staff training and professional development (Electronic Education Report, 2001; CEO Forum, 1999), which is consistent with teacher survey data that confirms training as a barrier to technology implementation.

Despite the lack of data analysis on cost return, the future of technology spending for schools continues to look bright. By 2006, public schools in the United States will spend about $9.5 billion on technology (Kane, 2002). Trotter (2004) points out in a survey of school leaders across the United States, that the lack of evaluation of instructional technology is evident when two-thirds of districts do no return on investment calculations on technology current in their districts and do not utilize this information when making a new purchase of technology. A smart investor will testify that a positive return is necessary before additional capital is pumped into a virtually unproven system. In the past, educational technology spending has escaped this type of scrutiny. This study proposes to evaluate the initiative of providing teachers with laptop computers in an effort to ascertain where teachers are functioning in their implementation of technology four years from the inception of the program. This information can provide a framework for school leaders to evaluate the usage of technology and determine an appropriate funding structure.

Technology spending for schools will be influenced by a variety of factors. Federal mandates encompassed in No Child Left Behind Act (NCLB) will impact technology dollars, forcing school districts to manage and aggregate information on many different levels by accounting for differences in ethnicity, gender, socioeconomic status and abilities (Scholastic, 2003). NCLB will also force districts to rely on real time data. As data-driven decision making becomes the norm in schools, there will be a need for assessments of student's abilities to make modifications and adjustments immediately to improve their performance. Teachers with real time data can make adjustments for individual students based on accessed weaknesses.

Another factor that could influence school technology spending and the direction that it may take in the future is the accessibility of technology for all students. As technology becomes more mobile and costs are driven down, districts will spend money for students to have hardware, software, and home access to school curriculum and programs (Kane, 2002; Rockman et al., 1998). Some Schools will attempt to provide these components in an effort to address the equity issue of technology accessibility for typically underserved populations or populations at risk. Addressing the factors that can influence student achievement and school funding will be prime issues as schools try to gain or maintain federal funding.

The federal and state legislatures strongly support the use of instructional technology in classrooms evident in the funds spent on this initiative. The Goals 2000: Educate America Act provides funding for technology planning at both the state and federal levels (United States Congress, 1994). A federal grant program, Preparing Tomorrow's Teachers to Use Technology (PT3), helped fund the development of the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) for Teachers (U.S. Department of Education, 1999). Federal grant programs, such as Key Instructional Design Strategies (KIDS), are an additional funding source in support of schools using technology (Knezek & Christensen, 2001).

Instructional leaders have had the opportunity to receive funds from a variety of sources, including state and federal government, to place technology into the classrooms. The majority of districts have succeeded in this phase of technology implementation, as evidenced in the number of computers in schools. Computers and technology are commonplace in the vast majority of schools today across the nation. Computer to student ratios are rapidly decreasing and have reached an all time low of ten students for every computer (ETS, 1998). In 1999, The National Center for Education Statistics reported that an astounding 99% of schools had computers, and that 95% of these schools were connected to the internet. Nearly all public school teachers responded as having computers available somewhere in their schools. More than half of these same teachers reported having internet access in their classrooms. The majority of teachers confirmed that they had personal access to these technologies in their homes (Smerdon, 2000).

The financial support to maintain the presence of technology in schools is promising. The accessibility of technology to students and teachers continues to improve. The need to investigate and evaluate how spending and accessibility have impacted teachers' integration of technology in the classroom is vital and should become the standard for technology spending. Without proper evaluation of how technology is impacting the learning process, spending will likely continue in potentially the wrong areas.

Advantages of technology use in schools

It is likely that financial support for technology in schools will continue. An area of analysis that naturally flows from this is the impact of technology on student performance. Policy makers, who work mostly from a cost benefit model, want to know if the effect of this significant spending yields the benefits of improving student achievement (Heinecke, Blasi, Milman, & Washington, 1999). Most research on the effectiveness of technology on student achievement falls into a few basic areas. The primary research area that deals with the impact of technology in core curriculum areas of study that includes mathematics, science, and reading/writing. Another area of research is an emerging area that documents the impact of technology on students who are categorized as at-risk, those who are socio-economically disadvantaged and students who are academically disadvantaged. The last area of technology effectiveness research explores the more generalized benefits derived by students using computers.

Means and Olson (1995), authors of a Department of Education funded study that focused on the impact of technology on student achievement, found that in nine schools that were considered to be technology rich that educational gains were made with students regardless of age, race, parental income, or other characteristics. There are links between how computers are used in the classroom and student achievement. In a study conducted by the National Assessment of Educational Progress (NAEP) (1998), eighth grade students, whose teachers used computers for primarily higher order thinking skills, performed better on the NAEP. Consequently, eighth graders whose teachers followed a more "drill and practice" strategy emphasizing primarily lower order thinking skills performed worse on the same assessment, emphasizing the need for teachers to have an appropriate understanding of how to use the computer as a tool in the classroom.

Kulik (2002) conducted a meta-analysis in conjunction with the National Science Foundation (NSF) on the use of technology in classrooms and the student outcomes. The study revealed that some advancements in student achievement were noted where technology was used. Thirty-six controlled evaluations were examined in this meta-analysis. This study analyzed four different areas of computer applications within the core academic areas of math and science with documented effects of technology on student learning.

The first of the four areas in the NSF meta-analysis looked at integrated learning systems (ILS) in mathematics. ILS is a software application that has a focus primarily on reading and mathematics tutorials. Commonly, these tutorials will start on a basic level and continue upward in difficulty as the student progressively gains knowledge. This type of program also has the capability of keeping extensive records of student performance and allows for continual monitoring of progress and immediate feedback for performance. Kulik also found that several ILS for mathematics, from different vendors, each showed an increase in students' mathematics test scores. Nine of the sixteen studies in this area reported that the test scores of students utilizing the ILS system were large enough to be considered statistically significant by research standards and meaningful educationally. The increase in test scores for the students utilizing the ILS rose from the 50th percentile to the 65th percentile. This significant increase of students' math scores can be contributed to only partial implementation of the ILS software. Most schools used the ILS system as a supplement to the curriculum and not as the curriculum which the program was designed to do.

Over twenty years ago, Burns and Bozeman (1981) reported that computer-assisted instruction (CAI) showed promising results in their meta-analysis study. Several other studies since that time have confirmed the positive effects of CAI on primary school children (Tyler & Vasu, 1995; Riel & Harasim, 1994; Clements, Nastasi, & Swaminathan, 1993; Funkhouser, 1993; Repman, 1993; Gardner, Simmons, & Simpson, 1992; Mevarich, Silber, & Fine, 1991; Reglin, 1989). A similar effect was found for secondary school students. A meta-analysis involving 27 studies that included students in sixth through twelfth grade where split into two groups. One group was taught by traditional methods alone while the other half received traditional instruction supplemented by CAI. Those students who received the traditional instruction with the supplemental CAI instruction showed 58.2% higher achievement academically than those students who received only traditional instruction (Christmann, Badgett, and Lucking, 1997). ILS and CIA are both technology tools that clearly improve students' success in mathematics.

The Apple K-12 Effectiveness Report (2004) validates these findings for the improvement of student achievement in mathematics with technology. Apple found that when computers were used in mathematic classrooms and students were allowed time for exploration, that students in algebra scored significantly better on a test of knowledge than a group taught with traditional methods. These students retained more mathematical information and also scored significantly higher on measures where they were able to transfer their knowledge to other areas of math.

Students in the Apple study also demonstrated an increased knowledge in math content and had significant gains in their problem solving abilities. An unexpected benefit of the use of technology in the classroom, as reported by the Apple K-12 Effectiveness Report was that students who utilized technology in the mathematics classroom had a more positive attitude, not only about mathematics, but with themselves. Another study costing $14.1 million and carried out in 55 New York schools was used to document that technology had the ability to improve student achievement, especially in mathematics (Mann & Shafer, 1997). Once again, the general use of computers in the classroom demonstrated to be beneficial in the educational setting.

Kulik (2002) studied a second area in the meta-analysis for NSF, one dealing with computer tutorials in science. Where ILS instruction is a more broad sweeping tutorial experience, science tutorials are commonly focused on specific topics. The science tutorial programs function much like a live tutor. The computer presents the information, the student responds to the information; the computer evaluates the response and makes a determination about which material to present to the student next. The six reports that were evaluated by Kulik in this meta analysis all ranged from ten days to three months. The results of the study were consistent with other research findings. All the studies, with the exception of one, showed a statistically significant increase in student achievement. It was also noted that student attitudes toward the subject area and instruction were both strongly positive. This information is not new, as computer tutorials have shown a positive effect on student achievement since the 1970's (Kulik, 2002).

The next two areas of educational technology deal with computer simulation and microcomputer-based laboratories revealed mixed results on student achievement. Computer simulation in science was the third area evaluated by Kulik in the NSF study. This type of instruction tends to focus on simulations of real world applications of science. It surpasses the tutorials in that it offers the students the opportunity to utilize higher order thinking skills. The use of simulation, however, showed no gains in student achievement. Students who used computer simulations scored nearly identical to student who did not utilize computer simulations. Microcomputer-based laboratories (MBL's) are a technology where electronic sensors are used to collect data and convert it into graphs, and are used in science labs. As the fourth and final area evaluated, the results for this technology were mixed. A small positive effect or a small negative effect of MLB's was noted on student learning.

Microsoft Corporation and Toshiba American Information Systems in 1996 sponsored a program that provided students and teachers with their own laptop computers. The goal of this study was to provide students with business tools used in the real world that supported learning anytime anywhere. The results of the study conducted on this program showed that students who had access to technology both in the classroom and at home utilized the computers more than non-laptop students. This type of technology also yielded several other beneficial outcomes for students. The laptop served to extend the school day as these students spent up to 48% more time on schoolwork than their non-laptop counterparts. The direct learning benefits of students who had ready access to the laptops yielded increased levels of collaboration as well as improved participation in project-based instruction. Teachers reported that their students who used the laptops wrote more and had a higher quality of writing. It was also noted by teachers that students utilized higher order thinking skills more, liked school better, and produced higher quality assignments than students who did not utilize laptops. The positive effects of the laptop program were not exclusively noted in the students. Teachers in laptop classrooms spent less time lecturing and more time consulting with students (Rockman et al., 1998). This resulted in a shift in the teacher's role from directing the learning to facilitating the student learning.

North Central Regional Educational Laboratory sponsored a meta-analysis of 20 quantitative studies that looked at technology's impact on student outcomes focusing on integrated instructional technologies. The outcome showed a positive effect on student outcomes compared to traditional instruction (Waxman & Pardon, 2002). Another meta analysis that was specifically directed at reading and mathematics software showed a strong relationship between the use of the software and student achievement in these subjects (Murphy, et al., 2002).

Polk County School District in Central Florida utilized a best practices approach to improving student achievement with technology. The district's Information Systems and Technology Division combined the effects of technology-based instruction, ongoing professional development for teachers, and proven practices to assist students in improving on the state's standardized tests. Students from fifty-seven schools participated, including fourth graders in reading and fifth graders in mathematics. Both groups showed gains of at least 16% between pre-tests and post-tests (T.H.E. Journal, 2002).

Apple Classrooms of Tomorrow (ACOT), a ten year project, found that students performed better, as measured on the California Achievement Test (CAT), in a computer rich environment and had a better attitude toward school (Ross, Smith, Morrison, & Erickson, 1989). An evaluation performed several years later confirmed and added that the ACOT's program did improve students' self esteem and attitude as well as increase their writing abilities (Baker, Gearhart, & Herman, 1994). In addition, schools involved in the ACOT project report that the increased access to technology allowed more student collaboration, more project based learning, greater student confidence, and more accurate student communications (Dwyer, 1995).

Other studies have documented the effects of instructional technology on students' self esteem and confidence (Tyler & Vasu, 1995; Repman, 1993; Mavarich et al., 1991; Robertson, Ladewig, Strickland, & Boschung, 1987). It is clear that technology can also play a significant role in improving the academics of students who have special needs (Parry, Thorkilden, Ryba, Selby, & Nolan, 1995; Waxman & Pardon, 1995; Grossen & Carnine, 1990). Improved academic performance for nontraditional students has been documented as well (Poirot & Robinson, 1994; Signer, 1991). The same benefit is true for students in lower socioeconomic classes (Ehman, Glenn, Johnson, & White, 1992). Cradler (1994) found that through the integration of technology and telecommunication in the classroom can yield:

1. Increased student performance and collaboration
2. Opportunity for interactivity for instructional program increases
3. Improves problem solving, attitude and confidence of students
4. Prepares students for work, careers and vocations.
5. Improves writing skills and work force skills
6. Provides for student centered learning

The literature is clear that the proper use of computers in the classroom can have an impact on student achievement. The need to evaluate how teachers integrate technology in the classroom can assist students in doing more, learning more, practicing higher order thinking, and liking school more. These results should entice educators with the documented positive effects technology can yield for students (Quinn & Valentine, 2001). It is clear that the knowledge or lack thereof that teachers hold in the integration of technology will be what is manifest in the instruction for their students.

Pedagogy, change, and teacher integration of technology

Teachers are the key to integrating technology into instruction. The importance of exposing students to technology can yield life long results and pay off in increased opportunities and income. Most teachers understand what technology can do for students, but many do not know how to transfer the knowledge into practice in the learning environment. Technology has the power to transform a teacher from traditional to constructivist. This leap into a new territory is difficult for teachers as change is a process and takes time to put into practice. The National Information Infrastructure Task Force (1994) found that Americans still learn, teach, transmit, and access information much like they did a hundred years ago. The task force cites:

1. Teachers work in isolation with limited contact with their colleagues.
2. Students are not active participants in the learning process, but rather recipients of information from their teachers.
3. Educational success is based on how well a student absorbs the content of a textbook which still remains the basic unit of instruction.
4. Many teachers use passive video materials, but only a small fraction use or have access to interactive videos, computer networks, or telephones in the classroom.
5. Computers are used only for basic functions such as an electronic gradebook. The use of the computer for collaboration and higher order thinking activities is limited to small pockets of successful implementation.
6. Schools are conservative by nature and are slow to adopt new practices and technologies.

The integration of computer technology into the classroom is no exception as it constitutes one of the major changes that teachers have had to face in their careers. Once teachers embrace the innovation of technology integration the benefits will continue to evolve for students. According to OTA (1995); Henriquiez & Honey (1993); Hadley & Sheingold (1990), educator use of technology in the classroom can lead to the following benefits:

1. Increased communication among teachers, parents and teachers, and administrators and parents;
2. Increased emphasis on individualized instruction, less time lecturing;
3. Teachers engaged in the advisement of students;
4. Increase interest in teaching, teacher productivity, planning with colleagues, and participation in restructuring efforts;
5. Higher expectations for students.

