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AN ASSESSMENT OF TEACHER CONCERNS ABOUT CLASSROOM TECHNOLOGY INTEGRATION IN SOUTHEAST OKLAHOMA

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By

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A Dissertation APPROVED FOR THE
DEPARTMENT OF EDUCATION

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DEDICATION

This work is dedicated to my father and mother, the late Ira M. Harris Sr. and Margie M. Harris Petty, the two people who taught me that a good name is to be more desired than rubies or gold, that hard work is not to be shunned and that “I can do all things through Christ who strengthens me”. I also dedicate this work to my late uncle, Howard Harrell an educator’s educator, who provided me with countless bits of advice about children, teachers and education administration.

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Abstract

This study measures the concerns of Southeast Oklahoma schoolteachers in the implementation of technology into the classroom. Using the Stages of Concern Questionnaire, teacher concerns were measured to assess the level of implementation reached. Factors of teacher instructional practices and beliefs about educational technology were also studied. The data were then analyzed to determine relationships between variables and to determine differences between concerns, practices, and beliefs of teachers and characteristics of years teaching, years using technology, and school size.

Three hundred sixty-two teachers volunteered to complete the survey instrument. Based on the findings of this study, the following conclusions were made: a) Teachers were at the Stage 5, collaboration; b) teachers had access to technology, but did not use it extensively; c) Insufficient time to integrate technology hampered teachers efforts to use technology in the classroom; and d) school size was significant in teachers' use of educational software, and in beliefs about technology skill development.

Conclusions derived from the findings suggest that staff development activities need to provide teachers with knowledge of the innovation. Leaders' responsible for professional development also need to design, develop and implement plans and activities that address teachers' concerns for collaboration and to provide teachers adequate time for implementing technology into the classroom.

CHAPTER ONE

Introduction and Overview

Background of the Problem

Over the past decade, computer technologies have changed nearly every aspect of American life. This explosion of new technologies has changed the way people live; from the way business is conducted to the way everyone communicates. In 1996, nearly one out of every four adults had access to online services and only 14% of the nation's classrooms had access to the Internet (QED, 2001; NCES, 2000). By the end of 2002, 98% of all public schools reported access to the Internet (NCES, 2002). The advances in technologies and access to high-quality personnel and nearly limitless information available electronically, have opened up many possibilities for improving the opportunity of students to learn (Leverett, 2001). Additionally, the rapid increase in the availability of computers and other technology being so pervasive through many electronic pathways has now provided schools with the necessity to facilitate access to these resources so students can pursue their educational goals and prepare learners for the twenty-first century (Boethel & Dimock, 1999).

Technology is regarded by many as a key element of education reform (Molenda & Sullivan, 2000; McNabb, Hawkes, & Rouk, 1999; Sandholtz, et al., 1997) and has gained recognition and acknowledgement as an important component of the educational process (Lauda, 1994; Lumley & Bailey, 1993; OTA, 1995; Trotter, 1999). To thrive in today's world and tomorrow's workplace, America's students must learn how to learn, learn how to think, and learn how technology works and what it can do to help them learn in a global society. Teachers will hold the key. In fact teachers are perhaps the single most important factor determining the quality of education (CEO Forum, 1999). As a result, business and industry have driven schools to incorporate technology in hopes of providing skills for young people to perform in an economy characterized by high-skill, high-wage employment. However, when schools are not addressing the concerns and training needs of teachers, the district may be wasting much of their resources allocated to technology integration when compared to students effectively using the resources for learning.

In the past, the basic classroom tools have consisted of pencils, paper, blackboards, movie projectors, overhead projectors, and the like. Today, there has been commendable progress in improving technology availability in schools, especially in terms of per student spending on computers and Internet access (QED, 1999). Schools are incorporating computers and other digital technologies into the classroom in order to empower all children to function effectively in their future (International Society for Technology in Education, 2000). Educational technology will allow students to participate in hands-on activities while gaining conceptual knowledge (Lauda, 1994). Others maintain that in order to effectively integrate technology into teaching, schools must change from teacher-centered classrooms to classrooms in which the students as learners use computers and other technology tools to become global learners (Ali,2003;and Bitner & Bitner, 2002). Computer technology is now closely associated with virtually every educational setting across the United States and the students of today are being exposed to computer technology in every aspect of their day- to-day activities (Tapscott, 1999).

Since 1999, Congress has committed over $275 million to the Preparing Tomorrow's Teachers to Use Technology program. Nevertheless, the conversion of technology from hardware, software, and connections into tools for teaching and learning depends on knowledgeable and enthusiastic teachers who are motivated and prepared to put technology to work as an effective tool to improve student learning and performance (Royer, 2002).

Many educators, students, and parents envision the possibilities for improved instruction that technology can bring to the classroom. Schools have reformed, restructured, and at times created new programs in order to increase instructional effectiveness. School districts are equipping their schools and classrooms with computers and other technologies to be used by teachers in student instruction. However, in a significant measure, the technology revolution affecting schools has proceeded without the necessary attention to research on how teachers learn to use new strategies (Joyce & Weil, 1996; Lieberman, 1995, 1999).

Schools have invested time, money, and other district resources in computers and other technologies in an effort to enhance student achievement and to prepare students for the twenty- first century.

Public schools spent approximately $5.8 billion to purchase educational technology in 2001 (QED, 2002). Integrating computer technology in education is an expensive venture and the stakeholders in the school district have to pay the cost however, buying the technology is a beginning step not the final step of creating global classrooms.

In our knowledge-driven society, access and utilization of educational technologies will become increasingly critical, and knowledge along with access to knowledge will have a price attached. School districts have restructured school budgets to finance expenditures for computer technologies and the public has consistently agreed to increased levels of spending. Schools steadily make sizable investments in computer equipment and renovations to accommodate the equipment. However, most schools provide very little professional development with 61% of teachers receiving θ 5 hours of technology training annually (MDR, 1999). When there is a focus on training for teachers, most of the training is on learning software applications rather than on curriculum integration (McKenzie, 2002).

Most computer technology is used for isolated activities unrelated to a central instructional theme, concept, or topic (Lippman, 1997). Teachers will need specialized instruction if they are to use technology successfully in classrooms (Marshall, 1988). One of the most important factors in implementing technology in schools is effective staff development (OTA, 1995). The U.S. Department of Education has recognized that educational leaders need to be aware of the reforms that are needed to support improved teaching and learning:

> Learning technologies are effective only when treated as one component in implementation strategies that also encompass (1) curriculum reform, (2) sophisticated and multiple assessments, (3) effective professional development, (4) well-maintained technology infrastructures and support systems, (5) attention to equity, and (6) the restructuring of organizational practices, budgets, and policies. An exemplary technology-based program will incorporate all of these dimensions. A promising one may incorporate some of them and will include plans to achieve the remainder. The ultimate goal of the linked elements of any technology program is increased student learning (U.S. DOE, 2000)

The use of technology can no longer be an option for school districts if they are to prepare students for the future. The number of households with children having online access has increased to over fifty million. However, the goal of any school district should be to deliver a quality education to its students. Many school district administrators and boards of education support the direction set by state and federal governments and the local schools embrace the opportunities offered by the infusion of technology even though there are concerns. Unlike previous technologies, computer-based technology offers many opportunities in allowing students and schools to achieve the goals proposed by educators.

Certain attitudes toward innovations and other school and teacher concerns may be factors that need to be examined when educational technology is advanced. Studies have demonstrated the validity of variables such as teacher attitudes, concerns, and training as factors influencing adoption of innovations (Fullan, 2000; Hall & Hord, 1987; CEO Forum, 1999).

Well-trained teachers can use computers to improve their student's attitudes, and they can coordinate computer lessons with classroom assignments, read reports to monitor student progress, create incentives, and use reports to diagnose and remediate individual student's skill deficiencies (Sherry, 1998). Teacher preparation in the use of technology can help ensure that teachers use technology to improve student achievement. The U.S. Department of Education's Preparing Tomorrow's Teachers program focuses on strengthening teacher technology use in the classroom and includes directives such as, "The power of technology for student learning doesn't come from the presence of classroom computers or the Internet, the real power of technology in education will come when teachers have been trained well and have captured the potential of technology themselves. Teachers must model the behavior students are expected to learn" (August 2000).

In order to maximize the effectiveness of computer-based instruction, teachers must be given the time and training necessary to understand how to take advantage of its strengths. Teachers also need training in how to coordinate the use of computers with their regular classroom instruction. Preparing over three million teachers who work in schools to use technology effectively needs to be a priority in terms of spending and practice (CEO, 1999). School districts vary significantly in their spending on professional development. District spending on professional development ranges from 1.8% of the total of all staff development funds to 4.3% (Miller, 1994; Miles, et. al., 2001).

Although school districts often are compelled by legislative and educational mandates to provide staff development activities for current educational issues such as special education and blood borne pathogens as well as new program initiatives such as technology. The problem is that the pattern of professional development in schools has long been focused on one-day or even one-hour workshops where instructors introduce teachers to a methodology or topic and lead them through exercises that are often abstract (McKenzie, 1991). These types of short-term strategies do not imply a commitment to teacher development, whereas long-term investments in teachers as growing professional provide better educational programs for students (Brand, 1997). They often give teachers inadequate opportunity to practice new skills and offer little ongoing support or follow through (McKenzie, 1991).

Schools are purchasing technology hardware and software on a regular basis and teachers need time for exploring software, for collaborating with other teachers, for getting and providing help,for planning lessons, and for gaining new perspectives on student motivation and learning using computer learning environments (Smith & Ragan, 1993). Additionally, to be effective, professional development programs need to accommodate the program goals of the school and target the results for students. Because teachers are the key players of student success, their individual requirements for mastering innovative methods, knowledge, and techniques deserve specific attention (CEO Forum, 1999).

Staff training costs can run as high as $5,000 per teacher if the school staff is allotted two hours a week planning time given to learning about new ways to use technology in the classroom (Miles, et. al., 2001). These costs often force school districts to be conservative in providing staff training for activities other than for those mandated. Funds appropriated for technology often are applied to hardware and software purchases. However, schools that focus their funds on equipment without budgeting relevant funds for staff development, greatly limit their use of the technology (Byrd, 1994). These schools, therefore, may realize little return on student achievement with computer learning environments.

There is concern among the education community that teachers are not receiving adequate and acceptable training in the use of computers in instructional delivery. There are no assurances that teachers will receive training they need to use technology in the classroom, or that school districts have even adopted technology as a core value for their schools (Itzkan, 1995). Some teachers in research studies have indicated their concern in integrating technology in their student’s everyday learning activities (Figg, 2000). For computer technology to positively reorganize the learning environment, technology integration must be viewed in terms of function rather than application, process rather than approach (Becker, 2000; Hadley & Sheingold, 1993). School districts are not considering teacher technology skills as important as other instructional skills and teachers therefore are not receiving adequate and acceptable training in the use of computers for instructional delivery and therefore the technology is not being utilized for instructional purposes and students are not learning to their potential. Sheingold (1990) pointed out that integrating technology in schools and classrooms is not so much about helping teacher to operate machines as it is about helping teachers integrate technology as a tool for learning. Lack of training can translate into difficulties of successfully integrating technology into school curriculums. If school districts are not providing teachers with opportunities for training in the use of computers for instruction, it is probable that teachers will not utilize computers for instructional purposes. Therefore, if students are not granted the opportunities provided by technological innovations these students will be disadvantaged by their lack of experiences compared to students being taught utilizing computer technology.

Where teacher attitude and opportunity to become familiar with new integrations is important to successful implementation, if school districts are to successfully make the integration of technology into the student’s curriculum their priority, it is important that school districts support teacher opportunities to learn how to use computer technologies to enhance instruction and to make every effort in eliminating teacher apprehension. School districts that are in need of training teachers in the use of computers and technology need to expedite and plan for training of the teachers. If technology is to have an influence on the teaching of students, one might envision that a level of technology is necessary for training of both pre-service and in-service teachers and administrators.

Statement of the Problem

Research literature does not adequately represent the specific concerns and changes teachers make in the process of taking ownership of an innovation such as instructional technology so that integration into the classroom and long-term change in their pedagogy occurs. With the necessity for having well trained teachers, it is important for school districts to plan for staff development to facilitate instructional practice supported by educational technology. Staff development should be regular and ongoing, and should help teachers to utilize technology effectively within the framework of the school district's technology plan. Teacher's needs and concerns must be addressed in order to provide for more effective staff training as it relates to technology integration into the classroom curriculum.

Purpose of the Study

The purpose of this study was to acquire insight into the types and characteristics of teacher concerns with integration of technology into the classroom environment, teacher knowledge and use of technology in classroom instruction, and to examine any differences related to the demographic variables of age, gender, grade level teaching, subject teaching assignment, teaching experience, use of technology experience and level of education in relation to teacher concerns and teacher technology use. Through surveys, data was gathered about teachers, their use of technology, and their concerns with integrating technology. This research will focus on the extent to which teacher's concerns about technology integration into classroom instruction along with other factors prevent teachers from using computers significantly in instructional practices. Additionally, this study examined ways to assess the different concerns teachers have regarding the use of technology in their classrooms in order to develop intervention strategies related to their concerns. The results of this study will help educational leaders plan and provide for technology integration in school districts through appropriate staff development activities and programs.

Research Questions

1. To what extent are Southeast Oklahoma teachers concerned about various elements of the introduction of computer technology in their classrooms?

2. How do teachers in Southeast Oklahoma report their instructional practices in each of the following areas?
    - Computer application skills
    - Utilization of educational software
    - Proficiency in various technology related activities
    - Impact of technology on instructional practices
3. What are Southeast Oklahoma teachers beliefs about:
    - Developing their technology skills?
    - The use of classroom technology?
    - How technology can support teaching and learning?
4. Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and instructional practices in the following areas?
    - Computer application skills
    - Utilization of educational software
    - Proficiency in various technology related activities
    - Impact of technology on instructional practices

5. Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and teacher beliefs about the areas of:
    - Developing their technology skills?
    - The use of classroom technology?
    - How technology can support teaching and learning?
6. Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and the following demographic characteristics?
    - Age
    - Years teaching
    - Years using instructional technology
7. Are there statistically significant differences between teacher concerns with integrating technology into classroom instruction and teachers grouped according to the following demographic characteristics?
    - Highest degree earned
    - School size
    - Grade level assignment
    - Subject area assignment

8. Are there statistically significant relationships between Southeast Oklahoma teacher instructional practices using technology and the following demographic characteristics?
    - Age
    - Years teaching
    - Years using instructional technology
9. Are there statistically significant differences between teacher instructional practices with technology in classroom instruction and teachers grouped according to the following demographic characteristics?
    - Highest degree earned
    - School size
    - Grade level assignment
    - Subject area assignment
10. Are there statistically significant relationships between Southeast Oklahoma teacher instructional practices using technology and teacher instructional beliefs?

11. Are there statistically significant relationships between Southeast Oklahoma teacher instructional beliefs using technology and the following demographic characteristics?
    - Age
    - Years teaching
    - Years using instructional technology
12. Are there statistically significant differences in teacher beliefs listed below and between teachers grouped according to the following demographic characteristics?
    - Highest degree earned
    - School size
    - Grade level assignment
    - Subject area assignment

Significance of the Study

This study provides supporting research for the design of effective professional development that affects a teacher's concerns, perspective and practice when using instructional technology in classroom instruction. Through paying attention to concerns, perceptions and the personal dimension of the change process, this study collected transferable data about effective professional development planning, and programs and components that facilitate the implementation and ownership of an innovation, such as technology, into teaching practices.

As schools continue to use computer technologies into the first decade of the twenty-first century, it is imperative that data continue to be collected which are focused on the impact technology has on classroom teachers and on school districts. Educators have expressed high hopes for the potential of technology to improve student learning while significantly reducing instructional costs (Green & Gilbert, 1995). Unfortunately, during the last decade the swift deployment of computer technology in classrooms created several problems. For example, it was not unusual for a school district to purchase and install computers and educational software and for students to begin using the computer systems before anyone questioned the implementation of the technology. The problems associated with the implementation of computer technology were intensified when schools acquired hardware through E-rate but lacked adequate funding to teach and support teachers in the appropriate implementation of the technology.

Despite the increased incidence of hardware and software in classrooms, researchers have claimed that computer use in classrooms does not often play a central role in the instructional process (Glenn & Carrier, 1989; Cuban, 2001). Glenn and Carrier (1989) go on to state that poor or inadequate training of teachers appears to be the cause of the discrepancy. Government associations have made statements that despite the desire of most teachers to use technologies in the classroom most have not received adequate or necessary training to allow them to use the technology effectively for instruction (OTA, 1988). The OTA in another study (1995) claimed that staff development is crucial if technology is to be effectively used for instruction in schools. Other researchers have summarized that staff training is critical to the process of implementing technology into the classroom (Fuerstenau, 2000).

Implementation in schools is the placement of an innovation in the instructional process. Many implementations are adopted but never implemented (Bond & Finney, 2000). Fullan and Pomfret (1997) described implementation as a “phenomenon in its own right” and suggested implementation studies should measure the correspondence of actual use of an innovation with its intended use. Hord and Huling-Austin (1986) warned that implementation does not equal delivery of an innovation in the way it is intended to be used. Smith and Ragan (1993) postulated that it is critical to be able to identify the degree to which the description of the program represents what actually occurs during instruction with a new program when determining the cause and effect from the instruction to the results.

The process of educational change and innovation that results from technology implementation in classrooms is extremely complex. Implementation is often difficult and complex due to the variety of curriculum programs, computer platforms, and educational populations served by various courseware products. Consequently, schools cannot expect to experience gains in student achievement and motivation from computer technology if it is not properly implemented.

This research study provides information on how teachers are using technology innovations in their classrooms. It also provides administrators and other decision makers with an understanding of teachers’ concerns in implementing technology into their classroom instruction. Findings generated from this research study can be used by educational stakeholders in developing technology development programs that are beneficial to the teachers in implementing technology related innovations in classroom instruction and may be transferable to the introduction and implementation of other types of innovations as well.

Definition of Terms

Educational Technology - Educational technology, synonymous with instructional technology, is technology used specifically in a school and/or classroom setting for the explicit purpose of teaching and learning (Cohen, 1996). It includes a variety of types of technologies, both hardware and software, including but not limited to computers, that can be used as tutor, used to explore, used as a tool, and used to communicate.

Staff Development - Staff development in relation to this study is synonymous with professional development. It refers to the activities and/or processes intended to help educators improve their skills, attitudes, knowledge, and/or performance in their roles.

Technology Staff Development - Technology staff development is the integration of the emerging technologies into education by using a planned, ongoing, and comprehensive approach involving leaders (both administrators and teachers) who facilitate other stakeholders that are actively engaged in acquiring, upgrading, or abandoning knowledge, attitudes, and skills related to technology-based environments (Lumley & Bailey, 1994).

Computer Assisted Instruction – Incorporates software and hardware that is designed to help teach information and/or skills related to a specific topic. CAI often is used for review or previously taught material. CAI is also marketed as courseware by many retailers and publishers.

Concern – The composite representation of the feelings, preoccupation, thought, and consideration given to a particular issue or task; a mentally aroused state about something; stimulation of a person's perceptions, not necessarily the reality of the situation (Hall & Hord, 2001).