A major factor in the use of technology in the classroom is the shift in pedagogy for teachers. Those who are successful in the integration of technology become more aligned with constructivist practices (Moersch, 2000). Research on successful technology integration has found the movement is away from the traditional teacher-centered approach to an atmosphere more focused on students being the center of the learning (NCREL, 1999). This is quite a shift for many teachers employed in schools today and certainly divergent from the way most of them were taught themselves.

The movement toward a more constructivist pedagogy means that the emphasis for instruction will be placed on the learner's construction of their own knowledge. Teachers are able to do this by focusing a student on what they already know then promoting an environment conducive to introduction of new material. Activities are then used to build upon what the learner already has knowledge of in addition to providing time for reflection and sharing to solidify awareness of the new cognitive structures (Zahorik, 1995). This guarantees the authenticity of the learning for the student. The role that computers can play in constructivist learning occurs when students engage in 'just in time' learning where they are able to access data or exchange information as the need arises in their exploration of new topics. Online resources and databases are able to restructure learning into a format that is more commiserate with what students are accustomed to in this age of technology. Yet resistance of teachers to embrace computer technology into their teaching still persists though access to technology is at an all time high.

Technology has the ability to change the way that teachers teach and approach their classrooms (Quinn & Valentine, 2001; Scheffler & Logan, 1999; Byrom, 1998). The style of teaching that is employed by a classroom teacher can be used as a predictor of technology integration. It is then reasonable for research to predict that the preferred teaching strategies and styles of teachers usually determine or shape their patterns of technology usage. Teachers who are deemed "traditional" in their instructional methodologies are far less likely to allow students to use new technologies. Classrooms that show a focus on drill and practice of mastery of basic skills or to supplement teacher-controlled activities are marks of a traditional classroom that is teacher centered.

On the opposite end of the teacher spectrum is a more student-centered classroom where technology is used to support student inquiry. This type of classroom and this type of teacher encourages all students to conduct their own scientific inquires and engage in collaborative activities (Quinn & Valentine, 2001). In this type of classroom, teachers remove themselves from center stage and assume the role of facilitator or coach. Teachers who fall into the facilitator group are among the most enthusiastic technology users. This is because technology is particularly suited to support this kind of instruction and learning environment (CEO Forum School Technology Readiness Report, 1999).

Teachers who are deemed constructivist are far more apt to allow students to use technology. Transforming teaching styles, preferences and behaviors is not an easy task accomplished. It takes persuasion, learning by experience and providing teachers with a highly personalized learning journey that addresses their particular weaknesses (McKenzie, 2001). This reinforces the Joyce and Showers Model (1980) of delivering staff development. Bringing the coaching element into the classroom will ensure that teachers have the needed support to incorporate technology into the learning environment. The areas that seem to be at the forefront of technology and addressing the needs of teachers and students include the connectivity and availability of technology, adequate staff development, appropriate technical and hardware support and the application to student learning (Ricks, 2000). The role that teachers take on can impact the use of technology in the classroom.

Kook (1997) defines five roles that teachers will assume as they become more active in their use of computers and communication technologies. These five roles include information consultants, team collaborators, facilitators, course developers, and academic advisors. Teachers as information consultants search instructional resources and material and help students access the necessary information. Consultants will use the computer and its communication-related technology to teach. While employing this type of teaching methodology, the teacher will also be educating their students in the technology itself.

The second defined role of Kook states that teachers who are team collaborators will use networks to close the gap through communication. They will promote collaboration among institutions that are separated by geography and bring different disciplines and individuals together for the benefit of students. Facilitators help students decide upon appropriate instructional goals, and help to identify and coordinate the best means for students to achieve those goals. The fourth of Kook's roles that teachers take on in the integration of technology is course developers. This group plans the content, structures, objectives, resources, and assignments for a class. Information technology promotes course development because it requires a change from traditional curricula to a constructivist approach. Kook's last group includes academic advisors. This group diagnoses student academic needs for instruction and graduation; they help students select a program to meet those needs, and review students' educational progress.

The vast majority of schools in the United States have access to computer technology. In the third annual report from *Education Week* entitled Technology Counts '99, it was reported that of the 1,047 teachers who responded to the survey almost all had access to a computer either at home or at school. Most of these same teachers reported using the computer for some type of professional activity, yet only a limited number are using the digital content in the classroom. Fifty-three percent of the responding teachers used software to enhance instruction while sixty-one percent used the World Wide Web for this purpose. A shocking forty percent of the teachers reported that their students did not use the computer at all in a typical week (Education Week, 1999). In Oklahoma, the percentage of students using computers in the classroom is 67%. This ranks Oklahoma 28th in the United States (Atkinson & Gottlieb, 2005). Toolkit for Action reports where Oklahoma ranks on important technology issues with its youth:

1. Fifty-seven percent of Americans over the age of 25 who are employed use a computer at work.

2. There are 5.6 students for every Internet-connected computer in Oklahoma's public schools (High poverty schools are 6 students per internet connected computers).
3. In 31% of the schools in Oklahoma, the majority of teachers were considered "beginners" when it comes to using technology. The national average in this same category is 24%.

The vast majority of teachers have the desire to prepare their students properly in the use of technology, many are just unsure of how this powerful tool can be harnessed and used effectively in the classroom (Shuldman, 2004; Scheingold & Hadley, 1990). A major step for many teachers is to deal with some of their own fears regarding technology so that effective implementation of technology can benefit students. For teachers to move forward confidently in their technology endeavors, it is vitally important that educational leaders assist in making the connection between teachers and technology. Making this connection will facilitate schools in making the most of resources that they may purchase in the future, what they currently posses, and what has been retained from past technology purchases. This is not just an investment in teachers or technology; it is an investment in the future of America's children and one that schools must be willing to make. (CEO Forum School Technology Readiness Report, 1999; Byrom, 1998).

School leaders can be and should be instrumental in the usage of technology in the classroom. By making technology a priority on a school wide level, teachers will be more encouraged to utilize technology (Shuldman, 2004; Dawson & Rakes, 2003). The usage of technology is not enough. There should be concrete uses of technology that are visible and assessable to teachers. Over ninety percent of all schools have computers that are connected to the internet (Education Week, 2005; The National Center for Educational Statistics, 1999). This facilitates teachers accessing information and resources directly related to what is important for the success of their students (Archibald, 2001; Byrom, 1998). The focus for teachers should be on teaching and learning strategies that make a difference in daily practice for the students. The goal should be for these activities translating into stronger student performance (McKenzie, 2001). It is important to assist teachers and make them a part of the vision of what benefits can be drawn from technology integration by their students.

There are some precursory events that must occur before teachers will be able to move toward a more effect use of technology. Two-thirds of teachers surveyed by the U.S. Department of Education report consider themselves as either not at all prepared or only somewhat prepared to use technology in their teaching. Not surprisingly, younger teachers who have grown up in the technology age reported feeling comfortable in the use of technology and were therefore more likely to utilize it in their classrooms (Lonergan, 2001). It takes up to five years on average for teacher to feel adequately prepared to mix technology instruction with traditional practices (Bryom, 1998). The teacher laptop program in the district under investigation was initiated four years ago.

Most teachers will move toward the desired goal, if there is a clear vision communicated of what is to be accomplished. Teachers must be informed of the vision for technology uses and its unlimited potential and creativity that it provides students (Delisio, 2003). Educators must have the opportunity to apply technology in the areas that they feel most comfortable in their experimentation. Their classroom is the most appropriate place for this introduction to technology to occur. Training that occurs at the time of teacher usage can be an invaluable support tool for the classroom. Many teachers would feel more confident in their technology usage if a person knowledgeable in integration were available to assist them in their initial attempts at technology integration. Teachers must have time to integrate the available technologies. Only then can teachers be informed and fearless in their use of new technologies (CEO Forum School Technology Readiness Report, 1999; Byrom, 1998).

According to North Central Regional Education Laboratory (2003), over $7 billion dollars are spent annually for technology in schools. It is evident by the generous amounts of money that are spent in educational technology on a yearly basis that technology is here to stay. Figuring out why teachers barely use or never use technology in their classrooms poses an important question. Measuring the value of technology is difficult at best if it is never fully implemented by the teacher in the classroom. Providing a clear picture of technology's impact on education may be impossible if there is no evaluation of how teachers are utilizing the current technology available. Current research is focusing on a much broader spectrum of assessing what conditions must be present for teachers to use technology more effectively in the classroom.

Many districts have 'put the cart before the horse' by placing more of an emphasis on purchasing and installing equipment without providing funding to sufficiently train staff to get a return on the huge investments being made (Delisio, 2003; McKenzie, 2001). Curriculum integration is central if technology is to become a truly effective educational resource, yet integration is difficult, time-consuming, and a resource-intensive endeavor (CEO Forum School Technology Readiness Report, 1999). Technology is making integration an easier task by allowing schools to build standards based curriculum that aligns both vertically and horizontally. It is ultimately up to the teachers in the classrooms to employ technology as a tool of instruction. It is evident that now is the time for evaluating the level of technology integration and providing teacher training programs to bring effective technology usage into the preparation process. The United States will need a projected 2.2 million teachers over the next decade, and they will need technology experience to effectively integrate this into the curriculum (Lonergan, 2001).

Zhao et al., (2002) conducted a study that provided rich information about teachers' use of technology in the classroom. The participants fell into one of three categories on the implementation level of their projects; successful, mixed success, and failed. There were eleven factors that contributed to the success of the ten cases. Each of these factors fit into one of three areas of innovator, innovation, and context. Every area defined what aided in the teacher/teacher team being successful the integration of technology.
The primary focus of this study was to determine what conditions technology innovations needed to be successful in the classroom. All 118 teacher/teacher teams in this study were recipients of a technology innovation grant that ranged from $1,000 to $10,000. These teachers were motivated in the use of technology with their students. Data were collected at three different levels of this study. All grant recipients were given a survey at the onset of the project.

The second level included 32 of the 118 participants where an interview was added to the previously administered survey. Classroom observations were used in the third level with 10 of the 32 educators. The ten were narrowed down from the main group by geographical location, grade level and subject matter. It was also noted that there was no significant differences between the participants in the areas of proficiency, anxiety, pedagogy, computer beliefs, or current use of technology. The assumption is made that the selective cases would be representative of the 118 grant participants.

The mixed methodology used in this study yielded results that were meaningful in determining what conditions allowed for the most successful implementation of innovation in the classroom. The survey used was constructed from six constructs identified in literature to be indicators of technology integration. The six constructs included technology proficiency, computer anxiety, attitudes and computer beliefs about technology in education, professional uses of technology, pedagogical styles, and experiences preparing for submitting the grant proposal.

Interviews focusing on three areas followed the survey for 32 teachers. The focus of the interviews was the teacher's previous experience with technology, their motivation for applying for the grant, and concerns and plans for implementing the technology innovation in their classroom. Twelve of the 32 were selected to receive in class observations as well as follow up with some of their students and colleagues. A grounded theory approach was used with constant comparison. Each week the researchers would meet and talk about the cases. Each participant was given a rating of successful, mixed success, and failed. This process took six months and gradually a list of themes emerged. Eleven factors were recognized as explaining the degree of success for all ten cases and could be categorized in three areas as innovator, innovation, and context.

The teacher/teacher team's (innovator) overall proficiency of technology had significant impact on their ability to integrate technology in classroom. There was also an additional area of technology knowledge that played a role. That is an expanded view of what the supporting conditions of technology had to be for success. Teachers need to be aware of the components required to run a specific technology. Compatibility of the teacher's pedagogy with the technology was also shown to be important. Teachers who were reflective and had an understanding of their own style seemed to be better adapted for technology integration. The last area required for the teacher is a social awareness of their school culture. Teachers who were more attuned to the culture were more likely to successfully implement their innovation in the classroom. Knowing the priorities of their colleagues and the resources of the school were also helpful in teachers implementing technology into their classrooms.

The innovation itself had an impact on whether it was implemented in the classroom. Two dimensions of the innovation were found to be important; distance and dependence. Distance is how far from the common practice and the technology the innovation was and dependence refers to how much the innovation relied upon other people and resources. It was found that the innovations that were most successful were those that were consistent with the school culture, close to the technology in building, and did not rely on outside resources or others to implement.

The context in which the technology was being integrated made a difference to the success. The human and technology infrastructure as well as the social support available to the teacher were the most important aspects of successful technology integration. It is important for the teacher to be supported by their peers, have a reliable resource for the technology itself, and have ready access to technology as needed. The interaction of one domain on another also was an influence on the success of the innovation. Strong teachers were able to overcome both distance and dependence. The quality of the innovation was also very important to success. This could override a competent teacher if the innovation strayed significantly from the school culture. This could be overcome if there was sufficient human and technical infrastructure to support it.

To integrate technology in the classroom, teachers need to know how to use the technology, how it fits into the curriculum and their own teaching beliefs. Successful integration requires that the teacher interact with people outside of their classroom. Professional development needs to be expanded and ongoing to include skills necessary for successful implementation. Technology usage should be evolutionary and fit into the current culture of the school to increase chances for success. Steps should be small, but progressive. Districts should put into place an infrastructure that supports teachers using technology in the classroom (Quinn & Valentine, 2001; NCREL, 1999).

Teachers must also examine their pedagogical beliefs to see where technology fits and how technology can be used to complement their style. It is important for teachers to have a more broad understanding of the systems that go into making technologies work and to establish relationships with those that can assist in implementing technology into the classroom. Teachers should also take evolutionary steps to technology implementation and this should be in consideration of the school climate and culture. Technology integration is going to take a team approach that encompasses whole schools and districts. A clear vision and adequate time and resources need to be dedicated to make this a successful venture in helping students.

Barriers to implementing technology

Access to computer technology is becoming less of a factor and more focus is placed on use. Four areas that have been cited as contributors to under-use of computer technology in the classroom by previous research are: inadequate teacher training; lack of vision on how technology can improve instruction; time constraints to experiment with technology; and inadequate technical support (OTA, 1995). OTA specifically lists areas within the four categories that impact teacher use of computer technology:

A. Teaches must have time to:

    1. Experiment with new technologies;
    2. Share experiences with other colleagues;
    3. Plan lessons using technology;
    4. Attend technology courses or meetings.

B. Access:

    1. Hardware and software are limited;
    2. Upgrades, support and training are continuing costs;
    3. Technologies not located near classroom for easy access;
    4. Old hardware that cannot run new applications;
    5. New and updated wiring needed for expanded telecommunication capabilities.

C. Vision:

    1. Need for technology planning and leadership;
    2. Teachers need understanding of how technology can be applied in curricula;
    3. Lack of technology models for teachers;

D. Training and Support:

    1. Districts spend far less on teacher training than on hardware and software;

2. Training focuses on the mechanics not on integration of technology;
3. Few schools have a full-time, school-level computer coordinator.

E. Current Assessment Practices:

1. Standardized tests may not reflect what students learn with technology;
2. Teachers are accountable for changes, yet results take time (p. 119).

The availability of technologies in the schools has increased, yet many teachers report that they use computers either little or none at all for instructional purposes (CEO Forum School Technology Readiness Report, 1999; Byrom, 1998). There are many factors that contribute to the lack of teacher use of technology. One of the most prominent factors is the lack of effect training that meets the needs of the teacher (Woodridge, 2004; Scheffler & Logan, 1999). There is evidence from the Market Data Retrieval survey from 1999 that the majority of American teachers receive fewer than five hours of technology related professional development annually, and most occurs in the area of training. One hundred additional hours of learning computers is not likely to take the traditional teacher and transform them into a constructivist (Delisio, 2003; McKenzie, 2001). The lack of authentic and meaningful staff development has left teachers with millions of dollars of software and hardware and little knowledge in how to utilize it for the benefit of the students (Education Technology News, 2000; Sheffler, & Logan, 1999; Byrom, 1998). Forty percent of the teaching force did not receive instruction on how to use the internet and eighteen percent more had eight or fewer hours of staff development in technology (Wenglinsky, 1998).

Although schools have made significant progress in helping teachers to use basic technological tools such as word processing and databases, they continue to struggle with integrating technology into the curriculum (Byrom, 1998). Most teachers have not had adequate training to prepare them to use technology effectively in teaching. Currently, most funds for technology are spent on hardware and software, but experienced technology-using sites advocate larger allocations for training and support (CEO Forum School Technology Readiness Report, 1999; OTA, 1995). Only at this point do teachers become more comfortable using technology as a tool as they would use any other educational tool in their classrooms.

The evidence remains clear that few American teachers are adequately prepared to use the new technologies in any fashion, much less be able to use them in support of a standards based curriculum. Technology should be used by teachers to create a new learning environment that addresses the needs of students in the 21st century (Byrom, 1998). A survey conducted with 1,407 teachers revealed that only slightly more than half, 53%, use software to enhance instruction in their classrooms, and only 61% use the Web for this purpose. A figure that is even more discouraging shows that almost 4 out of 10 teachers surveyed indicated that their students do not use classroom computers at all during a typical school week. Schechter (2000) and Baily, Ross, and Griffin (1995) contend that the following are major barriers to technology integration when schools fail to accomplish the following:

1. Distinguish the computer from the emerging and learning technologies.
2. Develop a vision of how technology can be utilized in teaching and learning.
3. Have a technology plan.
4. Staff development that emphasis integration of technology.
5. Empower teachers and students to experiment with emerging technologies.

6. Integrate technology into the basic learning process within and outside of the classroom.

The research is clear in these specific areas that technology can play a positive role in improving student achievement. This raises major concerns about why more convincing proof cannot be found in research to solidify the effects of technology on student achievement in a more widespread fashion. Two areas that could possibly expand and improve upon the findings of technology on student achievement are the improvement of teacher training and utilizing a multifaceted approach in researching the impact of technology.

Addressing teacher training and staff development is vital to improving and sustaining the success of educational technology. It is evident that teachers are not receiving proper training to effectively implement technology into the classroom (Lonegran, 2001; McKenzie, 2001). A clear reason for this is that schools are shortchanging the funding dedicated to training teachers on technology. Linda Roberts, former U.S. Department of Education technology advisor, recommends that at least 30% of technology spending be used for teacher and staff professional development training. It is reported that most districts average 4% of their technology budgets on training. This serious lack of teacher training will continue to impact the results associated with technology and student achievement (Electronic Education Report, 2001; McKenzie, 2001; CEO Forum, 1999; Kook, 1997). It is also reported that fewer than 20% of American teachers feel adequate about integrating technology into their classrooms (Woodridge, 2004).

Another challenge that faces current researchers is how to design and expand upon what is already known about the improvements that technology can make on student academics. Researchers, educators, and stakeholders must move toward finding some basic agreed upon standards that best reflect what signifies student learning and/or student achievement (Heinecke et al., 1999). Program evaluation must utilize a mixed methodology approach where a more realistic and comprehensive picture can be formed about educational technology.

Technology is a tool that has the potential to change the face of education. Research shows that when technology is utilized in the classroom, it can impact and increase student learning and performance. As technology spending in schools continues to rise, the challenge for educators becomes greater to show the payoffs as measured in student achievement. Researchers are charged with finding new and innovative ways of measuring technology's impact on students and schools. The ability of schools to address the needs of the teachers concerning the integration of technology into the curriculum will be an important part of the utilization of technology dollars. Failure in this will continue to be one of the greatest waste of educational resources known to date.

Educators have the ability to control how great or how little of an effect technology can have in the classroom. Technologists have tried for nearly a century to usher in the use of technology to bring classrooms out of the dark ages. A fundamental fact remains consistent despite the type of technology being introduced. Teachers have proven repeatedly that they will slightly use the technology in the classroom and the classroom will remain very much unchanged (Zhao, Pugh, Sheldon, & Byers, 2002; Morsund & Bielefeldt, 1999; CEO Forum on Education and Technology, 1997; Accreditation of Teacher Education, 1997; National Council for Office of Technology Assessment, 1995; Hodas, S., 1993).

Districts are tasked with becoming more innovative in the development of effective staff enrichment programs that meet the individual needs of teachers and administrators. Without this type of dedicated training, there will continue to be a lack of impact on the daily routines of teachers, administrators, and students in the deployment of technology. Several factors have been outlined that account for and have an impact on the integration of technology into the classroom. Research is moving toward the answers by addressing the impact that leadership at all levels can have on the teacher's ability to use technology effectively in the classroom. It is also vital that money and resources be put into effective training for teachers. This training needs to be in just in time and available in the classroom. Teachers need to have a clear vision and understanding of the technology plan and use the technology based on sound curricular practices.

Summary

Technology integration when used in the proper context within the classroom can impact student learning. The capital investment has been made and the equipment is available in the vast majority of schools nationwide with accessibility down to a student to computer ration of 10 to 1 (Griffin, 2003; ETS, 1998). Almost as many schools are connected to the internet and have access to unlimited information resources via the World Wide Web. Teachers want to help students achieve all that they can in school and life, yet the challenge of technology integration is overwhelming for most teachers who lack the proper training to effectively integrate technology into their classroom. Teachers resist changing to the traditional style of teaching and learning. It is difficult to move beyond the way they were taught themselves and the way that they were taught to teach.

Therefore, American education remains very much unchanged since its beginning nearly one hundred years ago.

The intent of this researcher was to contribute to the current body of knowledge on technology integration in classrooms and to ascertain if it was related to demographic characteristics such as age, gender, teaching experience, level of education, level and type of school, and number of years of participation in a technology initiative that was focused on distribution of hardware to teachers. This investigation also allowed for insight into the teacher laptop program of a Southwestern Urban School District.

Chapter Three- Design

Introduction

Students benefit from the use of technology in the classroom. These benefits have been seen in both cognitive and non-cognitive domains (Quinn & Valentine, 2001; Middleton & Murray, 1999; Middleton, 1998). The role that technology has played in our lives, from personal efficiency to increased productivity in the workplace, is vital for students to become the workforce of the future. This all begins with teachers and how they have utilized technology as a tool in instruction. It remains important for districts to ascertain the level of technology integration that teachers are currently functioning. This is a vital component that should impact technology spending and effect student outcomes. This information can give vital direction in technology spending and staff development opportunities to close the divide between having the necessary accessibility of computers and the internet to effective utilization of technology in the learning environment.

The primary goal of this study was to identify the level of technology integration for in-service teachers employed in a Southwestern Urban School District. Examining the relationship between the level of integration and the number of years of participation of the in-service teacher in the district's laptop program was the focus of this study. Data were analyzed using descriptive statistics and multiple regression analysis to gain insight into the degree to which in-service teachers were currently implementing instructional technology. This research compared other demographic characteristics such as gender, grade level taught, number of years teaching in Southwestern Urban School District, self rating on computer proficiency, subject matter taught, age, years of teaching experience, highest level of education attained, and type of school currently teaching (Title I versus non-Title I) with the LoTiQ profile.

Quantitative analysis was used in the study, with two survey instruments utilized to collect needed information from a sample of in-service teachers within the district. The sampling technique was cross-sectional with the intent of generalizing the results from the sample group to the general teacher population within the Southwestern Urban School District under investigation. All in-service teachers received a request to complete the online survey via their school email address directing them to an URL found on the World Wide Web. The goal for the sample included having equal representation of teachers at various grade levels across the district as it appeared in the population and an equal representation of the six feeder patterns which have geographic orientation within the city of location of this Southwestern Urban School District. Online survey software was utilized to house the instruments online and administered the instruments through district-provided teacher email addresses, which allowed for security of the survey and disallowing multiple responses from the same subject. A reminder email was sent three weeks after the initial email contact to urge teachers to complete the survey.

The purpose of using survey research was to generalize the results to the population as inferences were made about how the dependant variable related to the independent variables (Creswell, 2003). The use of an online survey technique was selected as the basis for data collection on this study due to the large size of the district, the ability to minimize collection time, availability of a larger population of teachers, the flexibility of teachers taking the survey at their convenience, and the economy of collecting data via the Internet.

The data collection instruments included two surveys, the LoTi and a general questionnaire, constructed by the researcher that collected demographic information and the self perception of in-service teachers' basic computer usage. The results of the LoTiQ were used to draw conclusions about the populations' level of technology integration. The timeframe of administration followed the guidelines of the district's central office personnel and took place over a three week time span ranging from late May to early June. This chapter covers the following topics; description of the sample, research questions, instrumentation, data collection procedures, data analysis procedures, and summary.

Population and Sample

District Context

The district under investigation in this study covered 136 square miles across a metro area situated in the Southwestern Region of the United States. It housed a student population of 38,010 children which ranged from pre-kindergarten to twelfth grade. The district accommodated a total of 82 schools with an average building age of 59 years. The distribution of schools within the district included 59 elementary, 8 middle schools, 9 high schools, and 6 alternative schools all arranged into six different feeder pattern systems located within the metropolitan area.

This Southwestern Urban School District was the recipient of an unusual city sales tax initiative combined with the passage of a general bond election that was geared for urban renewal of the school system totaling $680 million dollars. The city in which the district resides passed this penny sales tax in 2001 in support of the district to make immense and much needed improvements for all of the schools structurally as well as a substantial portion dedicated for the purchase of technology. There were more than 70 total projects planned for the district with a spending breakdown as follows: building construction $469 million; technology $52 million; and transportation $9 million. There have been 25 projects finished to date with several others in various stages of completion.

The district, in the 2000-2001 school year, had initiated the teacher laptop program to bring technology into each classroom. This effort addressed one of the five strategic aims that the district adopted for itself. Many teachers were using the laptop computers to make operations more efficient and more effective. This addressed the school district's strategic plan aim number two. Since distribution of the laptop computers to teachers who completed the thirty hours of prescribed training, the district has adopted an online attendance reporting system and currently a district gradebook to facilitate the efficient and effective running of school operations. These were time-saving efforts to remove the focus of teachers from paperwork to teaching and allow a tool for technology integration. Though this was what the district hoped was happening there had not been an evaluation conducted district wide to determine if teachers were using the laptops and if they were using them to influence student achievement in any way.

The district's laptop training required teachers to be out of the classroom for three days to receive the necessary training. This training covered the fundamental basics of the computer and the internet. Teachers received instruction on the following items during the laptop training program:

1. Setting up and organizing files.
2. Basic navigation of the systems
3. Searching the internet

4. PowerPoint instruction
5. Word processing
6. Effective utilization of technology in the instructional setting

The district at the time of the study received nearly $56 million in grants and had a cost per student from the general fund of $5,882. It transported nearly 13,500 students daily on school buses and fed 25,928 students for lunch where 84.5% of the student population received free or reduced priced lunches. Currently, there were 57 schools Title I eligible based upon the number of students receiving free lunches according to information provided by the district. Twenty-two of these schools were identified as school improvement schools which meant that they did not meet at least one of the success indicators laid out by No Child Left Behind.

The district was divided into six feeder patterns that were geographically clustered in the same general vicinity of the city. Each feeder pattern had at least one high school, one middle school, and several elementary schools. Students who resided within each geographic area progressed through the schools within a single feeder pattern. There were six central office administrators housed within a central office each of whom were assigned to oversee the operations of the schools within his/her designated feeder pattern. This organizational structure effectively broke down this large urban district into six mini-districts.

Teachers within the Southwestern Urban School District were certified by the state criteria as meeting standards to receive a teaching certificate. Almost 31% of teachers held an advanced college degree. The average years of teaching experience for in-service teachers was 12.6 years. Teachers in this district had an average attendance rate of 93.4%

according to 2003/2004 district statistical data the district assembled each year. There were a total of 2,238 teachers in the district with 35 of these teachers holding National Board Certification. The ethic make up of the teachers is described in the Table 1:

Table 1

Teacher Demographic Data

Teacher Level	Elementary	Middle School	High School	Special Education	Career Tech
American Indian Male	1	3	4	0	1
American Indian Female	13	1	2	4	0
Asian Male	0	1	6	0	0
Asian Female	10	1	8	1	8
Black Male	25	27	45	16	13
Black Female	162	44	43	86	0
Hispanic Male	3	6	4	1	0
Hispanic Female	29	8	12	4	31
White Male	86	77	113	40	18
White Female	758	137	120	266	71
Total	1087	305	357	418	142

Data for table came from district statistical report for 2003/2004.

Average class size in the district was 19.4 students. Enrollment numbers by grade included: 22,111 PK- 5th grade; 7,796 6th-8th grade; 8,103 9th-12th grade. There was a charter school enrollment of 2,637 within this district. Ethic breakdown for students included: Black 33.9%; Asian 2.7%; Hispanic 30.4%; Native American 5.6%; and White 27.4%. More than 50 languages were represented within the district with 8,706 bilingual students. The district had an overall student stability rate of 82.13%, representing the number of students that started and finished the school year at the same school. Attendance rate was 92.5% for the district with 941 students in grades 7-12 dropping out of school. Nearly 5,000 students were served through special education programs in a variety of school settings.

Student achievement in the Southwestern Urban School District was well below the surrounding suburban school districts. Students who attended this district had an ACT composite score of 18.6 which compared to the state average of 20.6 and the national average of 20.9. Results for third graders on the Stanford Achievement Test 9 represented students who scored above the 50th percentile and are found in Table 2.