Intervention – An action or event that influences the use of an innovation.

Integration – Making pedagogical and curricular changes to include technology.

Implementation – As it applies to this study, implementation is based on a teacher's desire and action to incorporate more technology into their curriculum; it is the incorporation of the innovation into the instructional process.

Assumptions

This study was conducted within the framework of the following assumptions:

1. That teacher's stages of concern can be measured accurately.
2. The teachers will respond to the survey questions honestly.
3. The teachers in this study are expected to be engaged in teaching, supporting students, and contributing to the improvement of the whole school.
4. Adequate numbers of teachers will respond to the survey instruments.
5. The Stages of Concerns Questionnaire and Teacher Survey of Technology Use are valid as established in other studies.
6. The samples selected for this study will be representative of all school districts in Oklahoma.
7. The results of this study can be used to assist school districts to initiate appropriate practices for staff development in instructional technology that have the potential to shift the teacher's educational belief system and practices.

Limitations

The following were limitations of this study:

1. The study was based on one state's teachers in a limited geographical area only and it may be questionable to generalize the findings to other teachers in other schools outside the study.

2. This study examined only teacher concerns with technology implementation at a certain point in time. Many of the variables are not stable traits and will probably change.
3. The implementation components of the innovation were based on widely accepted technology standards and the variations for the components may differ from school to school.
4. Teacher's levels of concern and technology use may not clearly be separated out from other data.

Summary

This dissertation is divided into three chapters. The first chapter was an introduction and overview. Included in the chapter are the background of the problem, statement of the problem, purpose statement, research questions, significance of the study, assumptions, definitions of terms, and limitations. The necessity for the study focused on the teacher stages of concern and technology use in school districts that provide resources for training teachers in educational technology. The questions, which guided this study, encompass the concepts of where teacher stages of concerns are in using educational technology in the classroom to improve student instruction. The limitations of the study were discussed as well as the assumptions for this study. Chapter II was the literature review. The major issue for this dissertation was teacher concerns in their adequacy to use technology to teach their students. Chapter III covers the type of research conducted, the population used, the process for developing the instrument, and how data was collected and analyzed.

Chapter IV of this dissertation reports the data collected with the survey instruments as well as the results of the statistical procedures. Chapter V includes discussion of the findings and the implications that emerged.

CHAPTER TWO

Review of Related Literature

Introduction

Over the past two decades, school districts have integrated computers into classroom teaching at an ever-increasing rate. Within this period, both technology and theories of learning have changed. This literature review will examine the theoretical background important for conceptual understanding in this research study. The chapter was divided into several sections: (1) background, (2) Technology and Education Reform, (3) Importance of Technology in Education, (4) Factors that Influence the Use of Computers in the Classroom, (5) Professional Development, (6) Professional Development in Technology, (7) Concerns Theory, (8) Concerns-Based Adoption Model and (9) Summary.

Background

There have been many attempts at integrating technology into schooling, and most have been developed with optimism by their advocates. In the early 1900's, radio was first expected to have a significant impact on education. In the 1930's, film was at the forefront of technology, in the 1950's it was television, and in the 1960's it was teaching machines (Mehlinger, 1995).

The overhead projector was another technology that found its way into classrooms. It was first introduced in the 1940's by the military before finding its way into schools. The overhead was a technology that was easy to use and relatively inexpensive. It allowed teachers to prepare lesson notes in advance of the class and project them onto a screen for the students to view. It continues to be used as the technology of choice for supporting instruction in many classrooms today (Mehlinger, 1995).

The expanding role of computer technology and its infusion into education has happened at a seemingly faster rate than other technology tools for the classroom. The history of computers in education was traced to the mid-1960s under the designation of computer-assisted instruction. These earlier efforts of improving the achievement of slow learners have developed into interactive drill-and-practice software applications.

Technology and Education Reform

Models of learning, such as problem-based learning, authentic instruction, and multidisciplinary instruction, all share common instructional processes: students solve complex problems, use real-life resources, construct new knowledge, and produce projects, products, and information that they share with others (Coulter, et. al., 2000). The models also share a common view of learning, are problem or project centered, student centered, customized, communicative, productive, and lifelong. The focus of these models concerning technology is that teaching and learning are happening with technology and technology has to be a tool that enhances both student achievement and teacher learning (Coulter, et. al., 2000).

When technology is central to student learning and firmly established in the curriculum, it can be an effective tool by helping students achieve greater proficiency in classroom subjects (Clovis, 1997). Instructional leaders must also realize that the technology changes not only students' learning but also teachers' beliefs and practices (Dwyer et. al, 1991). Technology enlarges the scope and depth of traditional curriculum and practices beyond what can be offered only with conventional print resources. Constructivist teachers tend to be more comfortable with engaged learning than are more traditional teachers, and teachers who use technology effectively tend to become more constructivist in their orientation over time (Dwyer, et. al, 1991).

As the use of technology changes teachers' beliefs and practices, they evolve along a continuum of technology integration that leads to increasingly effective instructional practices. However, teachers' beliefs and practices change slowly, and the changes need to be supported. Teachers need to have access to technology over several years in order for their teaching to change, because technology intensive instruction evolves rather than just happens (Dwyer, et. al, 1991). In support of their idea, there are five phases of implementation and change that school administrators and teachers pass through as they move toward creating technology intensive teaching and learning environments: (1) entry; (2) adoption; (3) adaptation; (4) appropriation; and (5) invention (Dwyer, et. al, 1991). These phases are further described in Figure 1.

Figure 1. Five phases of implementation and change.

1. Entry Phase	**Expectations:** identify volunteer teams to investigate technology benefits and install a critical mass of computers in the classrooms. **Support:** providing for planning and sharing time
2. Adoption Phase	**Expectations:** establish curricula and use software for drill and practice and for word processing. **Support:** providing technology skill training and nurturing teachers' confidence and abilities.
3. Adaptation Phase	**Expectations:** integrate word processing and computer-assisted instruction, increase student and teacher productivity, and modify in the curricula. **Support:** providing time is essential: for teacher-peer observations, team collaboration, teaching and discussing of new pedagogy, training on new applications and strategies for integration
4. Appropriation Phase	**Expectations:** experiment with and re-examine technology vision and mission. New assessments emerge, including alternative/authentic assessments. **Support:** providing teachers the opportunity to conduct professional development for their peers.
5. Invention Phase	**Expectations:** integrate curricula, support project-based teaching and learning and alternative assessment modes. **Support:** providing opportunities for collaboration with other teachers, experts, and mentors within as well as outside of the school community.

Dwyer, Ringstaff, and Sandholtz, 1991.

Several authors and researchers have claimed that in the future, access to information and knowledge and the ability to employ it will be important determinants in the quality of life (Bitner & Bitner, 2002; Wright, 1994). Technology can be a catalyst that catapults change or a tool that facilitates change (Lauda, 1994; McGrath, 1994; Robinson, 1994). According to Means (1994), the school reform movement and the introduction of technology into classrooms were two of the most significant trends in education today. Technology is used to tutor students, support collaboration among students and teachers, to acquire educational resources, to aid the assessment of student progress, and in classroom management. At the same time technology has saturated the workplace, home, and businesses and has become so powerful and inexpensive that its introduction in to schools was inevitable.

In clarifying the necessity for school reform, researchers have stated that educators are aware that there are many new demands on schools resulting from the demands of industry that require new skills and methodology to learning. These demands to change are a result in majority to the developments of technology in our environment (Gooden, 1996). To meet the need to use technology successfully, changes in education will be substantial and educators must acknowledge this priority for change.

One such school district has met the demands of the technology revolution in education. The Sweetwater Union High School district, the largest secondary district in California, collaborated with other educational agencies, public libraries, hardware manufacturers, software designers, and local organizations to form the Advanced Curriculum through Technology (ACT Now!) project. The project focuses on training every teacher to know how to use a computer and the World Wide Web to improve teaching and learning in the classroom. The Sweetwater district contends that the ability to use computers and other technology to improve learning is essential for teachers and students. To help guide those involved in making decisions about the direction technology training should take, a Teacher Survey of Technology Use was developed to assess teacher skill levels and development, technology proficiency, classroom practices, technology beliefs, and student performance expectations (Bober, Harrison, & Lynch, 2001).

Several articles on the application of educational technology attempt to lay out a system of types of categories (Alessi & Trollip, 1991; Olds & Lightner, 1995; Taylor & Wiebe, 1994; Means, 1994). However, the categorization of forms of technology expresses a view that has significant pedagogical implications.

Alessi and Trollip (1991) regard the educational use of computers as a set of instructional methodologies:

> … the process of instruction includes the instructor presenting the information to students, guiding the students' first interaction with the material, the student practicing the material to enhance fluency and retention, and finally, assessment of students to determine if they have learned the material and what they should do next. (p. 9)

Alessi and Trollip (1991) further organize various forms of technology instruction into five categories: tutorials, drills, simulations, games, and tests with no specific location for general software tools such as spreadsheets, mail readers, or drawing programs.

Four categories of educational technologies have also been described based on their use: used as tutor, used to explore, used as a tool, and used to communicate (Means, 1994). These categories reflect a growing awareness that features of hardware and software alone do not determine educational practices.

Considering yet another taxonomy, Bruce and Levin (1997) determined that forms of technology that have excellent pedagogical potential did not fit within the existing categories. Most particularly the tools, techniques, and applications that address a constructivist and more integrated view of learning were of interest to Bruce and Levin. The assumption they postulate is the idea that the ideal learning environment satisfies students' curiosity and engages them in exploring, thinking, reading, writing, researching, inventing, problem-solving, and experiencing the world (Bruce & Levin, 1997).

Importance of Technology in Education

Parents want their children to graduate with skills that prepare them to either get a job or advance to higher levels of education and training. Employers want to hire employees who are honest, reliable, literate, and able to reason, communicate, make decisions, and learn. Communities want schools to prepare their children to become good citizens and productive members of society in an increasingly technical world. Researchers believe that if students are to become literate and productive with technology, the necessity for experience with sophisticated technology applications should be some of the highest priorities of educational agendas (Donlevy & Donlevy, 1995). In recent polls, teachers have asserted that student achievement is improving because of technology (Hofer, 1999).

Wise use of technology can enrich learning environments and enable students to achieve marketable skills. It is critical that educators analyze the potential benefits of technology for learning and employ it appropriately. The educational system must produce technology-capable students (ISTE, 1999). To live, learn, and work successfully in an increasingly complex and information-rich society, students must use technologies effectively. Technology use in education can deliver a notable and positive outcome on student achievement. In addition, technology can have a positive effect upon student attitudes and motivations for learning.

Factors That Influence the Use of Computers in the Classroom

While many advances have been made in technologies over the past decade, the use of computers in the classroom for the purpose of student instruction has progressed more slowly. In 1995, The Office of Technology Assessment reported that few of the nation's teachers used technology in their teaching (OTA, 1995). More recent studies have determined that the circumstances have not significantly changed (Cuban, 2001). Most researchers have found a lack of funding and commitment to staff development in technology as a major obstacle to teachers using technology in the classroom (Triplett, 2001). A majority of teachers responding to a survey stated they feel inadequately trained to use technology, particularly computer-based technologies. Although many teachers saw the value of students learning about computers and other technologies, many were not aware of the resources technology could offer them for teaching students (OTA, 1995).

Triplett (2001) also cites a pattern that limits the use of technology by teachers in their classrooms.

1. Staff development opportunities for teachers to explore the potential of computer technology for teaching are often minimal and insufficient.
2. Most computer technologies are used for isolated activities unrelated to the central instructional theme, concept, or topic.
3. The use of computers is often one-step removed from the classroom teacher.
4. The majority of school district technology plans do not establish a significant link between the need for technology and identifiable instructional priorities.

Meltzer (1997) suggested that teachers experience many obstacles in their attempts to integrate technology in classroom teaching that include problems with motivation, access, and technical assistance. Other research indicates that certain factors can function as either barriers or motivation, depending on their applications in the system (Lippman, 1997). Studies, conducted involving teachers' concerns and attitudes about technology, have revealed inconsistent findings in determining whether such factors as age, gender, teaching subject, teaching experience, access to computers, and technology training influence the use of computers in instruction. Additional research is needed to determine the effects of various factors that have an influence on the use of technology in instruction. An understanding of how factors influence teacher use of technology in instruction is beneficial in the planning of school district technology development programs.

Teachers' existing attitudes, skills, and work habits have a great influence on their acceptance of technology and how they use it in their classrooms (Lippman, 1997). Teacher motivation can be affected by factors such as having unlimited access to technology, updated equipment, and a community of other teachers trying to master the same tools and skills (OTA, 1995). Other factors of teacher motivation include teachers' fear about the impact of computers on their workloads and daily routines. Many teachers understand the commitment that must be made in terms of hours required to plan classes and to train in utilizing computer technology and realize that it can be incompatible with a rational work schedule.

The school administrator should be responsible for leading the effort to integrate technology into the classroom. His or her responsibilities largely falls into four categories: obtaining resources, buffeting implementation from outside interference, encouraging teachers, and adapting current policies to meet new demands (OTA, 1995). Administrators must also ensure that sufficient supplies such as hardware and software are in place for use to sidestep teacher loss of incentive (Meltzer, 1997).

Teachers also need administrators to run interference as they learn, experiment, and implement. Many people in the community, including some educators, may believe that teachers are avoiding their initial duties when they spend time developing technology skills (Sheingold, 1990)

At the same time, administrators must encourage teachers to use and acquire technology-based skills. Hawkins (1994) indicated that administrators must encourage teachers to pursue distinctive applications of technology that suit their classrooms and their individual teaching styles. Teachers should feel that if they engage in using technology in the classroom that their efforts will be supported and not wasted.

Additionally, administrators should lead by example. An administrator who expects to see teachers using technology in the classroom but does not know how to use it himself/herself is sending a mixed message to teachers. Administrators should know, be able to talk about, and have experience with trouble-shooting technology problems in order to gain the respect and confidence of teachers in implementing technology in teaching (OTA, 1995).

Technology will never be integrated fully if it depends on individual administrators acting alone based on their own conception of how technology should be used. School district boards, administration, and faculty must identify their instructional priorities (Meltzer, 1997). After a philosophical base is established for technology integration, a vision must be identified to commit teachers to using the technology (Moersh, 1995)

Professional Development

The vision will remain a dream and the best plan unfulfilled unless teachers are able to use technology effectively in their classrooms. The needs of teachers who will be implementing the technology into classroom instruction must be a top priority (OTA, 1995).

Professional development is a term referring to the plurality of formal or informal efforts and activities that schools undertake to enhance individual or institutional capacities to teach and serve students. Before the mid-1980s, staff development was the object of very little research and staff development programs did not provide the support system needed in the workplace to maintain innovations in teaching (Glickman, 1998). Teachers must be properly trained in the use of computer technology for classroom instruction. Failure of educational institutions to respond to the growing needs for technology and training in its use may have serious consequences for our students. Research on professional development stresses that a teacher's knowledge, experiences, and skills must be viewed as the base upon which competencies are built (National Staff Development Council, 2001).

All personnel functions have a direct or indirect impact on school effectiveness, but none has a greater impact than professional development and training. Professional development provides opportunities for teachers and other professionals and support personnel to acquire new skills and attitudes that can lead to the changes in behavior that result in increased student achievement (Seyfarth, 1996). Part of knowing whether the curriculum is being delivered, in a manner in which students learn knows whether the teachers are being prepared to teach it.

Over the years, there has been an emphasis on the need for teachers to continue to learn, and almost every school district in the country provides some form of staff development for teachers. Most professionals might agree that professional development is a necessary activity. However, professional development has been considered unsatisfactory in its current form. It has been argued that professional development in the American public schools is misguided in both policy and practice (Stout, 1996).

In 1994, the U.S. Department of Education under Secretary Richard W. Riley established a Professional Development Team with the goal of improving teacher-training programs. The Team's mission was to examine the best available research and exemplary practices related to professional development, and to summarize the lessons learned form this knowledge base in form of principles that might inform practitioners and policymakers across the country and guide the Department's efforts in the area of professional development. The principles of professional development selected by the team were published in the December 1994 Federal Register.

High-quality professional development should incorporate all the principles stated below. Adequately addressing each of these principles is necessary for a full realization of the potential of individuals, school communities and institutions to improve and excel. Professional development focuses on teachers as central to student learning, yet includes all other members of the school community; focuses on individual, collegial, and organizational improvement; respects and nurtures the intellectual and leadership capacity of teachers, principals, and others in the school community; reflects best available research and practice in teaching, learning, and leadership; enables teachers to develop further expertise in subject content, teaching strategies, uses of technologies, and other essential elements in teaching to high standards; promotes continuous inquiry and improvement embedded in the daily life of schools; is planned collaboratively by those who will participate in and facilitate that development; and requires substantial time and other resources (Sparks, 2002).

According to Fullan (1993), society has failed its teachers. Teachers have been criticized for not producing better results and at the same time, teachers have not been given help in improving the conditions that would make success possible. Professional development should induce change in teacher beliefs and practices. In order to change beliefs, teachers need time to learn about the innovation, to practice and to integrate the innovation into classroom practice. Additionally, they need a risk free environment in which to practice and support that makes them feel capable of learning and doing (Dwyer, 1994).

Bull and Buechler (1996) stated that traditionally, professional development for teachers has consisted of one-time training workshops delivered by outside consultants with no follow-up. In Learning Together: Professional Development for Better Schools, they presented five principles for professional development approach that included research, reflection, discussion, peer coaching, collaborative planning and problem solving, and involvement in decision making, along with more traditional skills training. The five principles encouraged teachers and administrators to plan and implement professional development activities based on a vision for overall school improvement.

Well-trained, well-supported teachers were defined as those who have easy access to technology, who know how to use it in their classrooms, and who are encouraged and supported by their administrators in its use (Braun, 1993). Sparks and Hirsh (1997) stated that staff development has been undergoing profound changes as traditional approaches fall short of current needs and educators face new challenges. Sparks and Hirsh further state that if schools are to prepare students for life in a world that is becoming increasingly complex, professional development of school employees and significant changes in the organization in which they work are both required. The old beliefs in staff development as an afterthought cannot be accepted. Districts must realize that they cannot educate students to high levels without well-designed professional development.