Table 2

Grade 3 Student Achievement Data

Grade 3	**2000-01**	**2001-02**	**2002-03**	**2003-04**
Reading	n/a	40%	44%	43%
Mathematics	n/a	46%	51%	53%

*Information for table provided by School Report Card

On the mandatory state testing program for elementary, middle, and high schools in 2003-2004, the school district results showed the percentage of students who scored satisfactory or advanced. Table 3 represents student achievement data for fifth and eighth grade students.

Table 3

Student Achievement Data for 5th and 8th Grade Students

Academic Year 2003-04	Reading	Mathematics
Grade Five	50%	62%
Grade Eight	58%	56%

*Information for this table provided by State School Report Card.

Table 4 represents district data for high school students on required state mandated testing. The percentage is reflective of the students scoring satisfactory or advanced.

Table 4

High School Students' End of Course Testing Data

Subject Tested	2000-01	2001-02	2002-03	2003-04
English II	45%	40%	34%	35%
Algebra I	n/a	n/a	9%	18%
Biology I	n/a	n/a	20%	27%
U.S. History	40%	46%	39%	46%

*Information for this table provided by State School Report Card.

Procedure

Teacher participation in this study was strictly voluntary and participants had the ability to withdraw from the study at any time without fear of retribution. Permission from the Southwestern Urban School District was obtained as specified in the policy and procedures of the Board of Education. The Institutional Review Board (IRB) of The University of Oklahoma granted permission to conduct research on human subjects prior to the start of this study. The anonymous consent form was posted on the Internet prior to the start of the survey that reinforced to the participants that they may cease the survey at any time or they may choose to not participate in the study at all. A brief description of the goals of the research project was posted along with contact information for the researcher, major professor, and the IRB should the subject have any questions or concerns regarding the study. Subjects were required to click a button located at the bottom of the informed consent form to be routed to the survey.

The survey was posted on the Internet via an URL on the World Wide Web. Each in-service teacher employed within the Southwestern Urban School District was sent an email with a link to the informed consent form to initiate the survey. This email message was sent in late May and a second reminder email was sent in the early part of June prior to the last contract day for teachers in an effort to encourage completion of the online surveys. A computer with internet access had to be used to complete the survey. Every effort was made to limit each in-service teacher to one submission of the survey by using the online survey software's security features tied to the Internet Protocol (IP) address that the survey was originally submitted. The online survey software restricted more than one entry into the survey from each designated email address which constituted a single IP address. This security feature assisted in maintaining the integrity of the study.

All subjects who participated in this study were considered at no more risk than what was involved with daily living. All data were recorded and stored in a limited access database with only a response number to identify each in-service teacher submitting a response. This method of information collection was used to preserve the anonymity of the subjects. Individual teachers were not referenced in the study to protect their confidentiality. All data were kept strictly confidential and used solely for the purpose of this research study. Feedback on the number of respondents was provided for the district's central office personnel upon completion of the study. After the deadline for responses had past, the surveys were disabled and no further responses were recorded. Data were compiled, calculated and analysized using SPSS Statistical Software. The results of the study were made available to the central office personnel of the Southwestern Urban School District. At the conclusion of this study, results submitted to the district were in an aggregated format and no teacher was identified individually.

Research Questions

1. What is the level of technology implementation of teachers in a Southwestern Urban School District?
2. What is the level of personal computer use of teachers in a Southwestern Urban School District?
3. What is the level of current instructional practices of teachers in a Southwestern Urban School District?
4. Is there a relationship between personal computer use and level of technology implementation for teachers in a Southwestern Urban School District?
5. Is there a relationship between current instructional practices and level of technology implementation for teachers in a Southwestern Urban School District?
6. Is there a relationship between the number of years a teacher participates in the Southwestern Urban School District's laptop program and the level of technology implementation?
7. Is there a relationship between the following demographic characteristics of teachers and the level of technology implementation?:

- Age
- Years of total teaching experience
- Gender
- Type of school employed (Title I versus non-Title I)
- Grade level
- Educational level of teachers
- Proficiency level

Instrumentation

Dr. Chris Moersch developed the LoTi Implementation Questionnaire (LoTiQ) in 1994 in an effort to evaluate teachers' authentic technology integration levels in classrooms. The foundation upon which the LoTi questionnaire was built includes the assessment of classroom practices that are tied to higher order thinking skills and relevant, engaging curricula. This questionnaire was based on teacher's self perceptions of their own technology use.

There were three major sections of the LoTi questionnaire for In-service Teachers. The three sections of the LoTiQ included: Level of Technology Integration (LoTi); Personal Computer Usage (PCU); and Current Instructional Practices (CIP). The Level of Technology Implementation (LoTi) profile comprised 80% of the LoTi questionnaire and approximated the degree that the in-service teacher was implementing technology into the curriculum. The Personal Computer Use (PCU) accounted for 10% of the LoTi questionnaire and addressed the comfort level and the proficiency of the teacher in using a computer. For the current study, this represented teacher technology self-efficacy. The third section of the LoTi, Current Instructional Practices (CIP), revealed the teacher's inclination toward instructional practices consistent with either a subject-matter or learner-centered curriculum design and accounted for 10% of the instrument. Teachers chose their response on a scale ranging from 0 (Not Relevant or Applicable) to 7 (Very True of Me Now) with the following breakdown of valuation represented by the scale below:

Table 5

LoTi Questionnaire Ranking

Score Selected	**Description**
0	Not Relevant or Applicable
1 or 2	Not True of Me Now
3, 4, or 5	Somewhat True of Me Now
6 or 7	Very True of Me Now

Learning Quest, Inc. (2004)

The scale was used to calculate where an in-service teacher fell within the eight integration levels of the LoTi. The eight integration levels are outlined in Table 6 according to the LoTi Framework:

Table 6: *Levels of Technology Integration Framework*

Level	Category	Description
0	Non-Use	A perceived lack of access to technology-based tools or a lack of time to pursue electronic technology implementation. Existing technology is predominately text -based (e.g., ditto sheets, chalkboard, and overhead projector).
1	Awareness	The use of computers is generally one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pullout programs, computer literacy classes, central word processing labs). Computer-based applications have little or no relevance to the individual teacher's instructional program.
2	Exploration	Technology-based tools served as a supplement to existing instructional program (e.g., tutorials, games, simulations). The electronic technology is employed either as extension activities or as enrichment exercises to the instructional program.
3	Infusion	Technology-based tools including databases, spreadsheets, graphing packages, probes, calculators, multimedia applications, desktop publishing, and telecommunications augment selected instructional events (e.g., science kit experiment using spreadsheets/graphs to analyze results, telecommunications activity involving data sharing among schools.
4A	Integration (Mechanical)	Technology-based tools are integrated in a mechanical manner that provides rich context for students' understanding off the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials and sequential charts that aid the teacher in the daily operation of the instructional curriculum. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems relating to an overall theme/concept.
4B	Integration (Routine)	Teachers can readily create Level 4 (Integrated units) with little intervention from outside resources. Technology-based tools are fully integrated in a routine manner that provides rich context for students' understanding in of the pertinent concepts, themes, and processes. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, work processing) is perceived as a tool to identify and solve authentic problems relating to an overall theme/concept.
5	Expansion	Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle via Internet), research institutions, and universities to expand student experiences directed at problem solving, issues resolution, and student activism surrounding a major theme/concept.
6	Refinement	Technology is perceived as a process, product (e.g., invention, patent, new software design), and tool or students solving authentic problems related to an identifiable "real-world" problems or issue. Technology, in this context, provides a seamless medium for information queries, problem solving, and/or product development. Students have ready access to a complete understanding of a vast array of technology-based tools to accompany any particular task.

Note. From "Levels of Technology Integration (LoTi): A Framework for Measuring Classroom Technology Use" by C. Moersch, 1995, Learning and Leading with Technology, 23(3), p. 41.

The LoTi questionnaire was used in its entirety without modification. The goal of this researcher was to utilize the LoTi questionnaire as a means of defining the current level of technology integration for in-service teachers and to evaluate if a relationship between technology integration and the number of years a teacher participated in the laptop program.

The Loti questionnaire has been tested for validity, reliability, and internal consistency. It has undergone validity studies and a strong correlation was found between the estimated LoTi Levels (based on interviews) and the actual LoTi questionnaire scores in both an August 1997 and a June 1998 pilot study. The reliability of the LoTi was established in 2000, with an overall reliability coefficient of 0.94. Reliability calculations using Cronbach's alpha indicated that the LoTi instrument demonstrated internal consistency on LoTi, Personal Computer Use, and Current Instructional Practices components ($r = 0.7424$, 0.8148, and 0.7353 respectively). Subsequent factor analysis revealed that the LoTi levels to be significantly correlated to Personal Computer Use (PCU) ($r = 0.579$). In addition, LoTi levels were found to be significantly correlated to Instructional Practice (CIP) ($r = 0\ .422$) (Learning Quest, 2004). Reliability measures taken from this survey find that the LoTi questionnaire was a reliable instrument for measuring levels of technology use for in-service teachers.

Data Analysis

This study used descriptive statistics, multiple regression analysis, and correlation based on data gathered through the LoTi questionnaire and the demographic survey. The results were compiled using frequencies and percentages. Statistical operations were calculated with the assistance of SPSS Statistical Software. Multiple regression and correlation were selected as a means of investigation of the relationship between several demographic characteristics and the overall LoTi questionnaire ranking. Subjects selected a number on a Likert scale between 0 and 7 that best described their perception of their own performance on each of the fifty LoTi questionnaire questions. The scale in its entirety is represented in Table 5.

Research question one," What are the levels of technology implementation of teachers in a Southwestern Urban School District?", was addressed utilizing data gathered via the online LoTi questionnaire. A technology integration profile was constructed for each in-service teacher completing the survey instrument, and the LoTi questionnaire scoring guide was applied to each subjects completed LoTi survey sheet. The profile indicated the highest level of usage for each teacher and was assigned a level according to the LoTi Framework ranging from 0, 1, 2, 3 ,4A, 4B, 5, or 6. The percentage of teachers at each level was calculated and an overall district mean was calculated. The LoTi ranking profile measured the degree each teacher is integrating technology in the classroom. The questions of the LoTi that corresponded to calculating the LoTi ranking was: Level 0 (Non-use) 12, 19, 25, 42, and 48; Level 1 (Awareness) 2, 9, 17, 23, and 24; Level 2 (Exploration) 4, 11, 16, 38, and 45; Level 3 (Infusion) 1, 5, 8, 37, and 40; Level 4A (Integration- Mechanical) 3, 27, 30, 31, and 44; Level 4B (Integration- Routine) 33, 34, 36, 43, and 46; Level 5 (Expansion) 10, 21, 22, 35, and 39; Level 6 (Refinement) 7, 14, 28, 29, and 47.

Research question two stated, "What are the levels of Personal Computer Use (PCU) of teachers in a Southwestern Urban School District?." The PCU profile provided an assessment of each in-service teacher's comfort and proficiency level on using a computer and performing general troubleshooting on technology (Moersch, 1999).

A PCU profile was assembled for subjects completing the LoTi. The LoTi scoring guide was applied to each subjects completed survey sheet. The percentage of teachers at each rank was calculated according to the following breakdown (0-2 Not True of me now; 3-5 Somewhat True of Me Now; and 6-7 Very True of Me Now). A district mean was calculated as well. The questions of the LoTi that corresponded to calculating the PCU ranking are 13, 15, 18, 26, and 49.

Research question three stated, "What is the level of Current Instructional Practices of teachers in a Southwestern Urban School District?" A technology integration profile was constructed for teachers completing LoTi. The LoTi scoring guide was applied to each subjects completed LoTi survey sheet. Percentages of teachers at each ranking were calculated as well as the mean for the district as a whole. The questions of the LoTi that corresponded to calculating the LoTi ranking to reveal Current Instructional Practices (CIP) are 6, 20, 32, 41 and 50. The CIP revealed the teacher's tendency of employing instructional practices that were inline with a learner-centered curriculum.

Research questions four through seven included analysis of the relationship between the LoTi and several independent variables. Questions four and five focused on PCU and CIP and their relationship with the LoTi. Research question four stated "Is there a relationship between Personal Computer Use (PCU) and Level of Technology Implementation for teachers in a Southwestern Urban School District?." The scores for the PCU and LoTi were correlated to determine if a relationship existed between these two factors. Research question five stated, "Is there a relationship between Current

Instructional Practices and Level of Technology Implementation for teachers in a Southwestern Urban School District?." The teachers' scores on the CIP and LoTi were correlated to determine if a relationship exists between these two factors and the significance of the relationship.

Questions six and seven focused on the relationship between the LoTi and other demographic independent variables such as: years with a laptop; proficiency level; education level of teacher; level currently teaching; age; teaching experience; and type of school employed. Research question six stated, "Is there a relationship between the number of years of participation in the laptop program and the level of technology implementation?" The LoTi ranking was used to compare to the teachers' years of experience that they reported to determine if a relationship existed and what the significance of this relationship was between these two variables. The LoTi was the dependent variable and the years of teacher participation in the district laptop program was the independent variable. A multiple regression analysis was utilized with all the independent variables which included, PCU, CIP, education level, level currently teaching, school type (Title I versus non-Title I), age, gender, highest degree obtained, and number of years teaching. It was important to determine if the number of years that a teacher participated in the laptop had an effect on the level of technology implementation. A logical inference to draw would be that teachers who have participated in the laptop program and had the use of the laptop for the longest would yield a higher level of technology implementation and Current Instructional Practices (CIP). Based on this assumption, more integration of technology should be demonstrated in classrooms where these teachers were teaching.

Research question seven stated, "Are there relationships between the following demographic characteristics: age; years of teaching experience; gender; type of school (Title I versus non-Title I); grade level; proficiency level and educational level?." A multiple regression analysis was utilized to compare several independent variables to one dependent variable, while a correlation matrix was used to determine the strength of the relationship between each of these demographic variables and dependent variable and the level of statistical significance. Descriptive statistics were utilized as well to assist in the analysis of the data. This included two items from the demographic survey (item 11 and item 12) that were open ended to address the barriers and resources that teachers cited within their district.

Summary

Data were collected from a sample of in-service teachers from a Southwestern Urban School District via online survey instruments. The LoTi questionnaire was used to determine the Level of Technology Implementation rating. A small demographic survey was used to collect the demographic characteristics. These demographic variables were evaluated for their possible relationship to the Level of Technology Implementation. Data were analyzed using descriptive statistics and multiple regression analysis. Based on the information gathered in this study, the Southwestern Urban School District should be able to evaluate the levels that teachers in the district are operating concerning technology integration. These data allow school decision-makers to formulate decisions about future staff development, training, and technology spending all in an effort to better serve students and impact their achievement. The following chapter outlines the actual data collected from the district and the last chapter discusses these findings.

Chapter Four- Data Analysis

Introduction

Across the United States, schools have invested billions of dollars to bring technology into classrooms (Murray, 2004). Getting the hardware into classrooms was a major obstacle that many schools had to overcome in order to incorporate technology. The next hurdle for schools resides within the confines of classrooms and deals with the use of computers in instruction by teachers in the learning environment. The foundation for successful utilization of technology rests largely with teachers who are responsible for engaging students and delivering instruction. Without the vital connection between teachers and the integration of technology, billions of dollars of technology will collect dust and remain largely unused, thus negating students the full benefit of a well rounded educational experience necessary for the 21st Century. This chapter details the results from the study of a Southwestern Urban School District to determine the level of technology integration of in-service teachers. Included is a description of subjects participating in the study, findings presented by research question, and a summary.

This study examined the level of technology implementation by in-service teachers and evaluated the effect of other demographic characteristics on technology integration within a Southwestern Urban School District located within the United States. The district under investigation had spent millions of dollars to provide laptop computers for all in-service teachers over a four year period. Teachers receiving the laptop computers were required to complete a 30 hour training session where basic computer skills, multimedia processes and internet instructions were covered. In an attempt to reveal the district's current technology practices among in-service teachers, the following research questions were examined in this study:

1. What is the level of technology implementation of teachers in a Southwestern Urban School District?
2. What is the level of personal computer use of teachers in a Southwestern Urban School District?
3. What is the level of current instructional practices of teachers in a Southwestern Urban School District?
4. Is there a relationship between personal computer use and level of technology implementation for teachers in a Southwestern Urban School District?
5. Is there a relationship between current instructional practices and level of technology implementation for teachers in a Southwestern Urban School District?
6. Is there a relationship between the number of years a teacher participates in the Southwestern Urban School District's laptop program and the level of technology implementation?
7. Is there a relationship between the following demographic characteristics of teachers and the level of technology implementation?:
   - Age
   - Years of total teaching experience
   - Gender
   - Type of school employed (Title I versus non-Title I)
   - Grade level
   - Educational level of teachers

- Proficiency level

This chapter contains the data as compiled from the survey instruments (LoTiQ and demographic survey) utilized in this study and the subsequent analysis of the data with the presentation of the results. The representation of this data includes a variety of formats including narrative, graphs, and tables using the analysis tools of multiple regression analysis and descriptive statistics. The statistical software SPSS was employed for the analysis of the data. The analysis included a general description of subjects completing the survey followed by each individual research question presented in the study.

Results

Description of Subjects

Once permission was granted by the Institutional Review Board (IRB) of the University of Oklahoma and the school district under investigation, the subjects were invited to participate in the survey through a blanket email sent to their school email address which was provided by the district's technology department. The online survey, consisting of 63 items (50 LoTiQ questions and 13 demographic questions), took an average time of 17 minutes for the subjects to complete. The initial response to the survey was 196 responses. A follow up email reminder was sent to in-service teachers who had not completed the survey approximately three weeks after the initial invitation. This followed the process for successful administration of internet surveys outlined in Dillman (2000) which stated that the response rate will usually be potentially between 20 – 40 percent lower without additional contacts with subjects. The follow up email conducted in this study generated an additional 194 responses. The effort to increase participation in the study was desired so that a representative sampling of in-service teachers could be obtained. Out of a possible 2,238 in-service teachers employed in the Southwestern Urban School District, 390 subjects responded to the online survey yielding a 17.4% response rate. The response rate from the district was acceptable for data analysis in a social science study (Hill, 1998).

Analysis of the data was conducted to ascertain the extent to which the sample was reflective of the population under investigation. Demographic data obtained from the online survey were compared to information reported by the district through its Planning, Research, and Evaluation Department (PRE) to ensure that the sample was representative of the population for the district. Demographic data that were used as variables were compared to overall district data. The available data compared included; gender and instructional level (elementary, middle school, or high school). The researcher noted that the information reported from the PRE department within the Southwestern Urban School District was from the previous school year and slight differences in demographics were expected. Comparisons illustrate that the demographic data of the sample population was not atypical of the district/s reported data. There was a slight decrease in male subjects from the district to the research data and a slight increase in the number of females. The instructional level data showed a representation of elementary, middle school, and high school teachers consistent with the district’s reported data. Table 7 outlines the comparison of the two sets of data in percents.

Table 7

Comparison of sample population data to district reported data 2003–2004

Variable	**Sample Population**		**PRE District Data**	
	Teachers	Percentage	Teachers	Percentage
Gender				
*Male	78	16.22	497	22.22
*Female	403	83.78	1,741	77.8
Instructional Level				
*Elementary	276	57.74	1226	54.8
*Middle School	90	18.83	494	22.1
*High School	112	23.43	567	25.3

*Special education teachers were split into each instructional level equally.

<u>*Sample*</u>

The sample for this study included N=390 state certified public school in-service teachers who were currently teaching in grades pre-kindergarten through twelfth grade in a Southwestern Urban School District. This sample size constituted over 17% of the district's total population of teachers making this sample size adequate as it falls within the guidelines of adequate participation for behavior science studies which are between 30 and 500 participants (Hill, 1998). Every effort was made to have as equal of representation from each of the grade levels within the district while preserving as much randomness as possible. The researcher's goal was to capture a sample that truly reflects the general population of teachers within the district.

The following two tables detail the results from the demographic survey. Tables 8A and 8B categorize the subjects and the number of teachers represented at each level.

Table 8A

Survey Results for Middle School and High School Participants by Area

Subjects Taught	**Middle School**		**High School**	
	Teachers	Percentage	Teachers	Percentage
Math	6	7.2	14	13.3
Language Arts	12	14.5	14	13.3
Science	12	14.5	9	8.6
Social Studies	8	9.6	9	8.6
Fine Arts (music, drama, art, band, orchestra)	10	12.0	9	8.6
Foreign Language	5	6.0	4	3.8
Computers	4	4.8	1	0.09
Career Technology	0	0	23	21.9
Physical Education	1	1.2	2	1.9
Special Education	6	7.2	8	7.6
Other (English Language Learner, Technology Ed., In School Suspension	14	16.9	10	9.5
All	5	6.0	2	1.9
Total	83	100	105	100

Table 8B

Survey Results for Elementary Participants by Subject/Grade Level

Subject/Grade Level	**Elementary**	
	Teachers	Percentage
Pre-Kindergarten	10	4.0
Kindergarten	12	4.7
Transition First Grade	2	0.07
First Grade	9	3.6
Second Grade	10	4.0
Third Grade	8	3.2
Fourth Grade	8	3.2
Fifth Grade	5	2.0
Reading	18	7.1
Math	2	0.07
All Subjects	88	34.8
Special Education	30	11.9
Other (Science, Physical Education, Library Science, Computers, Foreign Language/English Language Learners)	42	16.6
Fine Arts	9	3.6
Total	253	100%

Table 9 represents the educational level breakdown of in-service teachers in the sample.

Table 9

Education Level

Educ. Level	**Elementary Teachers**		**Middle School Teachers**		**High School Teachers**	
	Teachers	Percentage	Teachers	Percentage	Teachers	Percentage
Bachelors	**129**	**49.8**	**47**	**56.6**	49	46.2
Masters	125	48.3	35	42.2	**54**	**50.9**
Doctorate	5	1.9	1	1.2	3	2.8
Total	259	100%	83	100%	106	100%

Close to 51% of the subjects responding to the survey held a bachelors degree while 47% held a Masters degree. This compares to 40% of the teachers in the district holding an advanced degree. Middle school teachers held the fewest advanced degrees while high school teachers held the most.

Table 10 identifies the number of in-service teachers who participated in the study as having access to computers. Computer Access was defined in the LoTiQ as students and teachers can use computers within the school building for instructional purposes; including computers in the classroom, computer labs, and computers on carts, general access computers in the library or something similar. The overwhelming majority of teachers, regardless of instructional level reported having access to computers. This finding was consistent with Smerdon (2000), who reported that an overwhelming majority of public school teachers indicated having adequate access to computers in their school.

Table 10

Computer Access

Access to a computer	**Elementary Teachers**		**Middle School Teachers**		**High School Teachers**	
	Teachers	Percentage	Teachers	Percentage	Teachers	Percentage
Yes	**267**	**98.9**	**86**	**97.7**	**105**	**95.5**
No	3	1.1	2	2.3	5	4.5
Total	270	100%	88	100%	110	100%

Table 11 reports the age range of in-service teachers who participated in the study with the categories represented by instructional level.

Table 11

Respondent Age

Age range (years)	**Elementary Teachers**		**Middle School Teachers**		**High School Teachers**	
	Teachers	Percentage	Teachers	Percentage	Teachers	Percentage
21-30	40	15.2	12	14.1	8	7.7
31-40	69	26.2	10	11.8	22	2.1
41-50	**82**	31.2	29	34.1	29	27.9
51-60	60	22.8	**31**	36.5	**35**	33.7
61-65+	8	3.0	3	3.5	10	9.6
Total	263	100	85	100	104	100

Subjects responding to the survey included 82 elementary teachers reported their age to be between 41-50, while 31 middle school teachers reported their age to be between 51-60 years. High school teachers had 33.79% of the sample reported their age to be between 51-60. The largest reporting age range for elementary teachers was 41-50 years, while the range of 51-60 years was the largest age range reported for both middle school and high school teachers. Fifty seven percent of elementary teachers were 41 years or older while 74.1% of middle school teachers were 41 or older. Slightly more than 71% of high school teachers were 41 or older.

Table 12 includes the number of teachers that reported teaching in Title I schools versus non-Title I schools. Each teacher was asked to only identify his/her school, and for any subject who taught in multiple locations to report the school where his/her attendance was recorded. The list of schools currently being served by Title I was obtained from the Office of Federal Programs from the school district under investigation. Title I status was determined by the district and was based on the number of students receiving free and reduced lunches. Most schools identified as Title I have 70% or more of their student population served by free or reduced lunches.

Table 12

Type of School

Type of School	**Elementary Teachers**		**Middle School Teachers**		**High School Teachers**	
	Teachers	Percentage	Teachers	Percentage	Teachers	Percentage
Title I School	**228**	85.1	**51**	71.8	32	29.6
Non-Title I School	40	14.9	20	28.2	**76**	70.3
Total	268	100	71	100	108	100

Table 13 identifies the total years of teaching experience, both within and outside of the district under investigation.

Table 13

Total Years of Teaching Experience

Years Teaching Experience	**Elementary Teachers**		**Middle School Teachers**		**High School Teachers**	
	Teachers	Percentage	Teachers	Percentage	Teachers	Percentage
1-10	**119**	43.8	**41**	47.1	**38**	35.2
11-20	93	34.2	17	19.5	37	34.3
21-29	53	19.5	22	25.3	13	12.0
30+	16	5.9	7	8.0	22	20.4
Total	272	100	87	100	108	100

Mean years of teaching experience for elementary teachers within the district is 13.44 compared to 14.41 for middle school teachers and 16.19 years for high school teachers. This mean compares to 12.6 years of teaching experience reported by the district. Nearly 44% of in-service elementary teachers have been teachers between 1-10 years with another 34.5% teaching 11-20 years. Twenty-six percent of the elementary in-service teachers responding to the survey have been teaching over twenty years. Forty-seven percent of middle school teachers have between 1-10 years of teaching experience with another 19.5% falling in the 11-20 years, and 25.3% between 21-29 years. Only 8% of middle school teachers have been teaching 30+ years.

Teachers were asked to self-identify their level of proficiency prior to receiving the district issued laptop computer. The proficiency level of teachers prior to the reception of the district's laptop computer was rated on a Likert Scale from 1-7 with one being 'I did not use a computer' and seven being 'I used a computer with expert proficiency'.

Table 14

Proficiency Level

Proficiency Level	**Elementary Teachers**		**Middle School Teachers**		**High School Teachers**	
	Teachers	Percentage	Teachers	Percentage	Teachers	Percentage
(1) I did not use a computer	15	5.6	5	5.6	1	0.09
(2)	13	4.7	1	1.1	3	2.7
(3) Basic user (email , word processing)	76	27.6	21	23.6	19	17.3
(4)	37	13.5	9	10.1	11	10
(5) Proficient	**81**	29.5	**29**	32.6	**40**	36.4
(6)	35	12.7	12	13.5	18	16.4
(7) I used a computer with expert proficiency	18	6.5	12	13.5	18	16.4
Total	275	100	89	100	110	100

Nearly 30% of elementary teachers rated themselves as proficient users of computers prior to acquiring a district issued laptop computer. The mean for elementary teachers was 4.2. A total of 48.73% of elementary school teachers reported themselves at proficient or above on computer proficiency. Almost 32.6% of middle school teachers self-reported as proficient users, while 59.5% felt they were proficient or higher before getting the laptop computer. The mean for middle school teachers' proficiency level was 4.5. Slightly more than 36% of high school teachers rated themselves as proficient while 69% felt they were proficient users of technology or above before receiving a laptop computer. The mean for the high school teachers was 4.9, this mean was slightly higher than both elementary and middle school teachers. Overall, teachers rated their proficiency as a five on the Likert Scale of one to seven.

Table 15 shows the number of years that teachers in the sample have participated in the districts' laptop computer program. The vast majority of teachers completing the survey have had the district issued laptop computer for two years. More middle school teachers, who responded to the survey, reported not having a laptop than either elementary or high school teachers.

Table 15

Years with District Laptop

Years	**Elementary School Teachers**		**Middle School Teachers**		**High School Teachers**	
	Teachers	Percentage	Teachers	Percentage	Teachers	Percentage
Less than one	30	11.1	7	7.8	11	10.0
One	34	12.6	5	5.6	10	9.1
Two	**198**	73.3	**69**	76.7	**87**	79.1
Don't currently have one	8	3.0	9	10.0	3	2.7
Total	270	100	90	100	111	100

Results for Research Question One

What is the Level of Technology Implementation (LoTi) of teachers in a Southwestern Urban School District? Table 16 demonstrates a breakdown of in-service teachers into the various levels of the LoTi. The LoTi measure constituted eight levels ranging from 0 to 7 with two levels identified at level 4 (designated as 4A and 4B). It classified the level at which in-service teachers were integrating technology into their classrooms from the results of the LoTi questionnaire. Moersch (2002) identified 4B (Integration-Routine) as the target level for technology integration. Only 6% of teachers who completed the LoTiQ nationwide identified themselves at the 4B level, while 71% of teachers reported themselves between Non-Use (Level 0) and Exploration (Level 2). Additional insight into in-service teachers functioning at this these lower levels (Level 0 – Level 2) included them harboring a low self efficacy and resistance to change in trying new technologies (Moersch, 1999).