Guskey (1994) asserted that schools must recognize that professional development programs change not only the individual but also the organization. If professional development is seen only as an individual process, it becomes an uncomfortable personal endeavor for teachers. Principals and teachers are usually reluctant to adopt new procedures or practices under such circumstances, unless they feel sure they can work with them successfully (Guskey, 1994). Like many professionals, teachers and principals do not feel comfortable trying something new because of the risk of failure and the damage failure brings to professional pride and reputation. However, Elmore (1997) cautions that a focus exclusively on organizational change is also ineffective. He states that there is scant evidence that structural change leads to change in how teachers teach, what they teach, and how students learn. Guskey (1994) states that viewing change as both "an individual and organizational process that must be adapted to the contextual characteristics of each school system will help clarify the steps necessary for success in professional development." (pg.5)

Professional development literature also points to problems when the magnitude of change sought from individuals or from school organizations is too great. Joyce, Wolfe, and Calhoun (1993), noted that the magnitude of change teachers are asked to make inversely related to their likelihood of making it because educational professionals at all levels generally oppose radical alterations in their present procedures. Successful professional development programs are those that move in a gradual and incremental fashion with the effort made to demonstrate how new practices can be implemented in ways that are not excessively disruptive and do not require too much time (Guskey, 1994). McLaughin (1990) argues that professional development efforts must not be so ambitious that they require too much too soon from those responsible for implementation, but does need to be sufficient in scope to challenge the interest of those programs it is designed to reach. Smylie and Conyers, (1991) argue that to enhance the effectiveness of individual teachers, professional development must not be conceived of as filling gaps, plugging holes, and correcting wrongs. Instead, a teacher's knowledge, experiences, and skills must be viewed as assets and the base upon which additional competencies are built.

The re-conceptualization of teaching drives a need for changes in professional development. Professional development must help teachers move away from thinking of teaching as transferring knowledge to students. Instead professional development activities should help teachers learn to engage their students in inquiry. Roth (1995) defines inquiry: "open investigations where learning can take place in contexts constituted by ill defined problems" (p.75). Roth goes on to describe inquiry as a process in which students engage themselves and each other in problem solving situations by conducting investigations that have arisen out of learner-framed problems. Roth argues that open-ended investigations within realistic, meaningful contexts allow students to explore and generate many new possibilities while also providing intrinsic motivation for learning. Constructivists believe that when professional development for teachers requires them to frame their own problems, link learning to prior knowledge, and work on collaborative goals by sharing and discussing, teachers will be intrinsically motivated to advance their skills. Intrinsic motivation is the key to developing a culture of learning and growing. It is only through development of such a culture that learners will become experts in any field of study.

When teaching is viewed through the lenses of constructivist theory, it must be seen as a complex dynamic, interactive, intellectual activity, rather than a pre-planned, routine set of tasks. If teachers are to meet the individual needs of their children, their practice cannot be entirely prescribed or standardized. In other words, teachers cannot be regarded as simply implements of a curriculum designed by others. They must be given the responsibility to plan for the students in their class, and they must have a voice in decision-making. Constructivist learning theory combined with growing demands for education reform also requires that teaching be viewed as a collective, rather than an individual activity. Teachers now have to work and learn together to be successful in their classrooms (Sykes, 1997; Smylie and Conyers, 1991).

Smylie and Conyers support the conclusion that for teachers to use inquiry with their students they must engage in inquiry based learning. These authors point to a need for teachers to inquire into problems with the support of other educators. Therefore, professional development should include “collaborative learning activities in which teachers work together to identify and define problems, study those problems, and craft or access solutions” (Smylie and Conyers, 1991, p.14).

The highly complex nature of the teaching and learning process and the diverse contexts into which they are embedded suggest that there will never be one right way of structuring professional development programs. Although there might be some general principals that apply, professional development programs must be adapted to the unique characteristics of each school setting (Guskey, 1994). In other words, professional development programs must be shaped by the school settings into which they are integrated. McLaughlin (1990), and Talbert, McLaughlin and Rowan (1993) argue that professional development should be integrated in ways that best suit regional, organizational, and individual contexts. Some contexts demand practitioner specific activities (Guskey, 1994); while other contexts demand a more systematic or organizational focus (Sarason, 1990). Guskey cautions that some contexts require professional development to take a gradual approach to change, while other contexts require immediate and drastic alterations at all levels of the organization (Guskey, 1994).

Because of the highly significant influence of context, it has been difficult for researchers to identify any specific set of elements that result in effective professional development programs. However, in an effort to assist schools with the development of effective programs, a number of researchers and professional organizations have published guidelines. Glickman (1998) reports that a considerable base exists for successful staff development and describes characteristics of successful programs as follows:

- Involvement of administrators and supervisors in planning and delivering the program.
- Differential training experiences for different teachers

- Placement of the teacher in an active role (generating materials, ideas, and behaviors.
- Emphasis on demonstrations, supervised trials and feedback, teacher sharing and mutual assistance.
- Linkage of activities to the general staff development program.
- Teacher choice of goals and activities.
- Teacher self-initiated and self-directed training activities.

Bull and Buechler (1996) insist that effective professional development is school based and collaborative, that it uses coaching and other follow-up procedures as well as being embedded in the daily lives of teachers and providing for continuous growth. It focuses on student learning and is evaluated on that basis. Additionally, proper setting and support are necessary conditions for effective professional development, with the three most important conditions for initiating and sustaining professional development being: capable leadership, policy and resource support, and adequate time in the school schedule.

According to Guskey and Huberman (1995), professional development has been crucial for educational improvement. The emphasis on professional development has suggested that educators were doing an inadequate job. It implied deficiencies in the knowledge and skills of educators. It further implied that efforts must be made to correct these inadequacies if educational institutions are to meet the demands of our complex society.

Guskey and Huberman further state that education was a dynamic, professional field, with constant discovery of new knowledge about teaching and learning processes. New types of expertise are required of educators, and educators must be prepared to use this new knowledge base to continually refine their teaching skills.

Professional Development in Technology

According to the Office of Technology Assistance (1995) and supported by Cuban (2001) after a decade of investments in educational hardware and software, very few of the nation's 2.8 million teachers used technology in their teaching. Helping schools to make the connection between teachers and technology may be one of the important steps to making the most of our investments in educational technology and our children's future. Helping teachers use technology effectively was an important step to assuring our investments in technology.

Educational technology research that was conducted through the years 1990 to 1998 was summarized in the 1999 Research Report on the Effectiveness of Technology in Schools. The report of research considered differences and variations in methodology and addressed areas that technology impact in education. A significant finding was that the teacher in the classroom was the essential element in the effectiveness of technology in instruction. When students were with teachers that had ten or more hours of training, there were more significant results on student achievement than with students that had teachers with less than ten hours of training in technology (SIIA, 1999).

Technology staff development should focus on the use of the technology for teaching, not the mechanics of the technology. Teachers should learn to "teach with technology, not just about technology" (CEO Forum, 1999). Additionally, technology staff development should emphasize hands-on-training, use credible instructors, provide support in the building and district level, increase access time for training, provide training on both productivity tools and integration of technology, and get teachers online (Scrogan, 1989). Hands-on training with technology is more than a gimmick; it is a necessity (OTA, 1995).

Donlevy and Donlevy (1995) believe that training for teachers should be stressed because most teachers are not comfortable with using technology. Professional development, which assists teachers in fully integrating technology into the classroom curriculum so that it supports student learning, is a challenge for school administrators and decision-makers.

A majority of teachers feel inadequately trained to use computers and other technology resources (Bitter, 2002; Brand, 1997; OTA, 1995). Even with six million computers in K-12 schools, most teachers are not prepared to use them effectively in the classroom. Schools do not only need more technology; they need teachers who know when and how to use technology and online resources (CEO Forum, 1999). If staff development is to transform the current generation of teachers, a radical change in the nature of in-service training and a major increase in the resources devoted to staff development are needed (McKenzie, 1991).

There is general agreement that about 20 to 35 percent of school district technology budgets should be spent on staff development. Lessons from implementation sites suggest that if a school district invests in technology it also needs to invest in human resources (OTA, 1995). The main reason for the failure of technology being used in classrooms as it could and should is the failure to fund staff training (McKenzie, 1998). Schools spend about 5% of technology budgets on training, while the Department of Education recommends a 30% allowance (CEO Forum, 1999). The Illinois State Board of Education intelligently requires that all technology grant projects dedicate at least 25% of the project to staff learning (McKenzie, 1995). Ronan recommends one-fourth to one-third of technology budgets should be for ongoing staff development (1999). Twenty-five percent of technology budgets should go into staff development (Siegel, 1994). Fifteen to sixty hours of technology staff development should be provided per year, with 10 to 25% of the technology budget devoted to staff development (McKenzie, 1998).

Simon states, “The full utilization of technology as a tool to enhance learning will depend largely on how skilled our teachers are in its use” (1995). “It is clear that teachers and administrators cannot ensure effective and appropriate use of technology without effective and appropriate training and education” (CEO Forum, 1999). If schools do not allocate resources for teacher training instead of buying equipment, they will not have the talent needed to teach the students to use the technology (Shirley, 1999). More technology or more use of technology will not be sufficient to assure other innovations or reforms (OTA, 1995).

Technology takes time to master. Hardware and software is complicated and constantly changing. As technology continues to change, traditional staff development activities will not be able to provide the training that is needed. Future teachers that use technology will be self-motivated learners who must have opportunities to learn within and outside the school district. Time, materials, videotapes, and software for use should be made available (Simon, 1995).

Stasz and associates (1984), state that the lack of adequately trained teachers presents a major obstacle to the effective instructional uses of computers. Further support is lent by researchers who suggest that if computers are to be integrated into the school curriculum, then teachers need to be trained in computer use (Anderson & Becker, 1998; Wright, 1999). “Buying the computer system is the beginning, not the conclusion; teachers will need specialized instruction if they are to deliver the promise of the computer revolution to the students” (Marshall, 1988). The lack of adequately trained teachers presents a major obstacle to the effective instructional uses of computers in schools. For example, a survey of all school districts in California disclosed that over sixty percent of the teachers using computers were either unprepared or inadequately prepared (Stutzman, 1991). In-service training continues to be the means of access to student and teacher use of technology. “If teachers are not willing and able to use the technology, then students will not either” (Durost, 1994). Research studies of staff development for technology implementation have shown that in-service and technical support at the school site results in a higher level of implementation (OTA, 1995).

If in-service training is to be sufficient for the integration of technology into the curriculum, teachers will need an aggregation of structured hands-on activities, guided practice, planning time, and collaboration with other teachers in the use of technology (Lumley & Bailey, 1993). The old approach of after-school technology staff development does not work for all staff members (McKenzie, 1998). The two-hour after school workshop is not for everyone. A range of approaches needs to be used to serve the diverse needs of the teachers (Stager, 1999). Evidence exists to prove that one-time or short duration training programs have little impact (OTA, 1995). Training in the details of hardware or software may be a waste of time if teachers do not understand how to use these skills in teaching their students with technology (Patterson & Fleet, 1996).

One size does not fit all. A range of approaches is needed, including mentoring, conferences, and community education (Stager, 1999). Even when letting teachers work in a team to produce a newsletter, the sessions need to be designed around inspiration and demonstration. Follow-up with the teacher occurs infrequently (Patterson & Fleet, 1996). Finding out the skill level of the teachers and what skills they need to learn is necessary to provide the training and support (Sulla, 1998).

Teachers are rarely given the opportunity to participate in staff development in regularly scheduled sessions and substitutes used to allow teachers time for training are rare or non-existent. Teachers are tired and distracted after school. Weekend sessions are not sufficiently frequent and summer sessions do not allow for immediate classroom utilization.

Characteristics of Staff Development in Technology

Researchers and educators have identified several characteristics of effective and successful staff development programs. These characteristics of staff development center on the principles of leadership, planning, funding, training, and evaluation (Bailey, 1991; Gilbert et al., 1992; Finkel, 1993); Linsner, 1986; Lumley & Bailey, 1994). Educators suggest a framework of instruction, modeling, coaching, and empowerment for the designing of effective staff development programs (Browne & Ritchie, 1991). The Office of Technology Assessment (1995) conducted a study and found that:

1. Most teachers lack suitable training to prepare them to use technology in the classroom, and some are unaware of the resources technology can offer them in carrying out many aspects of their job.
2. There's no onsite support person officially assigned to coordinate or facilitate the use of technology in most schools.

3. Teachers need hands-on learning, time to experiment, easy access to equipment, and ready access to support personnel to achieve sustained use of technology.
4. Districts are using different approaches to training teachers and implementing technology such as peer coaching, mentoring, establishment of regional resource centers and utilization of resource people.
5. Districts should plan to invest significantly in human resources if they wish to invest in technology.
6. To encourage prolonged use of technology support from administrators, parents, community and colleagues should be initiated.
7. Every school site should develop a technology plan.
8. If technology is to be an effective resource it must be integrated into the curriculum.

One of the most important components of an effective staff development program is its leadership. The school administrator should provide support and guidance for teachers in technology training and use (Bailey, 1991). The school principal is the key participant in the staff development program. The principal must be a model for the teachers by using technology on a daily basis. Promoting the use of technology as a valuable learning tool, and participating in the staff development training activities along with the teachers and other staff members is a vital role of the building principal (Bolanos, 1999; Carter, 1997). In addition, the principal must generate excitement about the new technologies, provide incentives for teachers to learn the new skills, and empower the teachers to use the technologies in ways in which they feel comfortable (Chin & Horton, 1993). Administrative leaders need to be aware that the effective use of technology by teachers determines the success of educational technology being integrated into the curriculum.

Another essential element of an effective technology staff development program is planning. The program needs to be comprehensive, open, and flexible in order to accommodate emerging technologies, and must meet individual needs and interests of participants. Planning should include sessions for the appeal of new, moderate, or expert users. In addition, the program's success depends on being individually tailored to the school district's needs and resources. In the planning stage, it is helpful to visit other school districts that have technology staff development programs in place. Additional activities could include communicating with schools that have nationally recognized technology staff development programs and talking to teachers about their expectations for using new technologies in the classroom. Teacher concerns should be addressed in planning sessions; however the foremost thing to keep in mind while planning technology staff development is not every detail of the program can be decided in advance. Flexibility is the key to planning technology staff development.

Training is an extremely important role of the technology staff development program. School district leaders are acknowledging daily that unless they invest in effective, on-gong technology training for their teachers to successfully integrate computers into the curriculum, their expenditures in hardware and software will go to waste (Shibley, 2001). Teachers must acquire technological skills that allow them to use technology in the instructional process and in professional productivity (Thomas, et. al., 1997). Meeting the needs of the teachers who will be implementing educational technology programs must be a priority (OTA, 1995). Successful use of technology in schools depends upon the skills of the teachers and other staff members. Educational technology staff development is often conceived and delivered in one seminar in one day (Harvey and Purnell, 1995). Progressively more, the widespread utilization of technology in schools requires changes in teacher training and in the professional development of teachers. Teachers and staff must learn to utilize technology effectively for teaching and learning. Successful implementation of educational technology depends upon the potential to help teachers develop the skills required to use technology effectively in the classroom.

Staff development training programs need to contain coordinated activities that appeal to the varying interests of teachers. In addition, the training should be linked to everyday experiences (Hurst, 1994). The training should include basic explanations of the concepts, demonstration of the concepts, opportunities to practice, and time for questioning (Lumley & Bailey, 1994). Leaders should encourage teachers to practice new concepts in their classrooms (Finkel, 1993).

An extremely critical piece to the puzzle of technology staff development is funding. When a technology plan does not address the funding for staff development, the extensive successful use of the hardware and software never materialize (Finkel, 1993). It requires allocation of resources for effective staff development in integrating technology into teaching (Shibley, 2001). Commitment of financial support from district and building administrators are prerequisites to effective technology staff development programs (Bailey & Lumley, 1997). States such as Florida, Texas, and California have begun requiring school districts to spend as much as thirty percent of state technology funds on teacher training in technology (Harrington-Lueker, 1996). Budget considerations should include money to pay for staff developers, release time for teachers, and support staff when school districts plan for teacher staff development (OTA, 1995).

The characteristics of staff development include the design of activities, the amount of time spent in the activities, and the kinds of follow-up to support implementation (Westbrook & Tipping, 1992). The effective technology staff development program will be designed to meet the needs of the teachers. Researchers assert that effective technology staff development programs will be linked to long-range goals and ongoing and incremental (Hinson et al., 1989).

Some traits of effective staff development programs include an active school technology staff development committee, demonstrating to staff, conducting needs assessments, using individual learning plans, utilizing technology leaders in buildings, offering on-site learning opportunities, providing access to off-site learning opportunities, coordinating necessary planning time for teachers with like interests, sharing success stories among staff members, and reevaluating the technology staff development program (Bray, 1999).

Mandates and incentives are found in many successful technology staff development programs. Stipends and in-service credits are examples of incentives that are used. Mandating that teachers use software or reqiring them to earn credits to keep their jobs is done in successful programs (Southern Technology Council, 1997). If teachers are to feel good about taking their time to learn new technology skills, they must be provided incentives and recognition rather than roadblocks (Kinnaman, 1990). Encourage teachers to present at conferences or lead workshops, support teachers attending conferences, provide progressive teachers additional access to hardware and software, allow teachers to earn extra computers for their classrooms, and provide software and manuals that they receive training for (Kinnaman, 1990).

According to Joyce and Showers (1983), the challenge of transfer is the critical issue for all types of staff development, not just in the area of technology. They claim that few teachers who gain skill with a new instructional tool will actually transfer that skill into practice. To convert knowing into doing requires eight strategies: (1) give them the big picture, why and how it works; (2) make it personally meaningful to the participants and have them discuss how they can use it in their own classrooms; (3) arrange for observations so that the teacher can see this skill being used to authenticate learning; (4) provide opportunities to practice the skill as soon as possible after being introduced to it and learning about it; (5) provide in-class practice time; (6) encourage mentoring or peer coaching; (7) perform follow up sessions and discuss how the skills have been implemented in the classroom; and (8) allow time for transfer to take place.

Just showing teachers new ways to do things is not sufficient. The technology staff must provide support over several years to see the skills become part of daily practice (Joyce & Showers, 1983). McKenzie (1998) suggests several ways to support transfer of learned skills into the classroom. These include: (1) support groups that get together to discuss successes, problems, and exchange ideas; (2) peer coaching, where there is someone else in the building to go to when needed; (3) study groups where the participants get together to learn a new skill or concept; (4) development of reflective and inventive practices, asking questions such as: how can I use this or what does this have to offer my students rather than concentrating on purely skill development; and (5) piggy-backing on staff development initiatives.

The successful shift of learned skills to the classroom should be the objective of technology staff development activities (Hinson et al., 1989). Technology has the ability to be a powerful tool in helping teachers with the diversified aspects of their job (OTA, 1995). Teachers who use technology report that it can be used to help them to individualize instruction. Students can work at drill and practice exercises, lesson enrichment, and remediation until they have mastered the objectives (Pisapia & Perlman, 1992). As teachers learn how to use technology they will transfer the skills on to the students. The process is as significant as the product in using technology (Means et al., 1993). Student use of technology facilitates the development of valuable skills in finding, evaluating, organizing, and communication of many forms of information (OTA, 1995).

Schools are increasingly realizing that good support is not just technical expertise. The support professional should be knowledgeable about technical issues and teaching methods, curriculum, students, and instructional design (OTA, 1995). Schools need to invest in someone with experience in both technology and curriculum (Kinnaman, 1990).

More teachers use technology when they see how it helps them become more productive in job performance (Kerr, 1991). Technology can provide teachers with access to new ideas, support from outside the district, and enrichment activities for classroom instruction (OTA, 1995).