The data revealed that the overall LoTi average of the in-service teachers for the district under investigation was at Level One, constituting only Awareness. LoTi Level One (Awareness) was epitomized in the learning environment as technology being one step outside of the classroom meaning that computer-based applications were utilized more in a lab setting. In-service teachers who functioned at Level One do not utilize computers in their instructional delivery; therefore, technology had little or no relevance in their classrooms (Moersch, 1995).

Table 16

Overall District LoTi Level

LoTi Level	**Number of In-service teachers**	**Percentage of teachers**
0 Non-Use	88	22.4%
1 Awareness	117	**30.1%**
2 Exploration	26	7%
3 Infusion	16	4%
4A Integration (Mechanical)	37	9.5%
4B Integration (Routine)	12	3.1%
5 Expansion	69	17.7%
6 Refinement	24	6.2%
Total	389	100%

Slightly more than 52% of in-service teachers in the district were at Level Zero (Non-Use) and Level One (Awareness), the two lowest levels of technology integration based on the LoTi Framework (Moersch, 1994).

Results for Research Question Two

What is the level of Personal Computer Use (PCU) of teachers in a Southwestern Urban School District? Table 17 depicts the breakdown of Personal Computer Usage for in-service teachers participating in the study. The PCU profile provided an assessment of each in-service teacher's comfort and proficiency level on using a computer and performing general troubleshooting on technology (Moersch, 1999). A PCU profile was developed for subjects completing the LoTiQ. The LoTi scoring guide was applied to each subjects completed LoTi survey sheet. The percentage of teachers at each rank was calculated according to the following breakdown (0-2 Not True of me now; 3-5 Somewhat True of Me Now; and 6-7 Very True of Me Now). The district mean was calculated as well. The questions of the LoTi that correspond to calculating the PCU ranking are 13, 15, 18, 26, and 49.

The mean PCU for in-service teachers within the district completing the survey was 4.6 out of a possible score of 7 as measured by the LoTi ranking sheet. Teachers answered the questions on average as being Somewhat True of Me Now. The PCU was used as a general predictor of self efficacy.

Table 17

Overall District Results for Personal Computer Usage

PCU for in-service teachers	**Number of In-Service Teachers**	**Percentage of In-Service Teachers**
0-2 Nor True of Me Now	121	31.1%
3-5 Somewhat True of Me Now	**226**	**58.1%**
6-7 Very True of Me Now	42	10.8%
Total	390	100

The questions from the LoTi questionnaire included in calculating the Personal Computer Usage and how teachers responded by level were:

- LoTi Question 13: I access the computer daily to browse the internet, send/receive email, and/or use different productivity and multimedia tools (e.g., world processor, spreadsheet, databases, presentation software). High School, middle school, and elementary teachers all averaged an answer of 7- Very true of me now.
- LoTi Question 15: I am proficient with and knowledgeable about the technology resources (e.g., hardware, software programs, peripherals) appropriate for my grade level or content area. Both high school and elementary school teachers had a mean of 7- Very true of me now, while middle school teachers had a mean of 4- Somewhat true of now.
- LoTi Question 18: I have the background to assist other in the use of a variety of software applications (e.g., Excel, Inspiration, PowerPoint), the internet (web browsers, web page construction and design), and peripherals (e.g.,

digital video cameras, Probes, MIDI devices). High school, middle school, and elementary teachers each averaged a 4- Somewhat true of me now.

- LoTi Question 26: I do not have to call someone (e.g., computer technician, network manager) to figure out a problem with my computer or software application; I have the confidence and expertise to "fix" it myself. High school, middle school, and elementary school teachers had a mean of 4- Somewhat true of me now.
- LoTi Question 49: I frequently explore new types of software applications, web-based tools, and peripherals as they become available. High school teachers had a mean ranking for themselves of 4- Somewhat true of me now. Middle school and elementary school teachers both self ranked an average of 2- Not true of me now.

Results for Research Question Three

What is the level of Current Instructional Practices (CIP) of teachers in a Southwestern Urban School District? Table 18 shows the breakdown of Current Instructional Practices for teachers participating in the survey. A technology implementation profile was constructed for in-service teachers completing the LoTi questionnaire. The LoTi scoring guide was applied to each subjects completed LoTi survey sheet. The percentage of teachers at each ranking was calculated as well as the mean for the district as a whole. The questions of the LoTi that corresponded to calculating the LoTi ranking to reveal Current Instructional Practices (CIP) are 6, 20, 32, 41 and 50. The CIP revealed the teacher's tendency of employing instructional practices that were inline with a learner-centered curriculum.

Table 18

Overall District Results for Current Instructional Practices

CIP for in-service teachers	Number of In-service teachers	% of In-service teachers
0-2 Not True of Me Now	34	8.74%
3-5 Somewhat True of Me Now	254	**65.29%**
6-7 Very True of Me Now	101	25.96%
Total	389	100%

The mean CIP for the overall district including all in-service teachers that completed the surveys is 3.4 out of a possible 7 as measured by the LoTi ranking sheet. The questions from the LoTi questionnaire included in calculating the Current Instructional Practices score were:

- LoTi Question 6: My students collaborate with me in setting both group and individual academic goals that provide opportunities for them to direct their own learning within my classroom curriculum.
- Loti Question 20: I consistently provide alternative assessment opportunities (e.g., performance-based assessment, peer reviews, self-reflection) that encourage students to "showcase" their content understanding in nontraditional ways.
- LoTi Question 32: Students' use of information and inquiry skills to solve problems of personal relevance guides the types of instructional materials used in and out of my classroom.

- LoTi Question 41: Having students apply what they have learned in my classroom to the world they live in is a cornerstone to my approach to instruction and assessment.
- LoTi Question 50: Students' questions and previous experiences heavily influence the content that I teach as well as how I design learning activities for my students.

The average response to LoTi Question 6 for both high school and middle school in-service teachers was 2- Not true of me now. Elementary school in-service teachers' average for this question was 0- Not applicable. The average response to LoTi Question 20 for high school in-service teachers was 2- Not true of me, while both middle school and elementary school in-service teachers averaged a 4- Somewhat true of me now ranking on the LoTi Scoring Guide. LoTi Question 32 had a mean of 4-Somewhat true of me now for both high school and middle school teachers, while elementary school teachers ranked themselves at a 0- Not applicable. LoTi Question 41 had a breakdown of high school teachers ranked themselves at 7- Very true of me now, middle school teachers a 2- Not true of me now, and elementary school teachers averaged a 4- Somewhat true of me now. The last question used to compute CIP is LoTi Question 50 where each level had a mean score of 4- Somewhat true of me now.

Results for Research Questions Four through Seven

Multiple Regression analysis was conducted using SPSS Statistical Software. This type of operation was selected as a means of investigating the relationship that exists between the independent variables of age, years teaching experience, proficiency level, instructional level, gender, highest educational degree, years with a district issued laptop computer, Personal Computer Use score, and Current Instructional Practices score. These were all compared to the dependent variable of Level of Technology Implementation. The use of the coefficient of multiple correlation, R, was used for its predictive power (McMillian & Schumacer, 2001). Multiple R squared was used to determine how well the model fit the data.

Standardized or Beta Coefficients were used to convert the values for each different variable to the same scale so that a comparison could occur (Norusis, 2005). The Multiple R value in Table 19 labeled Model Summary showed that the chosen model explains 27% of the variance in the dependent variable (Level of Technology Implementation).

Table 19

Model Summary

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.519(a)	.270	.248	1.934

(a) Predictors: (Constant), CIP, Highest Degree, Instructional Level, Yrs. w/ Laptop, Gender, Age, Title I/Non-Title I, PCU, Proficiency Lvl., Yrs. Teaching Exp.

The independent variables of Age, Personal Computer Use, Current Instructional Practices, and Proficiency Level all made a unique and statistically significant contribution to the prediction of the independent variable, Level of Technology Implementation.

Table 20

Coefficients

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
Constant	-.165	1.002		-.165	.869
Yrs with Laptop	.135	.153	.042	.879	.380
Proficiency Level	.201	.088	.139	2.286	.023
Yrs. Teach Experience	.003	.015	.015	.240	.811
Highest Degree	.182	.204	.045	.894	.372
Age	-.029	.011	-.148	-2.512	.012
Gender	-.479	.300	-.079	-1.599	.111
Instructional Level	.173	.147	.064	1.176	.240
Title I/ Non-Title I	.206	.242	.043	.852	.395
PCU	.034	.014	.131	2.482	.014
CIP	094	.019	.302	4.895	.000

Table 21 lists the Correlation Matrix as calculated in SPSS. This calculation described the strength and direction of the relationship between the variables (Pallant, 2005).

Table 21

Correlation Matrix

		Title I/Non-Title I	Instr. Lvl	Gen-der	Age	High-est De-gree	Yrs. Tch Exp.	Proficency Lvl	Yrs w/ Laptop	PCU	CIP	LoTi Total
Title I/ Non-Title I	Pearson Cor.	1	**-.368****	**.109***	-0.060	-0.076	**-.118***	-0.059	-0.053	-0.096	0.068	0.037
	Sig. (2-tailed)		0.000	0.034	0.249	0.152	0.024	0.257	0.307	0.061	0.187	0.479
Instructional Lvl	Pearson Cor.	**-.368****	1	**-.283****	**.165****	-0.002	**.132***	**.175****	0.076	**.259****	0.060	**.121***
	Sig. (2-tailed)	0.000		0.000	0.001	0.975	0.010	0.001	0.135	0.000	0.240	0.018
Gender	Pearson Cor.	**.109***	**-.283****	1	-0.084	0.085	0.035	**-.187****	-0.020	-0.049	**-.123***	**-.130***
	Sig. (2-tailed)	0.034	0.000		0.098	0.105	0.503	0.000	0.698	0.333	0.015	0.011
Age	Pearson Cor.	-0.060	**.165****	-0.084	1	**.194****	**.575****	**-.196****	**.141****	0.076	-0.086	**-.145****
	Sig. (2-tailed)	0.249	0.001	0.098		0.000	0.000	0.000	0.006	0.133	0.088	0.004
High. Degree	Pearson Cor.	-0.076	-0.002	0.085	**.194****	1	**.297****	0.001	**.131***	-0.072	0.041	0.025
	Sig. (2-tailed)	0.152	0.975	0.105	0.000		0.000	0.980	0.012	0.168	0.438	0.637
Yrs. Tch Exp.	Pearson Cor.	**-.118***	**-.132***	0.035	**.575****	**.297****	1	**-.272****	**.222****	0.055	**-.172****	**-.129***
	Sig. (2-tailed)	0.024	0.010	0.503	0.000	0.000		0.000	0.000	0.287	0.001	0.012
Proficiency Lvl	Pearson Cor.	-0.059	**.175****	**-.187****	**-.196****	0.001	**-.272****	1	-0.014	**.161****	**.565****	**.390****
	Sig. (2-tailed)	0.257	0.001	0.000	0.000	0.980	0.000		0.791	0.002	0.000	0.000
Yrs w/Laptop	Pearson Cor.	-0.053	0.076	-0.020	**.141****	**.131***	**-.118****	-0.014	1	0.041	0.045	0.067
	Sig. (2-tailed)	0.307	0.135	0.698	0.006	0.012	0.000	0.791		0.420	0.374	0.192
	Pearson Cor.	-0.096	**.259****	-0.049	0.076	-0.072	0.055	**.161****	0.041	1	**.354****	**.272****
PCU	Sig. (2-tailed)	0.061	0.000	0.333	0.133	0.168	0.287	0.002	0.420		0.000	0.000
CIP	Pearson Cor.	0.068	0.060	**-.123***	-0.086	0.041	**-.172****	**.565****	0.045	**.354****	1	**.456****
	Sig. (2-tailed)	0.187	0.240	0.015	0.088	0.438	0.001	0.000	0.374	0.000		0.000
LoTi Total	Pearson Cor.	0.037	**.121***	**-.130***	**-.145****	0.025	**-.129***	**.390****	0.067	**.272****	**.456****	1
	Sig. (2-tailed)	0.479	0.018	0.011	0.004	0.637	0.012	0.000	0.192	0.000	0.000	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Question Four stated, 'Is there a relationship between Personal Computer Use and Level of Technology Implementation for teachers in a Southwestern Urban School District?' Personal Computer Use made a strong contribution to explaining the dependent variable, LoTi Level, when the variance explained by all other variables in the model is controlled. This revealed that a linear relationship exists between the dependent variable (LoTi Level) and the independent variable (Personal Computer Use). The Beta (b) coefficient was 0.131, with a level of significance of 0.014. This level of significance signified a unique and statistically significant relationship between the two variables under investigation. The correlation ($r = 0.272$, $p<0.05$) revealed a strong positive relationship between the PCU and LoTi. This relationship indicated that as Personal Computer Use increased for teachers that the Level of Technology Implementation increased as well. It could also be said that as the Personal Computer Use increased that a teacher's self-efficacy increased as well.

Research Question Five stated, 'Is there a relationship between Current Instructional Practices and Level of Technology Implementation for teachers in a Southwestern Urban School District?' Multiple Regression analysis and correlation were conducted using SPSS Statistical Software. CIP made the strongest contribution to explaining the dependent variable, Loti Level, when the variance explained by all other variables in the model is controlled. This analysis revealed that there was a statistically significant direct relationship between the Loti Level and Current Instructional Practices ($b=0.302$, $p<0.05$). Pearson Product movement correlation coefficient was used to determine the strength of the relationship between Current Instructional Practices and the Level of Technology Implementation as measured by the LoTi instrument. The correlation revealed a strong, statistically significant positive relationship indicating that as Current Instructional Practices increased the Level of Technology Implementation increased. The assumption can be made that in-service teachers who scored higher on the CIP measure had a more student centered classroom and were more likely to be integrating technology in the classroom at a higher level with their students.

Research Question Six stated, 'Is there a relationship between the number of years a teacher participates in the Southwestern Urban School District's laptop program and the Level of Technology Implementation?' There was no statistically significant relationship ($b=0.015$, $p>0.05$) between the number of years that a teacher participated in the district's laptop program and the Level of Technology Implementation. The correlation revealed $r=0.067$ with $p>0.05$. Regardless of the length of time that teachers participated in the district laptop program, there was no statistically significant effect on the Level of Technology Implementation (LoTi).

Research Question Seven stated, 'Is there a relationship between the following demographic characteristics (age, years of teaching experience, gender, proficiency level, type of school (Title I versus non-Title I), grade level, and teacher's educational level) of teachers and the level of technology implementation?' The multiple regression analysis showed that both age ($b=-0.148$, $p<0.05$) and proficiency levels ($b=0.139$, $p<0.05$) were statistically significant predictors of the Level of Technology Implementation. Age ($r=-0.145$, $p<0.05$) bore a statistically significant negative correlation to the LoTi. As the age of the teacher increased, the Level of Technology Implementation decreased. This was consistent with current literature in the area of technology integration. Proficiency Level ($r=0.390$, $p<0.05$) was also shown to have a significant relationship to

Level of Technology Integration. This constituted a positive relationship that confirmed as the proficiency level of teachers increased, the level of technology integration increased as well. All other demographic variables did not demonstrate any statistical significance compared to the Level of Technology Integration.

There was a statistically significantly positive relationship between instructional level (elementary, middle school, and high school) and the following other independent variables: age, years teaching experience, proficiency level, and PCU. As the instructional level increased, age, years teaching experience, proficiency level, and PCU increased as well. There was a statistically significant relationship between gender and the following variables; proficiency level, CIP, and LoTi level. This translated into males rating themselves higher on proficiency in using a computer, having a more student centered approach to teaching (CIP) and integration of technology in the learning environment.

Age had a statistically significant negative relationship with proficiency level and LoTi. As age increased both proficiency level and LoTi decreased. Years of teaching experience had a statistically significant negative relationship with proficiency level, CIP, and LoTi. As the number of years a teacher had been teaching increased, the variables associated with technology integration declined. Proficiency level had a statistically significant positive relationship with PCU and CIP in addition to the LoTi.

Qualitative Data

The following two questions from the demographic survey were qualitative in nature and were used to discern subject areas the in-service teachers taught who responded to the survey, the barriers they faced in integrating technology in the classroom, and what support they feel was available in using technology in the classroom. An evaluation of the areas reported by the teachers showed that all subjects had some representation within the group. Most of the elementary teachers reported that they taught all subjects.

Results for Demographic Item 11

Item eleven on the demographic survey stated, 'The barriers I face in integrating technology in the classroom are:' The emergent consistencies in this question included a large majority of teachers expressing that there were not enough computers in their rooms or building for students to have access. There were as many teachers who believed that the equipment, internet/networking issues, and ill placement of electrical receptacles were barriers to the implementation of technology. Many teachers expressed concerns about limited time to plan and implement lessons utilizing technology and a lack of training to effectively know how to use the programs and equipment currently available to them. Some teachers felt that restrictions placed upon them to add software were frustrating and unnecessary. Teachers who participated in the study also cited the district's strict filtering of websites needed for research as obstacles to the implementation of technology.

Results for Demographic Item 12

The support I receive in integrating technology in the classroom included: The sample responses in this question included (in frequency) order:

- Educational Technology Trainers and those district offered technology based in-services and professional development opportunities provided by this department. This area accounted for the majority of support that teachers felt they had within the district specifically for integrating technology. (104 responses). Nearly 27% of the in-service teachers who participated in the study reported that the Educational Technology Trainers were a support for the integration of technology.

- Lead Technology Educator (LTE): This was the seconded most frequently cited resource that teachers felt they had in using technology in their classrooms. (54 respondents).
- Colleagues: Many teachers sought and received help from other teachers within their building on issues related to technology usage. (49 respondents).
- Good or Adequate: 28 teachers rated the support they received as good or adequate to integrate technology in their classroom.
- IT Tech Support/Help Desk: 24 teachers felt like they were supported by this department to integrate technology.
- Principal/Administration: 14 teachers felt that they were supported by their school level administrators to integrate technology.
- Other (Self, websites, college, husband, friend, students, and books): Forty teachers reported a variety of other resources they utilized when integrating technology.
- None/Very limited: Seventy teachers responded that they received none or very limited assistance on integration technology in the classroom. This relates to 18% of the survey respondents.

Summary

The purpose of this study was to discern the level of technology integration in a Southwestern Urban School District situated in the United States. The focus was to compare the level of technology integration of teachers with varying years of participation in the district's teacher laptop program as well as evaluate the relationship that Personal Computer Use and Current Instructional Practices had on the Level of Technology Integration. Three hundred and ninety in-service teachers participated in this study. Though the study discovered that there was no significant relationship between the number of years that a teacher had participated in the laptop program and their level of technology integration, the discovery of this information should prove to be invaluable. As well as understanding the level at which teachers were integrating technology, the district can also get a general idea of the state of mind of teachers regarding technology implementation and their willingness to accept change. According to Moersch (2002) teachers who are functioning at the lower levels have a lower self efficacy and a resistance to change. There are several factors that were revealed in the qualitative questions that will address some possibilities for the insignificance in this relationship. The following chapter will include a summary, conclusions, and recommendations for further study in the area of instructional technology and specifically integration for in-service teachers.

Chapter Five – Conclusions

Summary and Conclusions, Limitations, Implications, Recommendations, and Concluding Remarks

Introduction

Technology integration has the potential to change the learning environment more than any other single innovation in education history. The use of the computer can revolutionize instruction and enhance student learning. Research showed that technology can have a positive effect on student achievement when used appropriately as a tool in the classroom to enhance the curriculum. Teachers have a pivotal position on how much or how little of an impact technology can have on the learning environment. With proper training, teachers can expand their students' ability to use technology for higher order problem solving and projects. Knowing that technology is a powerful learning tool and that schools have invested vast amounts of resources to facilitate the education that their students' receive, it is imperative for school officials to have solid evidence of what impact technology is making in the classroom. The first step to evaluate the level of technology use, is to understand where teachers are in the implementation of technology. This knowledge can have an impact on technology spending as well as staff development planning and implementation.

This study added to the limited research regarding teachers' levels of technology integration when there is ready access to computers. It was impractical to evaluate each and every software or technology application available in the district under investigation, and a broader evaluation of technology use by in-service teachers was more viable and practical to accomplish (Moersch, 2002). The goal of this study was to provide the decision-makers within the Southwestern Urban School District data that can be used to make decisions from the purchase of new hardware and software to the creation of staff development opportunities for the teachers. This staff development can be tailored to the specific needs of in-service teachers as identified by this study. It also outlined the barriers that in-service teachers reported facing in integrating technology. The study revealed the support systems the teachers reported as currently in place. By providing data that demonstrated the level of integration that teachers are currently functioning and the problems that teachers' perceived as barriers to integration, appropriate actions can occur to minimize barriers to maximize results. Teachers that participated in effective technology staff development trainings are better prepared to integrate technology into classrooms (Griffin, 2003).

This study examined seven research questions designed to ascertain the extent that in-service teachers within a Southwestern Urban School District are integrating technology. Findings for each research question id presented. The use of descriptive statistics provided insight into information that school districts can utilize to address areas of weakness identified by the study.

Summary and Conclusions

This study examined the level of technology integration of in-service teachers in a Southwestern Urban School District. The following research questions were examined by the study.

1. What is the Level of Technology Implementation of teachers in a Southwestern Urban School District?

2. What is the level of Personal Computer Use of teachers in a Southwestern Urban School District?
3. What is the level of Current Instructional Practices of teachers in a Southwestern Urban School District?
4. Is there a relationship between Personal Computer Use and Level of Technology Implementation for teachers in a Southwestern Urban School District?
5. Is there a relationship between Current Instructional Practices and Level of Technology Implementation for teachers in a Southwestern Urban School District?
6. Is there a relationship exist between the number of years a teacher participates in the Southwestern Urban School District's laptop program and the Level of Technology Implementation?
7. Is there a relationship between the following demographic characteristics (age, years of teaching experience, gender, proficiency level, type of school (Title I versus non-Title I), grade level, and teacher's educational level) of teachers and the Level of Technology Implementation?

<u>Conclusions for Research Question One</u>

The LoTi reflected the degree that teachers support or implement technology in the classroom for instructional purposes. The results of this study found that in-service teachers, who participated in the online surveys, had a LoTi score rated at a Level One. This level constituted only Awareness which is the second lowest level of technology implementation measured by the LoTi with Non-Use being the lowest. It is apparent from the data generated in this study that the majority of in-service teachers supported only the very lowest levels of use for technology and do not use computers as a means of curriculum enhancement and dynamic learning opportunities for students.

The majority of teachers who completed the LoTi survey reported having the district issued laptop for a period of two years. Over 78% of high school teachers reported having a district issued laptop for two years while nearly 19% report having a laptop for one year or less. This constitutes a staggering 97% of high school teachers participating in this study who have access to a computer that has the potential to revolutionize the learning environment and improve student achievement. This finding was consistent for in-service teachers at the other levels as well. Middle School teachers who reported utilizing a district issued laptop for two years was 73.33% while more than 23% reported having a laptop for one or less than one year. Elementary School teachers having a laptop for two years was 76.67% while nearly 14% have had a laptop for one year or less. Sixteen percent of all teachers completing the survey reported not having a district issued laptop at all.

This study found consistency with the current literature available in the area of technology integration for schools in the United States. Nationally, an overwhelming majority of public school teachers reported having access to computers somewhere in their schools (Smeardon, 2000). The in-service teachers who participated in this study were functioning at the most basic levels of technology integration with the majority having computer access at their fingertips. These findings paralleled the results reported for teachers in the state of Maryland. It was found that computers were being utilized by the teachers, but for much of the same purposes as the subjects in this study which revealed to be only basic tasks such as email and word processing (Mui & Partlow, 2005).

Within this two year timeframe, the district under investigation implemented an online gradebook and attendance reporting system. This information may account for the relatively low level of technology implementation since the focus for training within the district had been on basic computer use skills only to support the new reporting processes. It was not surprising that the U.S. Department of Education (2000) reported that less than 20% of teachers in the United States felt that they were adequately prepared to integrate technology in their classrooms. This was echoed in the sentiments of in-service teachers in this study.

According to the educational technology training calendar of the district under investigation, the vast majority of technology training within the district has been focused on the utilization of technology for the purpose of recording student attendance and grades. Very limited training in the calendar over the last three years has included teaching strategies and methodologies for implementing technology into the learning environment. The next progressive step in technology staff development planning would be to introduce authentic teaching practices that focus on integrating technology into classrooms and demonstrate ways that students' learning can be enhanced through the use of computers. Drawing from the responses recorded in the open response section of the demographic survey, this training should include ideas that demonstrate technology integration with limited access to student computers.

The effective use of technology integration will require some teachers to learn new ways of approaching instruction. Learning new teaching methodologies to incorporate the use of technology is difficult at best when teachers are already faced with the challenge of dealing with increasing pressures to raise test scores and deal with a more diverse student population than ever before (Griffin, 2003). Moersch (1999) concluded from the widespread use of the LoTi with tens of thousands of teachers across the United States that teachers who do not posses the computer essentials for using technology can become frustrated, apathetic, and resentful when asked to implement technology into their instruction.

Conclusions for Research Question Two

Slightly over 58% of the sample ranked their ability to use basic software applications or to troubleshoot minor computer problems as Somewhat True of Me Now. Personal Computer Usage comprised 10% of the LoTiQ. This section was also reflective of the teachers' self efficacy that is their belief in their ability to handle basic computer problems. A mere 10.8% of the subjects selected the Very True of Me Now option regarding their personal computer skills. The average PCU for the district was 4.6 which indicates, in general, teachers within the Southwestern Urban School District demonstrated a moderate to high level of skill when using computers for personal use. These teachers also were more likely to use a broad range of software applications that included multimedia, spreadsheets, and database applications (Learning Quest, 2004). It is evident that these teachers demonstrate sufficient self confidence to resolve routine problems they encountered while using the computer.

Training for these teachers should be designed to assist them in cultivating their skills into technology implementation. By raising the teacher's confidence level in working with the computer in the instructional setting, there is a greater chance that this will carry over into the integration of technology in the learning environment. Teachers who are more comfortable with technology are more likely to utilize it.

Comparison of the district to a national profile where 47,955 participants from twenty states across the United States completed the Loti Technology Use Profile in 2004 shows that the Southwestern Urban School District is slightly lower but consistent with teachers across the nation on Personal Computer Use. Sixty-one percent of the respondents in the national survey reported feeling that their ability to troubleshoot basic computer problems while 58.1% of the district's teachers reported the same. Slightly more than 31% of teachers within the Southwestern Urban School District report that it is currently not true of them now to troubleshoot basic computer issues while 22% of the participants in the national survey reported the same (Learning Quest, 2004).

Conclusions for Research Question Three

The measure for Current Instructional Practices revealed the teacher's support for or implementation of instructional practices that were focused on a learner-based curriculum design. Examples of this type of type of instruction included multiple authentic assessments for students found throughout the curriculum, teacher acts as facilitator of the learning, focus of the classroom is on learner based inquires, and the problem under investigation determines the learning materials (Learning Quest, 2004).

Data from the study showed that there was a significant relationship between a teacher's LoTi score and Current Instructional Practices (Moersch, 1999). As a teacher progressed on the CIP scale, his/her instructional focus shifted to a more student-centered orientation where technology was utilized to aid students in solving real world problems. The overall CIP level for the district under investigation was 3.4. This is the lower end of the rating Somewhat True of Me Now. More than 65% of teachers within the Southwestern Urban School District considered their current instructional practices to be somewhat learner based while 25.96% of teachers felt that their instructional practices that they currently employ as being learner centered.

Comparing the Southwestern Urban School District with the national profile for teachers across twenty other states demonstrated that finding is consistent with other teachers. Nationally, 68% of participants reported that their teaching strategies lined up as being learner-based as reporting Somewhat True of Me Now only slightly more than the teachers employed in the district under investigation in this study. Only 17% of the respondents nationally rated themselves at the highest end of the Current Instructional Practices scale while nearly 26% of the Southwestern Urban School District teachers perceived their instructional practices at the highest end of the scale (Learning Quest, 2004). Only 8.74% of the teachers in the district involved in this study maintained a classroom that employed instructional practices that were supported by subject-matter.

The majority of teachers in the Southwestern Urban School District are just beginning to move into utilizing instructional practices that are learning centered and student driven and away from sequential learning activities, uniform student projects, lectures and teacher directed presentations, and traditional evaluation practices. Training for these teachers should involve continued learning and support for authentic learning opportunities for students and methods for alternate assessment strategies.

<u>Conclusions for Research Question Four</u>

The study concluded that there is a relationship between the Level of Technology Implementation and Personal Computer Use. As teachers became more confident in being able to resolve common issues encountered when using computers, their ability to integrate technology in the learning environment increased as well. This was consistent with research that showed as a teacher becomes more comfortable in the use of technology, they were more likely to utilize computers as an instructional tool.

The Southwestern Urban School District should focus training and support on providing teachers with opportunities to learn more skills related to the operation of the computer and the opportunity to practice these skills in a non-threatening environment where support is available to assist and model when needed. A subject in the study provided that information literacy was seen as a peripheral subject which is treated as "distinct and separate from other subject areas." Another subject stated, "I feel very inadequate in computer skills." One teacher relayed that it was "hard to teach an old dog new tricks."