Professional Development and Adult Learners

Effective professional development programs should take into account the nature of adult learners and the need for making learning accessible to them. Smith (1982) proposes six optimum conditions for learning and that adults learn best when these six conditions are met:

1. Adults feel the need to learn and have input into what, why and how they will learn.
2. Learning's content and processes bear a perceived and meaningful relationship to experience, and experience is effectively utilized as a resource for learning.
3. What is to be learned relates optimally, to the individual's developmental changes and life tasks.
4. The amount of autonomy exercised by the learner is congruent with that required by the mode or method of teaching utilized.
5. Adults learn in a climate that minimizes anxiety and encourages freedom to experiment.
6. Adults learning styles are taken into account.

Adult learners have specific needs and special strengths and are themselves a valuable resource for each other in the learning process and adult learning differs from training models that have dominated technology related professional development for the past twenty years. Adult learning usually involves the learner in activities that match the person's preferences, interests, needs, style, and developmental readiness. The learner makes choices from a rich and varied range of learning experiences and possibilities, but must take responsibility for planning, acting, and growing.

If school cultures are to support adult learning, professional development needs to be viewed as a personal journey of growth and discovery that engages the learner on a daily basis. Emphasis on self-selection, transformation, and experience is also included in adult learning models. An adult learns by doing and exploring, by trying and failing, by changing and adapting strategies. An adult learns by teaming, by sharing failures and successes, and by mastering activities and techniques that work.

Adult learning is primarily concerned with creating the conditions, as well as the inclination and the competencies to transfer new tools and skills into daily practice. While training usually occurs outside of context and frequently ignores issues of transfer, adult learning is all about melding practice with context.

Concerns Theory

Models have been developed to recognize and assess concerns in education from the teacher’s perspective. The concerns theory provides change facilitators with ways to assess and list the different perceptions teachers can have. With this diagnostic information accessible, it is possible to be more effective in adjusting interventions so that they are related to teachers’ perceptions. Therefore, the teachers receive timely information and assistance that they perceive as being more relevant and their use of the innovation advances (Hall & Hord, 1987).

Fuller (1969) studied the developing concerns of small groups of prospective teachers and reexamined the findings of other researchers in the hope of discovering what teachers are concerned about and whether their concerns can be conceptualized in some useful way. Fuller defined "concerns" to include such emotions as motivations, perceptions, attitudes, feelings, and mental gymnastics indulged in by a person when confronted with a new process or product. Fuller felt students are more motivated to learn material that is of interest to them and disinclined to learn that which is considered less relevant. Of 100 education students questioned in a pilot study, ninety-seven students made disparaging remarks about certain education classes during individual interviews. Two explanations were presented to account for the difference in perceptions about the class. One possibility is that the class was worthless. A second possibility is that many of the students who enter education programs are not prepared to benefit from classes as they are now taught, and the structure of the traditional teacher education program may not be the most appropriate model for educating student teachers (Fuller, 1969).

Another study conducted by Fuller explored what teachers are concerned about and to determine if the concerns could be conceptualized into a helpful framework. The study used twenty-nine different student teachers, which were supervised by four different supervisors. The student teachers were asked to write an answer to, "What are you concerned about now?" Responses were classified into three categories: 1) Where do I stand ?

How adequate am I? How do others think I am doing? 2) Problem behavior of pupils and class control. Why do they do that? 3) Are pupils learning? How does what I do affect student gain? Results indicated that expressed concerns could be classified mainly as concerns of self-adequacy. These concerns could be clustered into four unique categories: concerns unrelated to teaching, concerns about self in relation to teaching, concerns about the task of teaching, and impact concerns. Instead of using time consuming personal interviews, Fuller (1972) developed the Teachers Concern Statement (TCS), an open-ended assessment to determine six concern categories based on the question, "When you think about your teaching, what are you concerned about?" Further research by Fuller resulted in the development of the Teacher Concern Checklist (TCCL) and a Teacher Concerns Questionnaire (TCQ) to assess self, task and impact concerns.

Hall, Wallace, and Dosset (1973), researchers at the University of Texas at Austin realized that teachers and professors who were experiencing change seemed to have the same type of concerns that Fuller had identified. The Concerns Based Adoption Model (CBAM) was developed and included two key components that describe the acceptance and implementation of change from the perspective of the individual. Assumptions of the change process for this model include: 1) change is a process, not an event, and it takes time to institute change; 2) change is accomplished by individuals, and institutions will not change until their members change; and 3) the change process is an extremely personal experience, and how it is perceived by the individual will strongly influence the outcome (Hall & Hord, 1987). The CBAM studies also suggested that similar steps for implementation should mirror the steps employed in developing an innovation. This research established the concept that the amount of concerns will differ at stages along a continuum of implementation (Hall & Hord, 1987).

Concerns Based Adoption Model

The Concerns-Based Adoption Model (Hall & Hord, 1987) became a model for change, which is used by staff developers in planning for educational change. The CBAM involves three diagnostic dimensions that permit description and documentation of the change process from the perspective of the classroom and the school as well. Studies about change efforts have been documented from the initial conceptualization of the project through implementation and institutionalization phases (Hall, et al. 1991). It is also emphasized that there must be an understanding on how teachers within schools become confident and competent in using educational innovations. It has been argued from the concerns-based perspective that a school has not changed until the individuals within the school has changed, and that change is done on an individual basis (Hall, et al. 1991).

Concerns have a direct effect on performance and lower level concerns must be alleviated before higher-level concerns can emerge (Hall & Loucks, 1978). CBAM addresses all of these assumptions: the individual's concerns about the innovation, the specific manner in which the innovation is used, and the adaptation of the innovation to the individual. The four main components of CBAM are the Stages of Concern, Levels of Use, Innovation Configurations and Intervention Taxonomy.

The Stages of Concern (SOC) about an innovation examines how people feel about the innovation. There are seven distinct stages of concern that an individual is likely to encounter as they move through the change process:

0. <u>Awareness</u> - little concern or involvement with the innovation.
1. <u>Information</u> - a general desire to know more about the innovation.
2. <u>Personal</u> - concern about how the innovation will affect self.
3. <u>Management</u> - concern about time management.
4. <u>Consequence</u> - concern about how the change will affect the students.
5. <u>Collaboration</u> - concern about cooperating and coordinating the change with others to improve the outcomes.
6. <u>Refocusing</u> - concern about finding new ways to make use of the innovation

The Stages of Concern about an Innovation Questionnaire was developed to provide a quantitative measure of intensity of seven dimensions of concern (Hall et. al., 1979). The instrument is a 35-item Likert-scale that measures the levels of intensity of concerns for an innovation. Both teachers in common education and higher education collaborated in developing the instrument. As the CBAM research continued over time, investigations were conducted which looked intensely at the concept of the innovation and the style of change facilitators in conditions that support effective implementations, and in a systemic nature of change process (Hall, 1979; Hall & Loucks, 1978).

In 1989, John Martin conducted a study to assess the Stages of Concern of teachers from eight schools in Florida to determine their attitudes toward the use of computers in the educational process (Martin, 1989). One hundred seventy-five questionnaires were collected and evaluated in determining the conclusions that teachers have different attitudes toward computers and that teacher concerns are developmental and require interventions for each stage of concern. Therefore, teacher’s attitudes should be assessed before and during the implementation of computers.

Stages of Concern in respect to technology integration continued to hold the interest of researchers with the continued prevalence of technology in education. One particular study by Nancy Atkins (1997) investigated for significant differences among teachers concerning their Stages of Concern about computers, their knowledge and actual use of technology and instruction, and the level of technology available at their schools.

Atkins’ research problem was based on the need to determine appropriate staff development opportunities for teachers in order for them to use computers to improve teaching and learning. The study of one hundred fifty-five middle school teachers from three different schools concluded that there were significant relationships between teacher concerns and teacher use of technology. Atkins additionally hoped to develop an instrument in which teachers could be assessed about their concerns of using technology throughout the staff development process and introduced the Teaching with Technology Survey (Atkins, Frink, & Viersen, 1995). Although the study by Atkins focused on teacher concerns with significant findings, the researcher adequately recognized the need for further investigation with a more diverse and larger population.

The Stages of Concern profiles can be used to show change in users of innovations over time. Non-users of an innovation are high in intensity on Stages 0, 1, and 2. New and inexperienced users show a sharp elevation of management concerns. Experienced users are more likely to have reduced information, personal and management concerns; and, if the appropriate support and facilitative interventions have been taken, consequence and collaboration concerns may start to prevail. Finally, refocusing users, by virtue of experience, show very low Stage 0 -2 concerns, low management concerns, and intense Stage 6 concerns. Intense refocusing concerns are the domain of only about six percent of the database population. (Hall & Hord, 1987).

A change of emphasis, from how change is perceived by the individual teacher to the behavior and skills of teachers, is made when moving from the Stages of Concern to the Levels of Use (LoU). The Levels of Use focuses on the teacher's behavior and skills with respect to the innovation. In practice concerns and behaviors seem closely related and may even be inseparable. The Levels of Use section of the CBAM model identifies how the user is implementing the innovation. Levels of Use focus on the behaviors that are or are not taking place in relation to the innovation. These descriptors range from nonuse through making modifications to the innovation.

Levels of Use recognize three kinds of nonusers. When there is no behavior whatsoever with the innovation, the person is at LoU 0, nonuse. At this level, the innovation has no place in the teacher's life, and no action is being taken with respect to it. When the teacher begins showing interest in the innovation and exhibiting the behaviors of looking for information about it, he/she is at LoU 1, orientation. This behavior may take the form of attending a workshop to learn about the innovation, discussing it with colleagues, visiting another school that is already using it, or reading about it.

Level of Use 2, preparation, has been reached when the person indicates an intention to use the innovation, a concrete decision has been made and a specified time has been set to begin. Behaviors at this level would include stocking the shelves, ordering books and materials and getting equipment ready, all practical actions directly related to actual use of the innovation. Both levels 1 and 2 presuppose some degree of involvement with the innovation, and level 2 is a decision to pursue or permit that involvement.

Levels of Use recognize five types of users. The individuals that begin to use an innovation are at LoU 3, mechanical use. The person at this level is inexperienced and still experimenting with the innovation, trying to make it work. LoU 3 persons are preoccupied with organizational and logistical considerations, such as getting organized, locating materials, making plans and timetables and setting up the classroom. The demands of mastering the new program, introducing it to students and still maintaining order tend to absorb a great deal of time and energy, which contributes to a generally poor coordinated and limited use of the innovation. The person lacks the experience and the practical and emotional resources to look much beyond the next day's preparations.

When teachers become stabilized in the innovation, they reach LoU 4A, routine. The practical dilemmas of working with the innovation have been resolved and a comfortable plateau has been reached. Rather than seeking to make changes, the Level 4a user is breathing a sigh of relief and using the innovation. Beyond Level 4a, the user actively seeks ways to change it that will improve student outcomes. With Level 4B, refinement, there are changes that may be targeted at a particular subgroup of students, fast or slow learners, or at the group as a whole. Changes at this level may affect the program itself or the way it is delivered, used or managed. The teachers, instead of making changes to help themselves use the program are experimenting with ways to help students use it more fruitfully. Changes at this level are based on a viable level of understanding of the innovation and imply some assessment, whether formal or informal.

When two or more teachers begin collaborating on a program or project, they are at LoU 5, integration. This level is higher than 4b because it is a cooperative venture. It can take the form of teaching as a team or some less evident method of mutual support. It is not integration if the collaboration is primarily user-oriented such as working together for the purpose of saving time.

Teachers who are restlessly creative may eventually reach LoU 6, renewal. When teachers are at this level the original innovation has already been outgrown. This teacher will make some fundamental alterations of the innovation or introduce a cluster of smaller changes that collectively accomplish the same end (Hord, 1987).

The CBAM model also contains the Innovations Configurations (IC) concept. The SoC and LoU are primarily concerned with the user of the innovation. The teacher is the center of attention, and the innovation is peripheral. Within IC, the innovation itself is the focus of attention, and the teacher's behavior is seen primarily as a means of gauging exactly what the innovation is in the context of that teacher's use of it. In this component questions are asked such as what would you observe when the innovation is operational? What would teachers and others be doing? What are the critical components of the innovation? Based on the responses to these questions, a preliminary list of components and their variations can be assembled.

The fourth component of the CBAM is the Intervention Taxonomy. Understanding the interventions that change facilitators make is emphasized in this component. The actions and events that influence teacher's use of an innovation are the basis for the change facilitator's efforts.

Too often, innovations are presented to practitioners on a somewhat abstract basis about the philosophical assumptions on which they are based or the exalted goals they are expected to accomplish. This kind of presentation ignores or overlooks precisely what teachers most want to know, that is, what will we be doing in the classroom? How will the innovation look in practice? How will it affect the current program? (Hord, 1987).

Summary

The purpose of this study was to acquire insight into the types and characteristics of teacher concerns with integration of technology into the classroom environment, teacher knowledge and use of technology in classroom instruction, and to examine any differences related to the demographic variables of age, gender, grade level teaching, subject teaching assignment, teaching experience, use of technology experience and level of education in relation to teacher concerns and teacher technology use. A review of the literature relating to the interpretation and integration of technology in K-12 schools was presented. Beginning with an overview of technology and current issues in implementing technology into the curriculum, the review them addressed the supporting literature regarding professional development for teachers. The review of Concerns Theory was provided to enhance the reader's understanding of theoretical framework of the study. The Concerns-Based Adoption Model was discussed in detail.

CHAPTER THREE

Research Design

Introduction

The purpose of this research study was twofold; 1) to determine if there were significant relationships among teachers with regards to their stages of concern about instructional technology and relation to the technology integration into classroom instruction; 2) to examine significant relationships that might exist on the measures that relate to eight demographic variables (i.e. chronological age, grade level teaching, subject area teaching, school size, years teaching experience, highest degree earned, teacher technology experience, and computer access at school) and teacher concerns with integrating technology into their classroom. If it can be established that a relationship exists between these factors and the differences among these factors, this research procedure could be used by school districts for planning technology staff development.

Further, the study collected data to examine the impact technology has on classroom teachers. As schools continue to use technology as a tool for delivering instruction to students, it is imperative that research be conducted to help develop effective policy.

This study will help school district stakeholders to add meaning to existing information and to generalize the process of making decisions to other change events. As funding increases and research is more readily available, staff development and training opportunities can be adapted so that individual teachers as well as school districts will have their needs addressed during a time when change has become a living part of American schools.

This chapter describes the design and methodology utilized to address the research questions. The chapter is divided into sections addressing information concerning: research design; target population; subjects and sampling procedure; assessment instructions; dependent, independent, and control variables; research questions; hypothesis; procedure; and data analysis.

Research Design

This researcher pursued Atkins' (1997) recommendation for further research by exploring teacher concerns about computer and technology, and teacher knowledge and actual use of technology in instruction using the Stages of Concern Questionnaire (Hall, 1979) and the Teacher Survey of Technology Use (Bober, Harrison, & Lynch, 2001), a survey used with the federal Technology Innovation Challenge Grant (TICG) entitled ACT *NOW!* The two survey instruments were utilized along with the additional examination of demographic variables of age, years teaching, years using technology, subject area, years teaching experience, and highest degree earned. Where Atkins study focused on a population of middle school teachers in three middle schools, this study has used the survey instruments on a different population consisting of all teachers in fifty school districts located in the five southeast counties of Oklahoma.

Atkins' study was conducted using 155 middle school teachers in North Carolina. This study was conducted in Southeast Oklahoma using a population that included teachers in elementary, middle school, and high school. This study also examined teachers' use of technology based on additional demographic information. This study was quantitative, utilizing descriptive and correlation research designs supplemented by mean testing procedures.

Population and Sample

The target population for this study consisted of all regular certified education teachers in fifty (50) school systems of a five-county area in southeast Oklahoma, consisting of Choctaw, Latimer, Leflore, McCurtain and Pushmataha counties. These districts employed 2027 classroom teachers at the time the data were collected. The school systems serve a variety of students from several ethnic populations. The population sample was chosen for this study because the intent of this study was to examine the concerns of teachers about use of technology in their classroom instruction. Since none of the identified counties have metropolitan areas the target population consisted of teachers in elementary, mid-level, and secondary schools in only rural settings. The geographical area in which the study was conducted represents 3% of the State of Oklahoma's total population with an average of 18.4 persons per square mile. Additionally, the schools in which the teachers are employed represent the largest employer in the community. The target population represented only the teachers working in the five southeast counties of Oklahoma. Of the 50 school districts in the five (5) counties, 31 school districts were independent schools and 29 were dependent.

Demographic Characteristics of Selected Schools Systems

The selected school districts for this study participate in the Oklahoma State Department of Education's Technology Plan, which requires each school district to address technology as it relates to hardware, connectivity, and professional development. To fulfill concepts of the technology plans the districts were required to spend a certain percentage of state technology funds to provide training for teachers. Technology-training workshops have been established that focus on three levels of professional development; basic, intermediate, and advanced. The state department of education conducts the technology workshops both in-house and on-site. Oklahoma does not require teachers to take technology courses to be recertified.

The total population of the five southeast counties was 120,212, which was 3.5% of the state's total population. The smallest populated county in the study consists of 10,692 persons and the largest populated county in the study consists of 48,109 persons. Twenty-five percent of the persons living in the counties were children of school age.

The ethnic background of the counties' populations was predominately white (74.1% of all persons living in the counties). Native Americans make up the greater part of persons from ethnic minorities. Native Americans comprise 12.9 % of the counties' populations compared to the state average of 7.9%. African American and Black persons living in the five southeast counties consist of 4.8% of the counties' population compared to the states average of 7.6%.

The school districts were located in counties with no metropolitan areas. The average drive time to work for persons living in the counties was 24.2 minutes compared to the state averaged of 21.7 minutes. Twenty-four point one percent of the persons employed work in education, health and social sciences with the majority of the remainder working primarily in the farming and petroleum industries.

The only post-secondary institutions in the counties were two state colleges and one higher-education learning center offering courses to the 70.3% of high school graduates. Eleven point three percent of the county citizens hold a bachelor degree or higher. Twenty-three thousand two hundred sixty eight residents have dropped out of school and have not obtained a diploma or GED. At a 13 to 1 student to teacher ratio there were 25,897 students enrolled in the fifty schools of the five counties in grades early-childhood through twelve with 2,027 certified teachers employed in the school districts.

Fifty- four percent of the third graders participating in state testing scored a satisfactory or above in reading but only 44% of the same students scored satisfactory or above in math. Sixty - seven percent, seventy-eight percent, seventy percent, and eighty percent of fifth-grade students scored satisfactory or above in math, reading, writing and science respectively with eighth-graders scoring 65%, 78%, 39% and 83%. Of the high school students taking the ACT, an average score of 19.0 was obtained.

Over two-thirds of the students attending the schools receive free or reduced lunches. The median per-capita income for the counties was $13,086 with an unemployment rate of 7.1% and with 22.8% of all persons living below poverty levels. Although 74.3 % of the houses were occupied by the owners, the median value of those houses in $45,400 compared to the state average median value of $70,700.

All school districts in the study were connected to the World Wide Web. Each district has filed five-year technology plans with the Oklahoma State Department of Education outlining their district's goals and objectives in relation to technology integration.

Subjects and Sampling Procedure

The entire target population was utilized for the study; therefore no sampling will be necessary. Researchers suggest using telephone surveys for large populations of 800-1500 (Rea & Parker, 1997) and Schaefer & Dillman (1998) states that generally more surveys were done by mail than any other type of survey and that the response rate obtained by traditional mail has yet to be developed. However, the researcher chose to use a web-based survey using e-mail for this study. The utilization of the World Wide Web allowed for immediate and timely responses and the approaches strategized by Schaefer & Dillman (1998) were incorporated to facilitate an effective response rate.

This researcher met with representatives from the selected school system's central office to solicit collaboration in encouraging certified staff to access this study's survey site and to ask them to consider completing the surveys used in this study. Additional contacts were made with central office staff as was determined necessary to insure an adequate response rate to the survey questions.

Assessment Instruments

Two survey instruments were used to measure the dependent variables in this research study: The Stages of Concerns Questionnaire (SoCQ) (Hall et. al., 1979) and the Teacher Survey of Technology Use (TSTU) (Bober, Harrison, & Lynch, 2001).

The Stages of Concern Questionnaire (Appendix A) was used to collect data associated with attitudes and skills of technology utilization and integration. The SoCQ was devised to measure the Concern-Based Adoption Model (C-BAM) seven stages of concern: (a) 0-Awareness, (b) 1-Informational, (c) 2-Personal, (d) 3-Management, (e) 4-Consequence, (f) 5-Collaboration, and (g) 6-Refocusing. Thirty-five items measuring the seven stages were rated on a seven-point Likert-type scale to measure teacher's attitudes about educational technology staff development. Five items in the Stages of Concern Questionnaire were targeted for each of the seven Stages of Concern. Respondents will indicate the degree to which each concern was true of them for each of the thirty-five statements on a zero (0) to seven (7) scale. Zeros indicate the statement was not applicable with high numbers indicating a high degree of concern for the statement. A raw score for each stage was calculated by summing the responses to the five statements on that scale. Upon obtaining the seven raw scale scores they were converted to percentile scores for interpretation. The data generated from the Stages of Concern Questionnaire provided the information to answer questions one, five, six, seven, and eight of the research study.

The Teacher Survey of Technology Use (Bober, Harrison, & Lynch, 2001) was developed to assess six areas that include teacher's skill levels, skill development, technology proficiency, classroom practices, technology beliefs and student performance expectations. The survey was designed with 90 multiple choice format questions related to the six objectives to determine to what extent the technological resources available to the classroom teacher were being utilized. The data generated from the Teacher Survey of Technology Use was used to answer questions two, three, four, five, six, seven, nine, ten, and eleven of the research study. An explanation of the survey was also embedded within the survey document (Appendix A).

Procedures for Data Collection

Upon receiving permission by the University of Oklahoma Institutional Review Board to conduct research for this study, the Stages of Concern Questionnaire developed by Gene Hall and associates at the University of Texas at Austin and the Teacher Survey of Technology Use developed by Marcie Bober at San Diego State University was posted to the World Wide

Web. Teachers were notified of the Internet address for access to the survey, and were given the option of completing a paper survey.

The data from the survey were collected from specific sections of the instrument that were used to provide information to answer the research questions. These sections included Demographics, Stages of Concern Questionnaire, Technology Skill and Proficiency, Classroom Practices, and Perspectives on Teaching. Respondents were given one week to reply to the questionnaire before any follow-up contacts were made. No more than 3 contacts to encourage the teacher response rate were made

Research Questions and Methodology

Question 1

To what extent are Southeast Oklahoma teachers concerned about various elements of the introduction of computer technology in their classrooms?

The first research question was addressed through descriptive statistical analysis based on the Stages of Concern Questionnaire (S0CQ). The mean and standard deviation scores were based on the SoCQ using a seven point Likert scale that measures agreement with thirty-five statements. Five items in the questionnaire were targeted for each of the seven Stages of Concern. Respondents will indicate the degree to which each concern was true of them by marking a number to each statement on the zero (0) to seven (7) scale.

High numbers reported on the SoC indicate a high degree of concern for the respondent. The raw score for each scale were the sum of the responses to the five statements on that scale. Once the seven raw scale scores were obtained, they were converted to percentile scores for interpretation. The percentiles were obtained through a comparison of the individual results with the result of the norm reference group. The norm reference group for the SoCQ consists of 646 teachers ranging from elementary to higher education institutions who were involved in implementing various innovations (Hall, et. al; 1979).

Once the raw scores were converted into percentile scores, they were arranged by grade level to indicate individual Stages of Concerns. The peak score for each respondent were annotated.

Question 2

How do teachers in Southeast Oklahoma report their instructional practices in each of the following areas?

- Computer application skills
- Utilization of educational software
- Proficiency in various technology related activities
- Impact of technology on instructional practices

Mean scores, standard deviation, and rank were also calculated for each of the ten applications listed on the ACT Now! Teacher Survey. The mean scores were based on the survey's Likert scale that listed the educational practices for technology application, software utilization, and proficiency with using technology and technological impact on instruction in the classroom.

Demographic tables were constructed for comparison purposes and to provide an overall view of teacher skill with technology applications in the classroom. Tables were constructed to help identify the teachers' perceived skill in using technology.

Question 3

What are Southeast Okalahoma teachers' beliefs about?

- Developing their technology skills?
- The use of classroom technology?
- How technology can impact teaching and learning?

Mean scores, standard deviation, and rank were calculated for each of the areas identified on the Teacher Technology Use survey based on Likert scales. Items were designed to ascertain the importance of each area to the teachers' belief about developing technology skills, using technology in the classroom and the impact of technology in the classroom upon instructional practices. To collect data in teacher beliefs with technology skill development for the four sections of technology use, a five-point Likert scale was utilized. A four-point Likert scale was used to gather the responses to determine teachers' perception about his/her technology proficiency and impact upon instructional practices.

Question 4

Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and instructional practices in the following areas?

- Computer application skills
- Utilization of educational software
- Proficiency in various technology related activities
- Impact of technology on instructional practices

Composite scores from the SoCQ were correlated with scores from the various sections of the ACT Now! Teacher Survey. A correlation matrix was constructed to show correlation and levels of significance of the variables, with the focus on the relationship between level of concern and the other four variables measuring instructional practices.

Question 5

Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and teacher beliefs about?

- Developing their technology skills?
- The use of classroom technology?
- How technology can impact teaching and learning?

Composite scores from the SoCQ were correlated with scores from the various sections of the ACT Now! Teacher Survey. A correlation matrix was constructed to show correlation and levels of significance of the four variables, with the focus on the relationship between level of concern and the other three variables.

Question 6

Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and the following demographic characteristics of these teachers?

- Age
- Years teaching
- Years using instructional technology

Participants were asked to respond to these demographic inquiries as part of the survey, and each was coded as a continuous variable. Composite scores from the SoCQwere correlated with the three demographic variables. A correlation matrix was constructed to show correlation and levels of significance of the four variables, with the focus on the relationship between level of concern and the three demographic variables.

Question 7

Are there statistically significant differences between teacher concerns with integrating technology into classroom instruction and teachers grouped according to the following demographic characteristics?

- Highest degree earned
- School size
- Grade level assignment
- Subject area assignment

Participants were asked to respond to these demographic inquiries as part of the survey, and each was coded as a categorical variable. Four analyses of variances were conducted, each using the composite score from the SoCQ as the dependent variable. Each analysis of variance included an independent variable, to include: Highest Degree Earned, with three levels (Bachelor, Masters, or Doctorate); School Size, with three levels (Less than 500 students, 500 to 1,000 students, and more than 1,000 students); Grade Level Assignment, with four levels (Early Childhood, Elementary 3-6, Middle School/Junior High, and High School) and Subject Area Assignment, with seven levels (Elementary, Math, Science, Social Studies, Language Arts, Fine Arts, and other).

Question 8

Are there statistically significant relationships between Southeast Oklahoma teacher instructional practices using technology and the following demographic characteristics of these teachers?

Demographic characteristics:

- Age
- Years teaching
- Years using instructional technology

Instructional practices:

- Computer application skills
- Utilization of educational software
- Proficiency in various technology related activities
- Impact of technology on instructional practices

Participants were asked to respond to the demographic inquiries as part of the survey, and each was coded as a continuous variable. Scores from the various sections of the ACT Now! Teacher Survey were correlated with the three demographic variables. A correlation matrix was constructed to show correlation and levels of significance of the seven variables, with the focus on the relationship between the three demographic variables and the four instructional practices variables.

Question 9

Are there statistically significant differences in teacher instructional practices listed below between teachers grouped according to the following demographic characteristics?

Demographic characteristics

- Highest degree earned
- School size
- Grade level assignment
- Subject area assignment

Instructional practices:

- Computer application skills
- Utilization of educational software
- Proficiency in various technology related activities
- Impact of technology on instructional practices

Four sets of one-way analyses of variance were conducted. Each set of ANOVA included one of the instructional practices scores as the dependent variable. Four ANOVAs were conducted for each set, one for each of the independent variables (representing the four demographic characteristics).

Question 10

Are there statistically significant relationships between Southeast Oklahoma teacher instructional practices using technology and teacher instructional beliefs?

Scores from the four instructional practices sections of the ACT Now! Teacher Survey (Technology application skills, Exploitation of educational software, Proficiency in various technology related activities, and Impact of technology on instructional practices) were correlated with the scores from the instructional belief sections (Developing their technology skills, the use of classroom technology, and the impact of classroom technology on student performance) from the same survey. A correlation matrix was constructed to show correlation and levels of significance between the seven variables, with the focus on the relationship between the four practices variables and the three belief variables.

Question 11

Are there statistically significant relationships between Southeast Oklahoma teacher instructional beliefs using technology and the following demographic characteristics?

Teacher beliefs about technologies effect on instruction:

- Developing their technology skills
- The use of classroom technology
- The impact of classroom technology on student performance

Demographic characteristics:

- Age
- Years teaching
- Years using instructional technology

Participants were asked to respond to the demographic inquiries as part of the survey, and each was coded as a continuous variable. Scores from the various sections of the ACT Now! Teacher Survey were correlated with the three demographic variables. A correlation matrix was constructed to show correlation and levels of significance of the six variables, with the focus on the relationship between the three demographic variables and the three teacher belief variables.

<u>Question 12</u>

Are there statistically significant differences between the teacher beliefs about educational technology listed below and teachers grouped according to the following demographic characteristics?

Teacher beliefs about educational technology:

- Developing their technology skills
- The use of classroom technology
- The impact of classroom technology on student performance

Demographic characteristics:

- Highest degree earned
- School size
- Grade level assignment
- Subject area assignment

Three sets of one-way analyses of variance were conducted. Each set of ANOVAs included one of the teacher belief scores as the dependent variable. Four ANOVAs were conducted for each set, one for each of the independent variables (representing the four demographic characteristics).

Limitations

The major limitation of the study was the potential that the population may not have responded to the survey via the internet. Teachers who were unfamiliar with technology may not have readily responded to answering the survey, although a hard copy was provided. The source of information used to obtain this sample may not be complete. This may affect the generalizability of the study to other school districts.

Summary

The current chapter has included an explanation of the design of the study. Included were discussions of the context and setting of the study, the assessment instruments, and the specific methods employed to answer the twelve research questions addressed in the study. Chapter 4 will include the results of these analyses.

CHAPTER FOUR

Results

Introduction

The major purpose of the study was to accurately identify teacher concerns and factors that influence their efforts to implement technology into classroom instruction. A secondary purpose served by this study was to determine teacher use of and beliefs about classroom implementation of instructional technology. The final purpose served by this study was to determine whether selected demographic characteristics were related to teacher concerns, teacher use of, and beliefs about instructional technology.

In this chapter, data generated through the survey instruments were presented and analyzed. The data analyses were explained in narrative, graphic, and tabular form, and were introduced by order of research questions. Additionally, data collected for the demographic survey questions were explicated through frequency distributions.

Response Rate

Twenty-two of fifty school district superintendents gave the researcher permission to conduct research in his/her school district. Three questionnaires were used to collect data (Appendix A). One questionnaire included the thirty-five statements about teacher concerns developed by Hall, Wallace, & Dossett (1973). The second questionnaire contained ninety (90) items across seven sections related to teacher use and beliefs of technology developed by Marcie Bober, San Diego State University (1997) and the third questionnaire was utilized to collect teacher demographic characteristics. The questionnaires were distributed to 1078 teachers of the twenty-two school districts granting permission in Southeast Oklahoma between March and June of 2004. There were 362 subjects who responded to the survey, which resulted in a 33.6% response rate.

Findings

Results for Research Question One

1. To what extent are Southeast Oklahoma teachers concerned about various elements of the introduction of computer technology in their classrooms?

Data generated from the teacher responses to the Stages of Concern Questionnaire (SoCQ) instrument were used to address this question. The Stages of Concern are developmental, and depending on circumstances, some stages are more intense than others are. The stage with the highest score is called the peak score. The peak score is the beginning focus in interpreting Stages of Concern. If there is another score within a few points of the peak score, the results are said to have multiple peaks (Hall, et. al., 1979).

Part of the questionnaire used in this study contained the thirty-five statements about teacher concerns with technology integration in classrooms. Specific questions were assigned to each of the seven stages of concern identified by Hall & associates (1979). Mean scores were calculated for each of the seven Stages of Concerns of the teachers. These mean scores are calculated using the data generated from the SoCQ using a seven-point Likert scale that measures agreement with the thirty-five statements. Five statements assigned to each concern stage are dispersed throughout the SoCQ and are designed to collect responses for each of the seven Stages of Concern. Each respondent indicated the degree to which each concern was true of him/her by marking a number to each statement on a zero (0) to seven (7) scale.

Higher numbers indicated a higher degree of concern. The raw score for each scale was the sum of the responses to the five statements assigned to that stage. Once the seven raw scale scores were obtained, they were converted to percentile scores for interpretation. The percentile scores were obtained through using the SoC Hand Scoring Device developed by Hall and associates (1979) by comparing individual results with the results of the norm reference group. The norm reference group for the SoCQ consisted of 646 teachers ranging from elementary to higher education institutions who were involved in implementing various innovations (Hall, et. al., 1979).

Once the raw scores were converted into percentile scores, they were grouped by peak score into the corresponding Stage of Concern for data analysis by each separate stage.

Stages of Concern:

0. Awareness: Little concern about or involvement with the innovation as indicated.
1. Informational: A general awareness of the innovation and interest in learning more detail about it is indicated

2. Personal: Individual is uncertain about the demands of the innovation, her/his inadequacy to meet these demands, and her/his role with the innovation.
3. Management: attention is focused on the processes and tasks of using the innovation and the best use of information and resources.
4. Consequence: Attention focuses on impact of the innovation on students in her/his immediate sphere of influence
5. Collaboration: The focus is on coordination and cooperation with others regarding use of the innovation.
6. Refocusing: The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative.

The Pearson Product-Moment Correlation Coefficient was used to determine the significance of relationships between statements within each Stage of Concern addressing the integration of technology into the classroom. Statistically significant coefficients are indicative of a high degree of relationship, which is desirable in the case of statements allocated to each Stage of Concern. The data resulting from this analysis is presented in tables in Appendix D.

All stages of the SOC had statistically significant relationships between the statements assigned to each relative stage. The stages indicating the greatest degree of significance between statements were Stage 6, Stage 4, Stage 5, and Stage 0 respectively. Stages 1 and 2 indicated a moderate degree of relationship between statements. The stage representing the lowest significance was Stage Three. The statements related to each concern stage include:

Stage 6

2. I now know of some other approaches that might work better.
9. I am concerned about revising my use of the innovation.
20. I would like to revise the innovation's instructional approach.
22. I would like to modify our use of the innovation based on the experiences of our students.
31. I would like to determine how to supplement, enhance, or replace the innovation.

Stage 4

1. I am concerned about students' attitudes toward this innovation.
11. I am concerned about how the innovation affects students.
19. I am concerned about evaluating my impact on students.
24. I would like to excite my students about their part in this approach.
32. I would like to use feedback from students to change the program.

Stage 5

5. I would like to help other faculty in their use of the innovation.
10. I would like to develop working relationships with both our faculty and outside faculty using this innovation.
18. I would like to familiarize other departments or persons with the progress of this new approach.

27. I would like to coordinate my effort with others to maximize the innovation’s effects.

29. I would like to know what other faculty are doing in this area.

Stage O

3. I don’t even know what the innovation is.

12. I am not concerned about this innovation

21. I am completely occupied with other things.

23. Although I don’t know about this innovation, I am concerned about things is the area.

30. At this time, I am not interested in learning about this innovation.

Stage 1

6. I have a very limited knowledge about the innovation.

14. I would like to discuss the possibility of using the innovation.

15. I would like to know what resources are available if we decide to adopt this innovation.

26. I would like to know what the use of the innovation would require in the immediate future.

35. I would like to know how this innovation is better that what we have now.

Stage 2

7. I would like to know the effect of reorganization on my professional status.
13. I would like to know who would make the decisions in the new system.
17. I would like to know how my teaching or administration is supposed to change.
28. I would like to have more information on time and energy commitments required by this innovation.
33. I would like to know how my role would change when I am using the innovation.

Stage 3

4. I am concerned about not having enough time to organize myself each day.
8. I am concerned about conflict between my interests and my responsibilities.
16. I am concerned about my inability to manage all the innovation requires.
25. I am concerned about time spent working with non-academic problems related to this innovation.
34. Coordination of tasks and people is taking too much of my time.

Stages of Concern Results

When working with large groups it becomes more difficult to analyze each individual respondent's score. Thus the recommended way of treating group data is to aggregate individual data by developing a profile that presents the mean score for each stage of the individuals in a group (Hall, et. al., 1979). Mean scores were calculated for the seven Stages of Concerns for each teacher using the data from the raw scores generated by the five statements for each stage. Once the seven raw scale scores were obtained, they were converted to percentile scores for interpretation using the Hand Scoring Device.

Analysis and computation of individual teacher raw scores into percentile scores yielded a profile of each teacher's Stage of Concern at each of the seven Stages of Concern. The compilation of all the teacher scores yielded a composite Peak and Secondary Stage of Concern profile. Table 1 depicts the group scores (N=362) by average mean. The Peak Stage of Concern was reported by the sample population as Stage 5, Collaboration. The second highest score by group mean is Stage 4, Consequence.

Table 1

Means and Standard Deviations of Stages of Concern by Percentile

	Minimum	Maximum	Mean	Std. Deviation
Stage 0 Awareness	0	99	68.10	14.62
Stage 1 Informational	0	96	62.22	14.04
Stage 2 Personal	37	98	74.31	16.24
Stage 3 Management	4	99	63.59	15.78
Stage 4 Consequence	48	99	**77.54**	13.82
Stage 5 Collaboration	43	99	**79.94**	14.34
Stage 6 Refocusing	37	99	70.31	14.14

High concerns at the Collaboration Stages of Concern are illustrative of a respondent being concerned about working with their colleagues or others who are using the innovation. A high Stage 5 score can be complex to interpret. When all other scores are low, this concern often indicates that team leaders and/or administrators spend significant amounts of time coordinating others. If other stages have high scores there may be a concern about a collaborative effort in relation to the other high stage concerns. Concerns associated with Stage 5 may also be indicative of concerns about looking for ideas from others; reflecting more a desire to learn what others are doing, rather than a specific concern for collaboration (Hall, et. al., 1979).

A high Stage 4 teacher will have concerns about the consequences of using technology as it applies to his/her students. These concerns are directed toward students in the respondent's immediate sphere of influence and relate to student outcomes including curriculum.

Another way Hall and associates (1979) recommended for presenting group data is by tallying the number of individuals that are high on each stage of concern. Data presented in this manner allows for a clear picture of the range of peak scores for each stage within the group of respondents. Table 2 presents group data for each respondent's frequency of highest and second high stage score respectively.

Table 2

Frequency of Highest and 2nd Highest Stage of Concern of Respondents

Stage	0	1	2	3	4	5	6
High n =	58	9	27	23	99	**167**	37
2nd Highest n =	48	35	**130**	25	115	79	36

With one-hundred-sixty-seven (n=167) respondents having a highest concern score for Stage 5, the highest frequency for Highest Stage of Concern mirrors the high stage as indicated by percentile mean scores in Table 1. Examining frequency of high stages of concern assists the researcher in determining if there are distinct subgroups. Although the frequency count of high stage scores is beneficial for the researcher, it should be noted that the more individuals that are aggregated, the greater the likelihood that the mean is not representative of individual scores.

Analyzing the second high stage of concern score can also help develop additional insight into the dynamics of concerns according to Hall and associates (1979). The second highest stage will often be adjacent to the highest Stage of Concern. By looking for the presence or absence of the second highest stage this pattern can be assessed.

Results for Research Question Two

2. How do teachers in Southeast Oklahoma report their instructional practices in each of the following areas?

    - Computer application skills.
    - Utilization of educational software.
    - Proficiency in various technology related activities.
    - Impact of technology on instructional practices.

Data generated by teacher responses to the Teacher Technology Use section of the survey instrument were used to address this question. The items of the questionnaire are presented in full in Appendix A.

Computer Application Skills

Teachers were asked to rate their skills with using various types of software by selecting one of four choices. The 4-point Likert scale response choices were: 1) No experience; 2) Know the basics; 3) moderately skilled; and 4) advanced. Frequencies of the responses are represented in Table 3. Word processing software and the use of educational courseware, e.g. Accelerated Reader, are indicated to be the two highest skill areas of the respondents. Most teachers had at least some skill using the World Wide Web and email. Very few teachers reported having any significant skill in multimedia, classroom management, database, spreadsheet, and graphic application software.

Table 3

Frequency of Teacher Rating for Technology Skills

	No Experience	Know the Basics	Moderately Skilled	Advanced
Word Processing	28	0	222	112
Presentation	245	61	25	31
Multimedia Authoring	334	15	12	1
Classroom Management	230	131	0	1
Database	279	82	0	1
Spreadsheet	224	136	0	2
Graphics	167	145	19	31
Courseware	73	65	94	130
Web Browsers	34	185	90	53
Email	77	249	25	11

Utilization of Educational Software

Research question two also dealt with how teachers in Southeast Oklahoma use technology software. Teachers were asked to respond to the survey by selecting: 1) Do not use; 2) use for class preparation; and 3) use instructionally with students for each of the items relating to how he/she used educational software in his/her classroom. Respondents could select both; use for class preparation and instructionally if both statements applied to them. Table 4 presents the, self-reported, level of usage of various types of software by the respondents.

Table 4

Frequency of Teacher Use of Technology in the Classroom

	Do Not Use	Class Prep	Instructionally with Students
Word Processing	20	359	83
Presentation	241	100	58
Multimedia Authoring	309	41	22
Classroom Management	210	152	24
Database	229	131	44
Spreadsheet	138	212	76
Graphics	58	274	97
Courseware	74	175	187
Web Browsers	4	301	146
Email	11	326	70

For identifying computer applications for instructional use, the respondents selected courseware software and the World Wide Web more than any other type of computer applications. All but 20 teachers self reported that he/she used word processing software for classroom preparation. Email was used also for class preparation activities. A substantial majority of the teachers reported that there was no use of multimedia authoring software for class preparations or for instructional purposes.

Proficiency in Various Technology Related Activities

In order to collect data to answer how teachers rated their proficiency in various technology related activities, eighteen questions using a five-point Likert scale were used. The respondent choices for selection were: 1) Not at all proficient; 2) somewhat proficient; 3) proficient; 4) more than most teachers; and 5) highly proficient. The results are included in Table 5. For the list of specific questions that were asked in order to generate the following data, refer to Appendix A.

Table5

Frequency of Teacher Proficiency Rating

	Not at all proficient	Somewhat proficient	Proficient	More than most teachers	Highly proficient
1.	46	55	147	58	56
2.	0	30	170	53	109
3.	1	60	160	88	53
4.	0	58	167	78	59
5.	0	21	118	137	86
6.	9	68	118	99	68
7.	33	33	141	115	40
8.	33	66	113	113	37
9.	0	9	115	119	119
10.	116	147	60	39	0
11.	48	84	131	61	38
12.	41	85	131	100	5
13.	193	116	48	1	4
14.	0	52	126	111	73
15.	32	91	88	79	72
16.	10	41	160	98	53
17.	46	84	103	118	11
18.	57	96	110	95	4

Teachers reported themselves to be proficient above their peers for figuring out how to use software programs, using technology to search for information and for using the Internet. Areas lacking teacher proficiency as reported by the respondents included using the Internet to expose students to diversity and for using technology to assist special need students.

Impact of Technology on Instructional Practices

Another purpose of this study was to determine if teacher concerns or technology experience was having a significant impact on their instructional practices. In order to collect data to answer this question, twenty-five items of the questionnaire that focused on classroom practices were asked teachers. Using a four-point Likert scale for recording their responses to the items, the respondents' choices were: 1) Isn't part of my everyday teaching practice; 2) Is generally a part of my everyday practice; 3) Is fundamentally a part of my everyday practice; and 4) Is integral to my everyday teaching practice.

The specific questions asked the teachers that apply to instructional practices are found in Appendix A. The responses with the highest frequencies to its respective questions are represented in Table 6. The complete table of response frequencies is located in Appendix D

Table 6

Frequency of Teacher Instructional Practices Rating

Question Number	Isn't really part of my everyday teaching practice	Is generally a part of my everyday practice	Is fundamentally a part of my everyday practice	Is integral to my everyday teaching practice
1	260	75	14	13
14	247	63	47	5
21	227	76	59	0
25	224	88	49	0
13	191	96	66	9
23	80	96	186	0
2	54	96	69	143

Focusing on the categories receiving more than a 50% response rate for not being a part of the teachers' everyday teaching practice, five items attracted the researcher's attention. The specific items asked were: 1)if teachers used terminology such as classify, analyze, predict, and create when framing tasks; 2) if teachers participated in technology planning at school; 3) if teachers helped plan and implement professional growth; 4) if teachers used technology to connect with students absent from school; and 5) if they contributed to research of technology's impact on education through action research.

Not one of the items in the category of 'the practice being integrally a part of the everyday teaching practice' received responses in excess of forty percent of the teacher's total responses. Combining the two categories of "the practice is fundamental to my everyday teaching practice" and "the practice is integral to my everyday teaching practice", there were response rates in excess of 50% for 11 of the 25 statements. The item receiving the highest teacher response for everyday practice was the item that the respondents regularly assessed the effectiveness of the lessons they taught with a 59% response rate.

Additional noteworthy findings included what teachers did NOT indicate. Only one teacher of all respondents reported that implementing lessons that are standard-based was integral to their everyday teaching practice. No teachers selected the implementation of collaborative or independent tasks that challenged students thinking as being integral to their everyday teaching practice.

Results for Research Question Three

3. What are Southeast Oklahoma teachers beliefs about:

- Developing their technology skills?
- Their use of classroom technology?
- How technology can support teaching and learning?

Developing Technology Skills

The survey contained ten (10) items that were used to ascertain teachers' beliefs about what is important in helping him/her develop his/her technology skills. A three-point Likert scale was used to tabulate the responses, which included the following respondent choices: 1) not important at all; 2) somewhat important; and 3) very important. Appendix A contains a list of the survey questions that were used to gather data for this question. Table 7 includes the frequency of responses for each item.

Table 7

Frequency of Developing Technology Skills

Question Number	Not important at all	Somewhat important	Very important
1	0	62	300
2	83	134	145
3	54	155	153
4	177	81	104
5	71	188	103
6	126	145	91
7	125	123	114
8	145	143	74
9	31	227	104
10	83	195	84

Of all possible responses, 83% of the respondents indicated that their personal desire and effort was very important in helping them develop their technology skills. Using online tools available on the World Wide Web was significantly important to sixty-three percent of the teachers for helping them develop skills in technology. Classes offered in the community through higher education received the highest frequency for not having any importance at all in skill development by receiving forty-nine percent of the responses.

Use of Classroom Technology

The survey contained thirteen (13) items that were used to ascertain teachers' beliefs about what technology use activities are important for students to utilize in the classroom. A four-point Likert scale was used to collect the responses. One ofthe following respondent choices was selected by each respondent: 1) not important; 2) minimally important; 3) important; and

4) extremely important. Appendix A contains a complete list of the survey questions that were used to gather data for this question. Table 8 includes the frequencies of the survey results relating to the 13 items associated with teacher beliefs about how students should use technology in the classroom.

Table 8

Frequency of Teacher Beliefs on Use of Technology in the Classroom

	Frequency	Percent
Not Important at All	182	4.0
Somewhat Important	925	19.6
Important	2208	46.9
Very Important	1391	29.5

Many respondents reported that having students work on real-life issues (Question 2; n =343, 94.8%) and to work on lessons/activities that are multidisciplinary or cross-curriculum (Question 1; n = 322, 89.0%) are important or extremely important. Creating a school or classroom web page (Question 12; n = 184, 50.9%) was reported as being the least important or not important at all. Table 9 displays the descriptive results of the items in the questionnaire used to answer question three.

Table 9

Descriptive Statistics for Teacher Beliefs about Technology Use

	Sum	Mean	Std. Deviation	Variance
Question 1	1216	3.36	.67	.452
Question 2	1222	3.38	.59	.352
Question 3	1107	3.06	.64	.404
Question 4	1050	2.90	.71	.505
Question 5	1046	2.89	.87	.763
Question 6	1166	3.22	.62	.383
Question 7	1004	2.77	.94	.885
Question 8	1096	3.03	.86	.742
Question 9	1001	2.77	.84	.712
Question 10	1152	3.18	.76	.576
Question 11	1107	3.06	.73	.537
Question 12	912	2.52	.94	.882
Question 13	1141	3.15	.70	.495
Valid N 362				

How Technology Supports Teaching and Learning

Teachers were also asked to self-report his/her beliefs about how technology affects his/her teaching and student learning. A five-point Likert scale was used to tabulate the answers to the thirteen survey items that were designed to solicit a response for answering research question three. The five respondents' choices on the Likert scale, from lowest to highest were: 1) I don't know; 2) strongly disagree; 3) disagree; 4) agree; and 5) strongly agree. A complete listing of the survey questions are listed in Appendix A. Table 10 represents the frequency of each choice selected by the respondents.

Table 10

Frequency of Teacher Beliefs on Effect of Technology

Question Number	I don't know	Strongly disagree	Disagree	Agree	Strongly agree
1	93	53	86	124	6
2	59	9	150	144	0
3	0	19	30	263	50
4	0	29	50	253	30
5	0	11	0	186	165
6	0	156	196	10	0
7	0	89	150	123	0
8	9	168	185	0	0
9	0	70	200	82	10
10	0	79	194	89	0
11	0	120	226	16	0
12	0	29	19	206	108
13	0	178	184	0	0

The respondents reported that technology was important in teaching students to synthesize information that students had generated into a final product. Having students working in teams with specific roles assigned and working in teams with no specific roles assigned were also reported as being highly important for promoting student learning.

Technology was not important as an educational tool for helping students make judgments about information and ideas, according to the respondents' selections. Additionally, neither student planning, composing, writing and editing stories, essays, or reports and teacher professional development, were conveyed as having much relevance on the outcomes of student learning. Notable to the researcher was the implication from the respondents' reporting that technology used for communication purposes has negligible effect on student learning by assisting them in communicating with others in their community and/or worldwide.

Results for Research Question Four

4. Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and instructional practices in the areas of:

   - Computer application skills?
   - Utilization of educational software?
   - Proficiency in various technology related activities?
   - Impact of technology on instructional practices?

The primary goal of the SoCQ is to collect data for the development of an overall perspective and description of the relative intensity of different Stages of Concern about a particular innovation. The SoC data can be interpreted holistically by looking at high and low stage scores, looking at individual item responses, or by looking at the total score and total percentile. The total score and total percentile score, to some degree, reflects the amount of involvement the person has with the innovation. Low totals suggest low intensity of concerns and comfortableness with the innovation. A high total percentile suggests definite feelings and involvement with the innovation. These feelings may be either negative or positive.

Of interest to the researcher was determining if there were any relationships between teacher concerns and instructional practices. If relationships exist it could be implied that through identification of the concerns and then addressing them through professional development activities, the teachers could have confidence of using the innovation for improving instructional practices.

Pearson *r* correlation coefficients were developed to measure the relationship between total percentile scores of the Stages of Concern and the respondents' scores from the four sections of the questionnaire relational to teacher instructional practices. The Pearson *r* value is a number between -1 and 1 that represents the direction and strength of the linear relationship between variables. Correlation coefficients were calculated to address research question four. As a result of the Pearson *r* calculations, there were no statistically significant relationships reported by respondents between teacher concerns and selected instructional practices using educational technology. The correlation matrix detailing the results is included in Appendix D.

<u>Results for Research Question Five</u>

5. Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and teacher beliefs about the areas of:

    - Developing their technology skills?
    - The use of technology in the classroom?
    - How technology can support teaching and learning?

Pearson *r* correlation coefficients were utilized to measure the relationship between total percentile scores of the Stages of Concern and the respondent's scores from the three sections of the questionnaire relational to teacher beliefs. A table presenting the results of the correlation analysis between the Stages of Concerns total score and the selected beliefs about technology is located in Appendix D. The correlation analysis indicated no statistically significant relationships between teacher concerns and of the selected beliefs.

Results for Research Question Six

6. Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and the following demographic characteristics?

   - Age?
   - Years teaching?
   - Years using instructional technology?

The results of the correlation analysis utilized to answer research question 6 are included in Table 11. Results generated by the SoCQ for the teachers' total score and the section of demographic characteristics were utilized to address this question. Respondents were asked to identify their age, years teaching, and to self-rate their technology experience. Tables including the demographic characteristic frequencies as reported by the respondents are located in Appendix D. None of the correlation coefficients that tested the relationship between teacher concerns with technology integration and the demographic variables of age, years teaching, and technology experience were all indicative of having NO statistical significance.

Table 11

Correlation of Teacher Concerns and Selected Demographic Characteristics

	AGE GROUP	YEARS TEACHING	EXPERIENCE	CONCERNS
CONCERNS				
Pearson *r*	.030	.078	.015	1.000
Sig. (2-tailed)	.568	.138	.783	
N	362	362	362	362

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

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

<u>Results for Research Question Seven</u>

7. Are there statistically significant differences between Southeast Oklahoma teacher concerns with technology integration and teachers grouped according to the following demographic characteristics?
   - Highest degree earned?
   - School size?
   - Grade level assignment?
   - Subject area assignment?

Each respondent in the sample population was asked to report his/her highest degree earned, the size of the school in which he/she was employed and his/her highest grade level and subject area assignment. The concomitant response frequencies are included in Appendix D.

Table 12 includes the results of the Analysis of Variances (ANOVA) of teacher concerns with the teachers' highest degree earned, school size, and grade level and subject area assignment to address research question seven. Full ANOVA source tables are included in Appendix D. There were no significant differences between the groups.

Table 12

Teacher Concerns and Selected Demographic Characteristics

	Mean	F	Sig.
Highest Degree Earned	1.39	.126	.723
School Size	1.36	.792	.454
Grade Level Assignment	7.31	1.133	.336
Subject Area Assignment	3.53	.996	.427

Results for Research Question Eight

8. Are there statistically significant relationships between Southeast Oklahoma teachers with the following technology instructional practices:

    - Computer application skills
    - Utilization of educational software
    - Proficiency in various technology related activities
    - Impact of technology on instructional practices

    And the following demographic characteristics:

    - Age?
    - Years teaching?
    - Years using instructional technology?

Table 13 represents the data that were collected to answer this research question. There were no statistically significant relationship between the instructional practices of computer application skills, utilization of educational software and proficiency in various technology related activities and the selected demographics of age, years teaching and technology experience. However, there was significance of relationships between the impact of technology on teaching and learning and the selected demographic characteristics.

Table 13

Teacher Practices and Selected Demographic Characteristics

N=362	Age	Years Teaching	Technology Experience
Application			
Pearson	-.095	-.010	.058
Sig.	.071	.852	.273
Software			
Pearson	.008	.061	.092
Sig.	.886	.246	.082
Proficiency			
Pearson	.034	.010	-.075
Sig.	.523	.850	.155
Impact			
Pearson	-.138**	-.113*	.118*
Sig.	.009	.032	.025

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

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

Results for Research Question Nine

9. Are there statistically significant differences between Southeast Oklahoma teacher following instructional practices in the classroom of:

- Computer application skills
- Utilization of educational software
- Proficiency in various technology related activities
- Impact of technology on instructional practices

And the demographic characteristics of:

- Highest degree earned?
- School size?
- Grade level assignment?
- Subject area assignment?

Table 14 contains the statistical results used to answer question nine. Four sets of one-way analyses of variance were conducted. Each set of ANOVAs included one of the instructional practices scores as the dependent variable and the four demographic characteristics as the independent variables. Complete source tables are located in Appendix D.

Table 14

Instructional Practices and Selected Demographic Characteristics

	Skill Application		Software Use		Proficiency		Impact	
	F	Sig.	F	Sig.	F	Sig.	F	Sig.
Highest Degree Earned	.068	.795	.231	.631	.135	.713	.480	.489
School Size	.768	.465	3.778	.024*	1.553	.213	.197	.821
Grade Level Assignment	.911	.523	.868	.564	1.035	.413	.852	.579
Subject Area Assignment	1.147	.335	.852	.531	1.530	.167	.921	.480

* Statistically significant at p < .05

The results indicated that there were statistically significant differences in the use of educational software among teachers grouped according to school size. The one-way ANOVA produced an F statistic of 3.78 with a significance level of .024. The results of the one-way ANOVA for each of the other variables comprising question nine indicated no significant differences.

A Tukey post-hoc test was utilized to examine the extent of these differences. The Tukey test indicated that there were significant differences in software usages between the first two size groups (0 -500 students and 501-1,000 students) only. Table 15 depicts the results of the Tukey test.

Table 15

Tukey Post-Hoc

(I) SIZE	(J) SIZE	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1	2	-.94	.358	.024*	-1.79	-.10
	3	.25	.624	.919	-1.22	1.71
2	1	.94	.358	.024*	.10	1.79
	3	1.19	.673	.183	-.40	2.77
3	1	-.25	.624	.919	-1.71	1.22
	2	-1.19	.673	.183	-2.77	.40

* The mean difference is significant at the .05 level.

Results for Research Question Ten

10. Are there statistically significant relationships between Southeast Oklahoma teacher instructional practices using technology and teacher instructional beliefs?

Table 16 depicts the results of the correlation coefficients among the instructional practices and instructional beliefs variables. The results indicate there was a significant relationship between each of the instructional practices and the belief that technology helps develop student skills. There was also a significant relationship between the practice of using technology to impact teaching and the belief that technology supports teaching and learning. The correlation indicated no other significant relationships existed between the remaining variables associated with teacher practices using technology and teacher beliefs on how technology affects students.

Table 16

Teacher Instructional **Practices** and Teacher Instructional *Beliefs*

N=362	**SKILLS**	**TECH USE**	**SUPPORT**
APPLICATION			
Pearson	.239**	-.039	.078
Sig.	.000	.460	.138
SOFTWARE USE			
Pearson	.174**	.072	.012
Sig.	.001	.173	.817
PROFICIENCY			
Pearson	.148**	.071	-.047
Sig.	.005	.177	.377
IMPACT			
Pearson	.392**	.056	.164**
Sig.	.000	.292	.002

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

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

Note: Bold headings represent instructional practices and italicized headings represent instructional beliefs.

Results for Research Question Eleven

11. Are there statistically significant relationships between the selected teacher instructional beliefs:

    - Developing their technology skills?
    - The use of classroom technology?
    - How technology can support teaching and learning?

    And the selected demographic characteristics:

    - Age?
    - Years teaching?
    - Years using instructional technology?

Table 17 includes the results of the correlation analysis utilized to address question 11. There are no significant relationships between teacher instructional beliefs and the selected demographic variables of teacher age, years teaching, and length of time using technology.

Table 17

Teacher Beliefs and Selected Demographic Characteristics

	AGE	YT	EXP
DEVELOPING SKILLS			
Pearson	-.093		
Sig.	.076	-.008	.034
N	362	.884	.514
USE OF TECHNOLOGY			
Pearson	.054	.021	.038
Sig.	.310	.695	.476
SUPPORTING TEACHING/LEARNING			
Pearson	-.032	-.052	.085
Sig.	.539	.322	.108

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

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

<u>Results for Research Question Twelve</u>

12. Are there statistically significant differences between the selected teacher beliefs:

- Developing their technology skills?
- The use of classroom technology?
- How technology can support teaching and learning?

And the teachers grouped by the selected demographic characteristics:

- Highest degree earned?
- School size?
- Grade level assignment?
- Subject area assignment?

Table 18 contains the data on the differences between teacher beliefs and the aforementioned demographic characteristics. Full source tables are included in Appendix D.

Table 18

Teacher Beliefs and Selected Demographic Characteristics

	Skill Development		Classroom Use		Support	
	F	Sig.	F	Sig.	F	Sig.
Degree Level	.698	.404	.013	.910	.028	.868
School Size	3.314	.037*	.698	.498	.851	.428
Grade Level	.775	.653	.406	.943	2.154	.020*
Subject Assign.	1.314	.250	1.934	.075	2.001	.065

* Statistically significant at $p < .05$

Only two of the ANOVAs used to address research question 12 were statistically significant. Teachers from different grade levels maintained significantly different beliefs how technology may support teaching and learning.

A Tukey post-hoc test was utilized to examine the extent of these differences (Appendix D). Unfortunately, because of the extensive number of data categories (11), the Tukey test was not sufficiently powerful to ascertain where these differences were. For the benefit of the reader, Table 19 presents the means of teacher scores in the area of beliefs about how technology may support teaching and learning.

Table 19

Mean Scores of Teacher Beliefs of Technology Supporting Teaching/Learning

GRADE	Mean	N	Std. Deviation
1	33.89	9	4.649
2	34.79	14	3.167
3	36.73	33	3.357
4	37.76	25	3.179
5	35.52	21	3.415
6	36.00	11	3.550
7	35.43	21	2.993
8	36.03	71	3.234
9	36.93	57	2.902
10	36.86	87	3.359
11	36.15	13	2.267
Total	36.39	362	3.289

Teachers from different school size categories maintained significantly different beliefs about the development of their technology skills. A Tukey post-hoc test was utilized to examine the extent of these differences (Table 20). The Tukey test indicated that there were significant differences in beliefs about skill development between teachers in the first and third school size categories (0-500 students and 1,000 and greater students). There were no other significant differences found among the ANOVAs used to address research question 12.

Table 20

Tukey Post-Hoc Test

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) SIZE	(J) SIZE				Lower Bound	Upper Bound
1	2	.11	.822	.991	-1.83	2.04
	3	3.68	1.434	.029*	.30	7.05
2	1	-.11	.822	.991	-2.04	1.83
	3	3.57	1.546	.056	-.07	7.21
3	1	-3.68	1.434	.029*	-7.05	-.30
	2	-3.57	1.546	.056	-7.21	.07

*The mean difference is significant at the .05 level.

Summary

Three-hundred sixty-two teachers from Southeast Oklahoma school districts participated in this study. They provided information on their personal and professional characteristics, concerns with technology integration into classroom instruction, instructional practices using technology, and personal beliefs about the impact technology may have on teaching and student learning. A summary, conclusions, and recommendations for educational technology based on these research findings are discussed in detail in Chapter 5.

CHAPTER FIVE

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

Introduction

Chapter 5 discusses the results of this study in an attempt to answer its research questions. It also includes a discussion of findings and implications that emerged. This study was conducted to investigate teacher concerns, practices and beliefs with integration of technology into the teaching and learning process. Additionally, the study investigated the relationships between or differences between the aforementioned variables and selected demographic characteristics. Specifically, the study was intended to ascertain teacher concern levels, use of technology in the classroom, and teacher beliefs about the impact of technology on education. Twelve research questions were addressed in the study through descriptive statistical analysis and each question with its results will be discussed.

Summary and Conclusions

Research Question 1

To what extent are Southeast Oklahoma teachers concerned about various elements of the introduction of computer technology in their classrooms?

Hall (1979) reports that while the Stages of Concern are distinctive, they are not mutually exclusive. An individual is likely to have some degree of concern at all stages at any given time. These variations in intensity mark the developmental nature of individual concerns.

Impact concerns (Stage 4 – Consequence, Stage 5 – Collaboration, and Stage 6 – Refocusing) become intense when teachers' concerns begin to focus on the effects of the innovation on their students, and what can be done to improve the effectiveness of the innovation. Some pertinent questions teachers usually ask are: "How is using this going to affect students?" "Are the teachers going to cooperate with one another as we work with this innovation?" Statements that are likely to be heard from teachers are: I'm concerned about relating what I'm doing to what other teachers are doing." "I'm concerned about whether I can change this in order to ensure that students will learn better as a result of introducing this idea."

Using the Stages of Concern Questionnaire (SoCQ), the study participants (N=362) responded to 35 items using a 7 point Likert scale indicating the degree to which each concern about introducing computer technology into the classrooms was true for them. Study participants had a mean score of 127.14 out of a possible 245, and the average range of total scores was 122 from a range of 61 to 183. Although the total scores were not directly used to answer a specific research question in this study, they do indicate that southeast Oklahoma teachers have a moderate level of intensity for integrating computers into classroom instruction.

Stage scores for each of the seven stages were calculated and a peak stage was determined for respondents. Concern data for peak scores revealed that the majority of teachers from Southeast Oklahoma school districts included in the sample population reported higher levels of concerns of technology integration in the Stage of Concern category of Stage 5 – Collaboration and second highest inStage 4 – Consequence as identified by Hall, and associates (1979).

High concerns in stage 5 indicate that the teachers were concerned about coordination and cooperation with other teachers and staff in effectively incorporating technology into the classroom environment. Stage 5 is a desirable stage in that teachers at this stage that are instructionally effective would be engaged in establishing clear instructional and curriculum guidelines. Teachers also will be personally involved and desiring to work with others in accomplishing shared goals for student achievement. Triplett (2001) supported the conclusion that teachers reported collaboration as being important for learning to integrate computers and other new technologies into instruction. Teachers believe that collaboration provides needed support as they change their teaching practices toward integrating more technology into the classroom environment.

A Stage 4 high frequency is indicative of teachers being concerned with the impact upon the students or the school. These concerns may be in such spheres as evaluation of student outcomes, performance and competencies, and changes needed to increase his/her students' outcomes. The analysis of the group profile by its first and second highest peaks suggests that teachers integrating computers in the classroom environment are greatly concerned about working with colleagues or others in coordinating the use of technology. However, the teachers are also concerned about the consequences of its use in his/her classroom on students.

Research Question 2

How do teachers in Southeast Oklahoma report their instructional practices in each of the following areas?

- Technology application skills.
- Utilization of educational software.
- Proficiency in various technology related activities.
- Impact of technology on instructional practices.

The rapid increase in the availability of computers and other technology in schools represent a significant investment. To what extent does technology use result in improved student learning? Research has found that teacher skill in using technology is a major factor in improving student learning with technology (Wellens, 1998). Teachers must know not only how to use technology but also when and why to use it.

The skill with which the majority of teachers reported having the most experience was word processing applications, with 92% of teachers rating themselves as being moderately skilled or advance skilled. Having experience using web browsers was the second highest reported technology application skill, with 80% of teachers reporting he/she was skilled in the application. However, teachers reported having little experience (92%) or no experience

(61%) in the areas of multimedia authoring, database, presentation, classroom management, and spreadsheets.

In recent surveys, teachers have reported which types of technology they considered essential for teaching. Regardless of availability, teachers reported that a teacher's computer with access to electronic mail was the most essential with a 68% response and classroom access to the World Wide Web as being of next importance with a 61% response(NCES, 2005).

The most frequent use of technology reported by teachers in this study for class preparations was: 1) word-processing software; 2) email; 3) World Wide Web; and 4) specific courseware. These data from the current study corroborates the previous report. The use of courseware (52%), World Wide Web (40%), graphics (27%), and word processing (23%) was reported higher in frequency for use instructionally with students than the other types of software. Although the use of graphics was ranked third highest in instructional use, 46% of the teachers responded to the survey of having no experience using graphic software. It could be postulated that of those teachers having experience with graphic software, 53% use it as an instructional tool.

Multimedia technology was used for neither class preparation nor student instruction by 85% of the responding sample. Sixty seven percent of the respondents do not use presentation software applications and 63% do not use database applications. Intuitively, if teachers do not view applications as relevant or essential to teaching, they may not have any need or desire to use those types of applications.

In reviewing the data collected to examine teacher proficiency in various technology related activities, it was noteworthy to report the technological activities teachers responded to as being least proficient in as well as the activities they are proficient in conducting. Respondents could indicate they were: 1) not proficient at all; 2) a little proficient; 3) moderately proficient; 4) largely proficient; and 5) highly proficient. 53% of the teachers surveyed reported that they have no proficiency and 32%reported as having a little proficiency with using technology to help students compensate for disabilities. Only fifty-three teachers (14.7%) reported having any significant proficiency in using technology activities to help special needs students.

Teachers did report that they are most proficient in activities involving the World Wide Web and using various software programs. The activity of using the web to locate instructional resources had the highest reported mean. Additionally, the teachers reported themselves as being highly proficient, 30.1% in figuring out on their own how to use various software programs.

Over half the teachers reported that they never use technology as part of their daily teaching practice to classify, analyze, predict, nor create information when framing tasks. Teachers also do not use technology to connect with students who are absent or otherwise out of school in order to keep them on task and on level with other students. Participating in technology planning to benefit themselves or their colleagues, and contributing to action research about the impact of technology on students was of little or no importance to many of the respondents. Of greatest surprise to the researcher was that 22.1% teachers reported that it was not part of his/her everyday practice to assess the effectiveness of the lessons they teach and only 26.5% of the teachers reported that it was generally a part of their daily practice.

One noteworthy finding is the degree to which respondents reported that working collegially with other teachers at their school was an important part of their daily practice. Due to the fact that teachers participating in this study also reported their highest concern was at Stage 5 Collaboration, it stands to reason that they would also have a high response rate in the area of working collegially with other teachers as part of his/her daily practice. However, in relation to working collegially with others, 68.2% of the teachers responded that they do not actively participate in planning or implementing professional growth opportunities for other teachers.

Research Question 3

What are Southeast Oklahoma teachers' beliefs about?

- Developing their technology skills?
- Their use of classroom technology?
- How technology can support teaching and learning?

According to the U.S. Department of Education (2000), less than 20% of American teachers feel adequately equipped with the skills necessary to integrate technology into their classrooms. Therefore, although technology may offer the potential to enhance and improve the students' learning experience, there seems to be no consensus in educational related literature about how to combine technology with other learning tools and strategies. This absence of agreement may cause many teachers to be casual or even non-users of computers and other technologies in the classroom.

It has been argued that teacher beliefs have a strong impact on teaching and learning (Handal, Bobis, & Grimison 2001; Lovat & Smith, 1995). With teachers' instructional beliefs reflecting personal theories of knowledge and knowing, such beliefs can be seen as influencing teachers' instructional decisions.

In response to questions on the survey concerning teacher beliefs about developing technology skills, the teachers could select: 1) I don't know; 2) strongly disagree; 3) disagree; 4) agree; or 5) strongly agree. One-hundred percent of the teachers reported that they taught in a subject area that did lend itself to using technology, including the World Wide Web, and that they did not feel awkward when confronted with using technology in their classroom. The three statements that teachers reported as being a barrier to using technology in the classroom were: 1)there 's not enough time to incorporate technology into lessons and unit plans (123, 34%); 2) that students knew more about technology than the teacher did (92 teachers, 25.58%); and 3) that the students' many personal and educational needs made focusing on uses of technology impractical (89, 24.6%).

One could be reasonably sure that if teachers do not perceive that there was enough time to incorporate technology, that those teachers will not put forth efforts to incorporate technology in the classroom. Supporting this claim, in their study examining barriers to technology implementation, Ertner and associates (1999) did identify insufficient time to prepare instructional tasks as a barrier to technology implementation. The barrier of insufficient time can be ameliorated by providing teachers with adequate training and time for instructional preparation.

Over 60% of the sample reported that their school's technology plan did not provide clear direction (n=232, 64.1%), nor that they were familiar with their school's technology plan (n=218, 60.2%). What was indeterminate was how many of the responses to the two statements are the same teachers. If the 232 teachers reporting that their school's technology plan provides no clear direction also answered statement two as not being familiar with their school's technology plan, there should be a response rate of 450 (Study N = 362) teachers not benefiting from a technology plan.

Ninety seven percent of the respondents believe that incorporating the use of technology into the classroom instruction helps students to learn. In support of using technology in classroom instruction, teachers also believe that the basic software needed to use technology instructionally was available at their school (313, 86.5%) and the basic hardware and network capacity was available to use instructionally with students.

Specific areas in which the respondents thoroughly agreed as being beneficial for using technology to facilitate learning were having students work on lessons or activities that are multidisciplinary or cross-curriculum and having students use technology to work on real life issues and problems. However, teachers must make the transition from believing the activities that are important to actually using the technology to support student learning. It can be postulated that the success of technological integration was measured in terms of student practices and learning outcomes. Therefore, it was more important to train teachers how to integrate technology into their instruction. ISTE's (2000) standards for proficiency in the use of computers by teachers include the standards of teachers planning and designing of effective learning environments and experiences supported by technology and the standard of implementing curriculum plans that include methods and strategies for applying technology to maximize student learning.

Research Question 4

Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and instructional practices in the following areas?

- Technology application skills?
- Exploitation of educational software?
- Proficiency in various technology related activities?
- Impact of technology on instructional practices?

There are no statistically significant relationship between Southeast Oklahoma teacher concerns with technology integration and selected instructional practices. The teachers reported few concerns, as documented by the profile of the total sample of teachers, with the integration of student use of computers in instruction. According to Hall and Hord (2001), this can happen when the respondents have had direct experience with the innovation in classroom settings. This conclusion, however, was not supported by other results regarding lack of computer experience and the minimal use of technology for professional tasks.

Teachers primarily used the computer to access resources and to create instructional materials. Supporting this, Kelkar (2001) found that teachers in technology training programs took more time for learning web-based applications. Baylor and Ritchie (2002)also reported that teacher willingness to change teaching methodology predicted teacher use of technology for instructional practices; implying that if teachers were willing to experiment with new technology ideas, they would become more technologically competent.

Research Question 5

Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and teacher beliefs about the following areas?

- Developing their technology skills?
- The use of technology in the classroom?
- How technology can support teaching and learning?

Studies have shown the role of motivation in constructivist approaches to learning environment design that emphasizes the importance of authenticity or resemblance to real-world situations (Keller & Litchfield, 2002). The appropriate use of technology in such relevant situations would facilitate transfer of learning.

It was encouraging to note that teachers in the current study did believe that integration of technology in the classroom would benefit teaching and learning through the opportunities that were made available through technology use for greater interactivity and authenticity of learning experiences. Although there are no statistically significance relationships between teacher concerns with technology integration and select teacher beliefs, there was also no reportabledata supporting teacher inadequacy to integrate technology either due to lack of technological skills and/or absence of models of good integration practices.

Research Question 6

Are there statistically significant relationships between Southeast Oklahoma teacher concerns with technology integration and the following demographic characteristics?

- Age?
- Years teaching?
- Years using instructional technology?

As reported by Hall and associates (1979 and 2001) in their studies of teacher concerns with innovations and demographic characteristics, the relationships with age, years teaching, and number of years in this study also resulted in no significant relationship with teacher concerns. These findings would purport that teachers were willing to undertake the challenge to incorporate technology into their classrooms regardless of factors of age, experience teaching, or experience with technology.

Research Question 7

Are there statistically significance differences between Southeast Oklahoma teacher concerns with technology integration and teachers grouped according to the following demographic characteristics?

- Highest degree earned?
- School size?
- Grade level assignment?
- Subject area assignment?

ANOVA procedures were conducted to detect differences in group means based on highest degree earned, school size, grade level assignment, and subject area assignment. No significant differences were indicated for teacher's concerns with technology integration when comparing groups.

Research Question 8

Are there statistically significant relationships between Southeast Oklahoma teachers following technology instructional practices?

- Technology application skills
- Exploitation of educational software
- Proficiency in various technology related activities
- Impact of technology on instructional practices

And the following demographic characteristics:

- Age?
- Years teaching?
- Years using instructional technology?

Three areas from question eight produced statistical results indicating significance was present between instructional practices using technology and selected demographic variables. Impact of technology on instructional practices was significant with the selected demographic variables. This implies that teacher's age, years teaching, and years using instructional technology will likely have an impact on how teachers provide instruction with technology to the students. What was not distinguishable from reviewing the data was exactly what characteristics of the demographics have significant impact on technology instruction.

Mitchell (2000) in a study of factors affecting teachers' use of computers reported that the findings of his study did not support the hypothesis that older teachers were less likely to use computers nor those years teaching had any significance on the amount or types of computer use in the classroom. These findings along with the findings of the current study may indicate the difficulty in generalizing specific factors such as age, years teaching and years using technology as having effect on the instructional use of technology.

Research Question 9

Are there statistically significant differences between Southeast Oklahoma teacher following instructional practices in the classroom:

- Technology application skills
- Exploitation of educational software
- Proficiency in various technology related activities
- Impact of technology on instructional practices

And the following demographic characteristics:

- Highest degree earned?
- School size?
- Grade level assignment?
- Subject area assignment?

There was a statistically significant difference between teacher use of educational software and the size of the teachers' school. It could be surmised that teachers in the current study have greater access to educational software based on the size of the school. Mitchell, (2000) proposed that the size of the districts had an impact on the total funding and support for technology and that larger districts were more likely to purchase educational software and train the teachers in how to use it.

Research Question 10

Are there statistically significant relationships between Southeast Oklahoma teacher instructional practices using technology and teacher instructional beliefs?

High mean scores in the categories of instructional beliefs and technology skills development indicate that teachers in this study appeared to have strong relationships regarding these areas. It was encouraging noting that teachers in the current study believed that integration of technology in the classroom benefited teaching and learning through the opportunities that were made available through technology use and thereby created greater learning experiences.

An assumption made in the current study was that as teachers became more familiar with various functionalities of technology, such as use of software, improving pedagogy, increasing proficiency in introducing standards and the ability to increase student learning that the teachers will be more willing to spend time in professional development activities to incorporate technology into the classroom. It could be surmised that teachers in the current study felt somewhat adequate to integrate technology into the classroom instruction although the data reports that the respondents are not currently using technology for many purposes other than word processing and for accessing the World Wide Web.

Research Question 11

Are there statistically significant differences between teacher beliefs of?

- Developing their technology skills?
- The use of classroom technology?
- How technology can support teaching and learning?

And the following demographic characteristics:

- Age?
- Years teaching?
- Years using instructional technology?

The current results reflect that there are no difference between teacher beliefs about incorporating technology into the classroom and selected demographic characteristics. Thus, the encouragement of teachers by instructional leaders to use technology for instructional practices would not be affected by his/her age, years teaching, nor his/her years using technology in the classroom. Emphasis can be focused towards other areas in the teachers' sphere of influence that produce barriers to technology integration into the classroom environment.

Research Question 12

Are there statistically significant differences between teacher beliefs of?

- Developing their technology skills?
- The use of classroom technology?
- How technology can support teaching and learning?

And the teachers grouped by the following demographic characteristics:

- Highest degree earned?
- School size?
- Grade level assignment?
- Subject area assignment?

ANOVA procedures were conducted to detect differences in group means based on selected demographic variables and teacher beliefs about educational technology. Statistically significant differences were detected between teacher beliefs about the impact of incorporating technology into the classroom and their grade level assignment. In order to determine which grade levels have the greatest significance, further research needs to be conducted to address the current studies findings in relation to elementary, middle school, and high school teachers. Studies have indicated that technology use differs instructionally by grade level (Pisapia & Perlman, 1992). However, these studies focused on drill and practice lessons and the use of tutorials. Educational technology has the potential to not only reinforce lessons but also to develop the minds of students.

Statistically significant differences in teacher beliefs and in how they developed their current level of technology skills were also found between teachers based on the size of their school district. This might imply that teachers working in larger school districts have greater opportunities to develop their technology skills. Ravitz & Mergendoller (2002) reported that schools in Idaho have a higher proportion of technology users but also have lower test scores overall. They also made note that the larger schools which also had higher incomes and more computers, but fewer users by proportion, scored higher on achievement tests. They postulated that if higher scoring schools are using more technology, then technology might be making a difference. The current study indicates that the teachers themselves are the most responsible for developing his/her technology skills. If these teachers have access to greater numbers of computers, they might be taking the initiative to train themselves.

Discussion

In recent years, technology in education has received strong government support at both state and federal levels. This support has caused an increased focus on funding and improving technology within schools. Data generated from this study was indicative that the results of these governmental efforts are evident among Southeast Oklahoma teachers. For example, 100% of the teachers reported having Internet access at school. Furthermore, a majority of the teachers use the World Wide Web to communicate and obtain instructional resources. However, although data indicates technology was available, its use for instruction in the classroom was limited. Therefore, it can be surmised that access to the technology was apparently not the only factor that leads to teacher adoption and full implementation of educational technology.

The profile of the total sample of teachers was typical of teachers who are beyond the implementation stage of educational technology and are more concerned about areas of collaboration and the affect on students, which suggests that teachers' concerns need to be addressed at these stages. Teachers are aware that the technology exits for improving instruction. In fact, teachers in the current study believe that integration of technology into the classroom was beneficial to teaching and learning through the opportunities made available using technology. Although teachers were aware of the many benefits of the computer in general for improving teaching and learning, they choose not to use the technology for purposes other than word processing and to run specific software programs. This implies that teachers perceive using technology for greater interactivity and authenticity of learning experiences but require more information about its affect on student learning before utilizing it extensively in his/her classroom.

McKenzie (2000) states that making significant change with regard to the use of instructional technology necessitates time away from the "daily press" of teaching. An important factor may be established from the data reported by teachers in the current study. With teachers reporting they feel somewhat restrained by time and other classroom mandates to incorporate technology into their lessons, if instructional leaders provide additional professional development opportunities and time for technology training, it can be postulated that collaboration among teachers will be facilitated.

Limitations

1. Self-reported measures cannot compare with actual performance measures in order to fully understand teacher behavior. Pajares (1992) specifically cautioned about the use of self-reports, especially with respect to beliefs, as it was difficult to control time and contexts in which specific beliefs become attitudes or values that lead to behavioral intention and behavior.

2. Teachers from cooperating schools were included in this study; teachers teaching in grades EC-12, and teaching only in Southeast Oklahoma were included in this study. This limited the generalization of results to only this sample of teachers and similar populations.

3. The data were collected at one point in time, creating a snapshot of results for these participants. Longitudinal studies, in contrast, can capture richer data regarding the translation of teachers' beliefs and uses toward technology integration into actual practice, and student outcomes thereof. Moreover, the constructs in this study, such as stages of concern, instructional practices, and pedagogical beliefs are evolutionary in nature, and can be better studied over time.

Implications

The findings of this study revealed that Southeast Oklahoma teachers are in the high stages of integrating technology into the classroom. However, the teachers are constraining themselves to using only a few of the promising applications available with the use of technology. Only if efforts are made to address teacher concerns as indicated by this study, will the full and effective implementation of technology into the classroom be accomplished. The following implications are provided to assist teachers in their transition from limited use of technology to full implementation of educational technology into the classroom.

Educational leaders have prescribed technology standard for teachers and students (NCES, 2000). However, these standards are not appearing to have any impact on the schools in this study, at least for technology integration into the classroom environment as it relates to teaching and learning. There seems to be no change from Sheingold's and Hadley's (1990) conclusions from their study conducted over a decade ago. They remarked that, "computers were not an integral part of subject matter instruction in American schools". The current study echoes similar conclusions about technology integration in Southeast Oklahoma schools.

Findings of this study revealed that a large majority (84%) of Southeast Oklahoma teachers learned to use technology on their own or through informal sources. Self-teaching may result in missed information or in misunderstanding. Additionally, self-taught users of technology may lack confidence in their knowledge and ability to use the technology efficiently and effectively. As indicated by the concern profiles, teachers have a concern for how technology integration will affect their students.

This study did not attempt to find causes for non-use of computers by teachers. However, certain deductions could be made from item wise analysis and from researcher experience. A multitude of factors, such as lack of computer time scheduled by the school for planning, implementing, and evaluating technology integration lessons, lack of adequate and timely support, lack of motivation and other incentives, unsatisfactory quality of training courses, seems responsible for teachers not using technology in the classroom.

There is a perceptible trend in schools to move computers from isolated laboratories into the classrooms. However, it remains to be seen if classrooms in Southeast Oklahoma will benefit from this trend. Although teachers may now have access to adequate technology, time demands, curriculum constraints, and inappropriate information on the World Wide Web may act as barriers to integrating technology into the classroom.

Research suggests that staff development, which was designed to address teachers’ specific concerns and was delivered in a logical progression, may be responsible for reducing teacher resistance to implementing technology into the classroom (Casey & Rakes, 2002). Initial staff development activities concerned with integrating technology should focus on the personal and internal concerns of teachers first and later focus on the external concerns.

Recommendations for Research

"Preparing teachers to use and integrate technology into their work in a meaningful way remains a challenge" (Skinner, 2002). More research is needed to determine the specific needs of teachers before they are ready to implement technology integration. If extensive studies indicate that time is a factor, then more research needs to be conducted about what incentives produce the motivation in teachers to find the time or administrators to provide the time for technology integration.

Studies should be conducted that seek out the answers to questions such as the following:

1. What are the views of administrators and principals regarding technology integration?
2. Do the administrators have effective technology plans for the near future?
3. Are teachers willing to take up the commitment to integrate technology?
4. What are the outcomes of technology integration on student achievement and attitudes, and on classroom instruction and management?

Further research in these areas is vital for successful technology integration into classroom instruction. Previous research points to the need for leadership involvement in the implementation of innovations.

Because leaders control the allocation of resources that include materials, training and time, teacher change cannot be expected without the commitment and support of administration at the district and building levels. Studies, which identify administrative concerns with facilitation of educational technology and barriers in supporting teachers in technology implementation, could support practices for effective integration of technology into the classroom.

In addition, further research is needed to determine the causes for the differences based on school size and use of software. Software licenses can be expensive to purchase and software oftentimes requires onsite support from technology staff. Some school districts may be too small and therefore financially unable to pay the high costs associated with purchasing software and onsite technology support. These factors and others should be examined further to determine the differences between software utilization and school size.

Lastly, further research needs to be conducted in the area of teacher technology skill development to determine the significant reasons teachers report being responsible for his/her own technology skill development. Teacher skill development is the responsibility of instructional leaders.

Findings from this research could have significant impact on integrating technology into the classroom.

Recommendations for Practice

Administrators and trainers hoping to positively influence student learning using instructional technology need to provide a clear demonstration of how the use of instructional technology tools can address the concerns of teachers. Use of a concerns-based training model rather than a skills-based training model is one method for addressing barriers to the use of technology. Training must target the individual concerns of teachers before moving on to concerns of how others, even his/her own students, will use the technology.

It is critical that administrators realize that another person cannot simply be manipulated to higher levels of concern development. Concerns are an individual matter. However, to increase the integration of technology into the classroom, a variety of activities in professional development should be designed and implemented that provide teachers with an understanding and the tools for implementation. Such activities should include pilot projects, teaming teachers with technology proficient teachers, providing mentoring and modeling activities and displaying best practices.

Additionally, teachers must become leaders and change agents, but should not be expected to carry the full load by themselves. In order to become leaders of change, teachers must first become: 1) advocates of learning; 2) active researchers and 3) reflective practitioners who collaboratively set goals, plan, develop, and evaluate programs. Attention to teacher concerns for time, information, and assistance need to be addressed. Classroom teachers must adamantly insist that their teacher organizations and administrative leaders support the needs of the classroom, for teachers and students alike by addressing all concerns.

A sound technology plan with a clear vision of the goals supporting the integration of technology into classroom instruction, along with administrative backing and support is required if technology integration is to succeed (Atkins & Vasu, 2000; Roblyer & Edwards, 2000). School improvement is within the grasp of school leaders who seek to understand teacher concerns, collaboratively plan, set long and short-range goals and expectations.

Concluding Remarks

A striking observation of the researcher was the increasing trend in computer accessibility and ownership by teachers. This study presented evidence that although teachers in Southeast Oklahoma are at the higher stages of concern with technology integration and that these teachers report having the skills to integrate technology into the classroom, the integration of technology into the classroom that promotes teaching and learning was not happening.

A random sample of teachers was surveyed to examine teacher Stages of Concern, teacher instructional practices, and teacher beliefs about instructional technology and to examine the significance of relationships and differences between selected demographic characteristics. Additionally, relationships between teacher concerns, practices, and beliefs about integrating technology into the classroom was investigated.

Findings indicated that teachers have concerns about collaborating with their colleagues about technology integration. There is an immediate need for school leaders to become sensitized to the concerns experienced by staff as educational technology is introduced.

These findings have implications for teachers who are directly responsible for the preparation and development of our children to be successful in the global community. What can be more important than teachers accepting the challenges of technology integration into the classroom to promote teaching and student learning?

In conclusion, since the success of technology integration issues rests with teachers, it is imperative to determine the factors that will promote use of technology in classrooms. It is essential that teacher confidence levels and expertise with computers be utilized. It is also essential that administrators prioritize teachers' professional development and support the teachers' needs with technology integration. Then, teachers will not only be enabled but also can be expected to integrate technology into the classrooms to improve teaching and student learning.

Chapter 5 has presented an overview of this study and the results with implications for further research. By investigating the practices, beliefs and stages of concerns of Southeast Oklahoma teachers, profiles have emerged that begin to illustrate technology integration into classroom instruction. The data increase the potential for successful integration of educational technology into the classroom. In our fast changing world, it is essential that all educators gain a better understanding of the opportunities that can affect learning.

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APPENDICES

APPENDIX A

Survey Questionnaire

Demographic Information

1. What is your age?

2. What grade level do you teach?

3. What subject area do you teach?

4. What is your total school enrollment?

5. How many years have you been teaching?

6. What is the highest degree you have completed?

7. How would you rate your technology experience?

8. How would you rate your computer and technology access at school?

Skill and Proficiency

● Read through the following explanations to understand each choice on the skill scale.

- No experience means you never use the application although you may be familiar with what it's designed to do.

- Know the basics means you occasionally use the application and believe you have figured out a few of its features and functions.

- Moderately skilled means you use the application routinely and believe you have figured out most of its features and functions.

- Advanced suggests you could offer training on the application to others.

<u>How do you rate your skills?</u>

(Fill in one bubble only)

Types of software (Applications named are for examples only)

No Experience

Know the basics

Moderately skilled

Advanced

- Word Processing (Microsoft Word)
- Presentation (PowerPoint)
- Multimedia authoring (HyperStudio, KidPix)
- Classroom management (GradeQuick)
- Database (Access, FileMaker Pro)
- Spreadsheet (Excel)
- Graphics (clip art, PhotoShop)
- Courseware (Decisions, Decisions; Accelerated Reader)
- Web browsers (Explorer, Netscape Navigator)
- Email (Netscape Communicator, Outlook)

<u>How do you use the software?</u> (Fill in both *Classroom prep* and *Instructionally*, if appropriate)

Do not use

Classroom prep

Instructionally with students

To what extent have each of the following been important in helping you develop your technology skills?

Not important at all **Somewhat important** **Very important**

- Personal desire and effort
- Mentoring and support from a colleague
- Professional development
- Other classes in the community (adult school)
- Conference presentations or workshops
- Support/encouragement from a school administrator
- Assistance from the district's EdTech staff
- Assistance from a district TechPrep Facilitator
- Online tools available on the World Wide Web
- Online help in applications

How would you rate your proficiency with each of the following?

Not at all proficient **Highly proficient**

- Setting up and maintaining a computer workstation.
- Figuring out how to use various software programs.
- Incorporating technology into the physical environment of the classroom to support different learning activities.
- Using technology to add excitement and interest to your teaching.
- Using specific search strategies to locate information.
- Teaching students how and why to use technology.

- Helping colleagues learn different technologies for their *personal* use.
- Helping colleagues learn different technologies for *instructional* use.
- Using the Internet to find instructional resources.
- Using the Internet to expose students to diverse viewpoints.
- Using technology to support student cooperation/collaboration.
- Using technology to support problem-based or case-based learning.
- Using technology to help students with special needs.
- Using technology to create instructional units, lessons, or activities.
- Using technology to communicate with parents about the school day.
- Ensuring students use the web safely.
- Creating assessment tools (rubrics, checklists, matrices) for evaluating student work.
- Ensuring students understand how to assess the validity and reliability of information they find on the Internet.

Classroom Practices

The following items focus on classroom practices. For each of them, please *fill in the bubble* that best describes where you currently see yourself.

<u>The Practice…</u>

Isn't really part of my everyday teaching practice.

Is generally a part of my everyday practice.

Is fundamentally a part of my everyday practice.

Is integral to my everyday teaching practice.

- Using such technology as *classify, analyze, predict,* and *create* when framing tasks.
- Encouraging students to engage in dialogue, both with me and with one another.
- Encouraging student engagement by asking thoughtful, open-ended questions.
- Encouraging students to contribute to the development of assessment criteria and standards.
- Engaging students in experiences that may contradict their initial ideas, and then encouraging discussion.
- Modeling the skills of inquiry - including skepticism, curiosity, an openness to new ideas, and an interest in data.
- Assessing both student understanding and student skills.
- Using technology to enhance school/home communications.
- Encouraging students to assess their own learning.
- Using student data, observations of teaching, and interactions with colleagues to reflect on and improve my teaching.
- Extending the school day via use of the Internet and other technologies.
- Allowing my students to contribute to the decisions I make about the content and context of their work.
- Actively participating in technology planning at my school.

- Helping to plan and implement professional growth opportunities for the teachers at my site.
- Encouraging the use of computers, calculators, and other technologies.
- Incorporating multimedia technologies into my teaching.
- Using multimedia technologies to create materials that students use in class.
- Modeling the ways technological tools can help students reason, make connections, and solve problems.
- Implementing lessons and units that are standards-based.
- Working collegially with other teachers at my school (including those in other disciplines and with grade-level assignments different from my own).
- Using technology to connect with students who are absent or otherwise out of school in order to keep them current and on-task.
- Implementing collaborative and independent tasks that challenge student thinking.
- Regularly assessing the effectiveness of the lesson or units I teach, and the extent to which I achieved specific instructional goals.
- Communicating with parents about my instructional program, and encourage parental participation.
- Contributing to the research about technology's impact through action research, teacher mentoring, writing articles, or presentations

<u>Perspectives</u>

For each of the following, please *fill in the bubble* that most closely represents your perspective:

I don't know Strongly disagree Disagree Agree Strongly agree

- My school's technology goals are stated in a way that provides clear direction.
- I am familiar with my school's technology plan.
- The basic *software* that I need to use technology instructionally is available at my school.
- The basic *hardware and network capacity* I need to use technology with students is available at my site.
- I believe that incorporating technology into my instruction helps students learn.
- Showing students how to use technology isn't my job.
- I don't have enough time to incorporate technology into my lesson or unit plans.
- I teach in a subject area that doesn't lend itself to using technology, including the web.
- The majority of my students know more about technology, including the Internet, than I do.

- My students' many personal and educational needs make focusing on use of technology impractical.
- I am concerned that technology interferes with the personal relationships I have with my students.
- Computers and other technologies are as important in classrooms as pencils and books.
- I feel awkward when confronted with using technology I my classroom.

How *important* is each of the following in helping your students meet school and district performance expectations:

Not important at all   Extremely important

- Having students work on real life issues/problems
- Having students work on lessons/activities that are multidisciplinary or cross-curricular
- Asking students to synthesize information that they or fellow students have generated into a final (graded) product or project.
- Having students work in teams, with each team member assigned a specific role.
- Having students work in teams, with no roles specifically assigned.
- Asking students to make judgments about information, ideas, arguments, or issues that they have researched.