Conclusions for Research Question Five

The study concluded that Current Instructional Practices (CIP) had the most impact on Level of Technology Implementation (LoTi). The more student centered a teacher was, the more comfortable they were in the integration of technology. A more constructivist teaching methodology yielded a classroom where technology integration was more likely to occur at a higher level than a classroom administered in a more traditional methodology. This study identified CIP as a primary area for the district as they move forward with a staff development plan that can assist teachers in moving to a student-centered learning environment.

Conclusions for Research Question Six

The study showed that the number of years that a teacher had a laptop had no impact on the Level of Technology Implementation (LoTi). This finding was consistent with literature and therefore not surprising. Just because a teacher had technology available, does not mean that he/she will use it in the classroom. It is important for teachers to have a comfort level in utilizing the computer in an instructional setting. This comfort is developed from their personal computer usage and a shift in instructional practices that reflect a more student centered learning environment.

Conclusions for Research Question Seven

The overwhelming majority of in-service teachers within the Southwestern Urban School District (97.88%) reported that they had computer access. Computer access was defined by Moersch 1995 as teachers and students having the ability to use computers within the school building for instructional purposes; including computers in the classroom, computer labs, computers on carts, general access computers in the library or something similar. An overwhelming majority (97.73 %) of in-service teachers in the middle grades (sixth – eighth grades) reported having computer access while 98.89% of elementary in-service teachers reported having access. Only 95.45% of high school teachers reported having access to computers. There was representation from each of the 81 schools within the district with 57 schools having Title I status and 24 schools having non-Title I status.

In-service teachers were asked to rate their own skills at using computer technology prior to their participation in the district's laptop program. Slightly more than 36% of high school teachers rated themselves as proficient in the use of technology while only

29.45% of elementary teachers rated themselves as proficient and 32.58% of middle school teachers considered themselves as proficient prior to participation in the district's laptop computer program.

Discussion

The finding that the Southwestern Urban School District in-service teachers were operating at Level 1- Awareness according to The Levels of Technology Implementation (LoTi) Framework was not surprising. The district had put a focus on the teachers recording attendance in real time, online grading via SmartWeb, and enhanced communication through email. The LoTi Framework outlined Level One as the following:

> The use of technology-based tools is either (1) used almost exclusively by the classroom teacher for classroom and/or curriculum management tasks (e.g., taking attendance, using grade book programs, accessing email), (2) used to embellish or enhance teacher-directed lessons or lectures (e.g., multi-media presentations) and/or (3) is one step removed from the classroom teacher (e.g., integrated learning system labs, special computer lab pull-out programs, central work processing lab). Learning Quest pg 1, LoTi Connection.

Until barriers are addressed in that teachers' perceive impact their ability to integrate technology in the class, most teachers will continue to function at a low level of technology implementation.

As Moersch (1995) explained, there are themes that have emerged as school systems have tried to implement technology into the learning environment. The first theme that can be found in many districts, the district under investigated included, is that most staff development focused on unlocking the potential of computer technology is most times "insufficient" and "misdirected." This theme is echoed repeatedly by teachers at all grade levels that they do not feel adequately prepared to utilize technology at a level that incorporates the needs of the students. The second theme encompasses the use of computers as an activity that is isolated outside of the instructional purpose or goals. These activities with the computer are usually carried out one step removed from the classroom teachers and is likely to take place in a centralized lab is the third theme that Moersch cites as emerging. The fourth theme is the use of technology as a support system for the current curriculum and does not act as a "catalyst for change." The technology plan is not used to establish a link to a specific goal (high order thinking skills or the restructure of existing curriculum) it is used to meet goals based on the number of computers in the school and how these computers will be linked to the network. At this point, technology has not fundamentally made an impact on the way that teachers teach and students learn. It is used solely for the purpose of supporting the old way of doing things in a typical teacher-centered classroom where lessons are delivered, collected, and evaluated in the same traditional ways (short answer, multiple choice, and true and false).

Staff development planning that takes place for enhancing the use of technology integration must be cautious to not assume that teachers are able to make a connection between the technology that is available and their curricula. Nor should it be assumed that teachers are ready or willing to initiate change to their own instructional practices (Moersch, 1995). A major concern for the implementation of technology in schools is the lack of authentic teacher training (Bray, 1999; OTA, 1995).

Teachers reported that the Lead Technology Educator (LTE) in their building was a support for them in integrating technology. This was a train the trainer concept that the Southwestern Urban School District implemented nearly two years ago. A concept that is consistent with the Joyce and showers (1980) of utilizing coaching to reinforce staff development. This was a district initiative that allowed one person in each building to receive additional training to address some of the basic needs of teachers to give just in time training. Anderson and Becker (2001) iterated that school leaders must focus efforts on technology purchasing to maintain current standards while shifting into providing more teacher training in the effective use of technology and integration practices.

Limitations

1. There was a threat to internal validity due to the low response rate of this study. This could possibly skew the results obtained hindering the ability to generalize it to the population.
2. In-service teachers provided their own perceptions about their integration of technology in the classroom. Results of this study were dependent on teacher self-reporting and not on actual classroom observations. Caution should be used with respect to self reporting data according to Pajares (1992).

Implications

History confirmed that merely mandating new initiatives in schools, including use of computer technology, will fail without the proper support system for teachers. David (1994) contended that the implementation of new technologies in the classroom must evoke a transformation in the school organization as a whole along with the supporting systems (e.g., technical systems, professional development) for change to happen effectively. The findings of this study demonstrated that in-service teachers within the Southwestern Urban School District were integrating technology in their classrooms at a very low level. Teachers were comfortable in using the computer to fulfill basic functions such as surfing the Internet, checking email, and recording attendance and grades. They were not, however, comfortable with using technology to enhance the present curriculum or to involve students on the fundamental levels of authentic learning. Until barriers have been addressed that impede the integration of technology, teachers will continue to minimally use the available technology for enhancing student learning.

Technology standards have been developed by educational leaders for both teachers and students (NCES, 2000). It is evident from the data collected in this study that these standards have had little or no impact on the majority of in-service teachers employed in the Southwestern Urban School District. This finding was consistent with Harris's (2005) recent study of technology integration and Sheingold's and Hadley's (1990) results of technology's impact on the learning environment conducted over fifteen years ago. Both of these studies concluded that computers were not integrated into the instruction that happened within schools. Very little has changed in the case of the subjects involved in this study. Teachers have demonstrated repeatedly that they will use technology in instruction on a limited basis and the delivery of the curriculum will remain very much unchanged (Office of Technology Assessment, 1995; CEO Forum on Education and Technology, 1997; National Council for Accreditation of Teacher Education, 1997; Hodas, 1998; Morsund & Bielefeldt, 1999; Zhao, Pugh, Sheldon, & Byers, 2002).

The role of educational leadership is to minimize the barriers faced by teachers in integrating technology in the classroom. The study defined the need for adequate training to overcome the barrier of not knowing or understanding the role that the use of computers can play in instruction. Casey and Rakes (2002) concluded that staff development that was designed to meet the needs of the teachers and delivered in a logical progression can reduce the resistance that teachers have in integrating technology. Wenglinshky (1998) confirmed that students whose teachers engaged in professional development for computers outperformed students who teachers did not.

Recommendations for Research

1. Investigate the amount and types of professional development activities in which teachers have participated to determine if these have an impact on the level of technology integration.
2. A study examining the beliefs and practices of administrators within the Southwestern Urban School District or similar districts could clarify a need for technology training among district leaders.
3. Compare the level of technology implementation and its impact on student achievement outcomes such as grades, standardized testing, attendance, and motivation.
4. Utilize the Levels of Technology Implementation for a second year to do a comparison of growth to the previous year's results.

Recommendations for Practice

Technology has the power to change the way that instruction happens in the classroom. It is important that during this period of transition for teachers that administrators, who hold the key to providing time, money, and resources, are tuned into the elements that are needed to support technology integration. It is imperative to monitor the level of usage within the classroom by multiple means including classroom observation. When technology integration is happening effectively, the administrator should recognize a change instruction. This change would entail the use of technology as a vital tool that supports the approved curriculum. Teachers should act as facilitators of learning. The key to implementation this type of instructional practice along is effective professional development.

The types of training that teachers found most helpful in this study included collaboration with their colleagues, assistance from a trained person within their building to consult with, access to timely technical assistance, and the training that was delivered by the educational technologist. Administration must be the facilitators of the types of training that teachers find most helpful. The most challenging aspect of this is to be creative in the use of staff training time while still preserving the teachers' ability to work in the classroom to prepare for the year or semester.

Modeling the use of a variety of technologies that have the ability to connect teachers with others who are working toward the same goal of technology integration is one way to minimize the barriers that teachers face. A second method is to arrange meeting schedules to include just in time training that covers one aspect of technology integration. One might set up a training opportunity based on the data in this study to show how teachers can use limited student computers and limited Internet accessibility to integrate technology. This can be accomplished by students rotating through stations where one station may include using Excel to solve a problem related to the study.

While much of the burden of technology integration rests on the shoulders of teachers, administration has the responsibility to support their efforts through training and resources. A first step is to build an effective technology plan that includes a needs analysis for both teachers and students. The technology plan must have clear vision with measurable goals for the integration of technology to be successful (Atkins & Vasu, 2000; Roblyer & Edwards, 2000). For this vision to be realized and school improvement to happen through the use of technology, school leaders and teachers must work together to address barriers, overcome fears, plan collaboratively, and establish expectations for integration. Fullan (1982, p.107), who is a renowned expert on change theory, said it best when he stated that “educational change depends on what teachers do and think- it’s as simple and complex as that.”

Summary

The use of technology in the classroom has the potential to change the way that teachers teach and students learn. For school districts to move forward into progressive levels of technology integration, a staff development plan should be designed to meet the teachers’ needs as well as the existing limitations of district resources of student computers. Moving from Awareness as measured by the LoTi Framework into the ensuing levels will require training focused on strategies for integration into in the accepted curricula, time for teachers to plan and implement technology, support in the use of technology both technically and through collaboration with peers, and the motivation of their administrator to mentor and lead the initiative by providing the necessary feedback to demonstrate the benefit to student achievement. Middleton (1998) reported a statistically significant difference between students’ performance on standardized test scores and how their teachers were integrating technology in the learning environment. Those teachers employing higher levels of technology to support instruction had students that scored significantly higher on the Metropolitan Achievement Test than students whose teacher used technology sparingly or not at all.

Assessing the student to computer ratio to determine if this is adequate for true integration to occur in the classroom is also important. It is suggested that an evaluation of the current network system be conducted to determine if it will continue to meet the growing demands placed upon it by teachers and students utilizing technology.

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APPENDIX A

From: <labquest@peak.org>
To: "SHELI MCADOO" <SMCADOO@mntechnology.com>
Date: 1/26/2005 8:38:20 AM
Subject: Re: Seeking permission

Sheli,

You have my permission to use the LoTi survey;unfortunately, surveying 2500+ educators would put a tremendous burden on our servers given our other clients' needs. You might want to rethink that large of number and perhaps scale it down. Why not a sampling?

Otherwise, the paper version is probably your best option. Let me know what you would like to do.

Chris Moersch

Dr. Moersch,
>
> Attached is a letter requesting permission to utilize the LoTi as the
> investigative instrument in a reserach project.
>
> ---
> ---
> You are hereby notified that this email came from the
> source address "@mntechnology.com" and that the
> content has been scanned for viruses using the latest
> virus signatures.
> Moore Norman Technology Center
> ---
> <<<<GWAVAsig>>>>

+++MNTC+++

APPENDIX B

Levels of Technology Implementation Survey

Dear Educator,

I am a doctoral candidate under the direction of Dr. Jeffrey Maiden in the Educational Leadership and Policy Studies Department at the University of Oklahoma- Norman Campus. I invite you to participate in a research study being conducted under the auspices of the University of Oklahoma Norman Campus entitled, :An Assessment of a Teacher Laptop Program in a Southwestern Urban School District", IRB #FY2005-264, investigating the level of technology integration in the classroom of in-service teachers.

The study will investigate the level of technology integration of in-service teachers with the district issued laptops and compare the number of years the teacher has had the laptop to determine if this makes a difference in the level of integration. The information will be made available to the district to construct staff development opportunities to facilitate teachers in their use of technology. The integration of technology is found to improve student achievement.

You will be asked to complete an online survey that will take approximately 25 minutes to complete. You will be directed to the survey which is housed on Questionpro.com. Your involvement in the survey is voluntary, and you may choose not to participate or to stop taking the survey at published, but your name will not be published or linked to responses. The results will only be presented in an aggregate format. All information you provide will remain anonymous.

The data gathered will be maintained in a secured database with access limited only to the investigator and Dr. Jeffrey Maiden. After the study is completed, the information on Questionpro.com will be deleted and all versions on the hard drive of investigator and Dr. Maiden will be deleted.

The findings from this project will provide empirical information about technology integration in the classroom fro the perceptions of in-service teachers employed within the district under study. The study will present information to districts across the state and beyond for accurately measuring the level of technology integration. There will e no cost to you other than the time it takes to complete the survey. There are no foreseeable risks associated with this study beyond those present in routine everyday life.

By going to the website and completing the survey provided, you will be agreeing to participate in the above described project. If you have any questions about this research project, please feel free to call, Sheli McAdoo at 405-694-8275, or email at smcadoo@mntechnology.com. You may also contact Dr. Jeffrey Maiden at, 405-325-1524 or email at maiden@ou.edu. Questions about your rights as a research participant or concerns about the study should be directed to institutional Review Board at The University of Oklahoma- Norman Campus at 405-325-8110 or irb@ou.edu. Thank you for your participation in this study.

Please start the survey now by clicking on the Continue button below.

Sincerely,

Sheli McAdoo

Appendix C

General Demographic Survey

Please complete the following survey. All information is confidential and will not be used to identify any individual. Rather the survey will be used to build a snapshot of the district's teachers participating in this study.

1. School Name Currently Employed: ______________________________________

2. Instructional Level: ? **Elementary** ? **Middle School** ? **High School**

3. Subject(s) Taught: ____

4. Gender: ? **Male** ? **Female**

5. Age: ______________ **Years**.

6. Highest Educational Degree obtained by participant:
   ? **Bachelors** ? **Masters** ? **Doctorate**

7. Total Years of Teaching Experience: _______**Years.**

8. Total Years of Teaching Experience in Oklahoma City Public Schools:
   ____________**Yrs**.

9. How would you rate your skills in using computer technology PRIOR TO YOUR PARTICIPATION IN THE LAPTOP PROGRAM?

1	2	3	4	5	6	7
I did not use a computer		Basic user (email word processing)		Proficient		I used a computer with expert proficiency

10. How many years have you had an Oklahoma City Public Schools District issued laptop computer:
    ? **Less than one** ? **One** ? **Two** ? **Three** ? **Don't currently have laptop**

11. The barriers I face in integrating technology in the classroom are:

12. The support I receive in integrating technology in the classroom is: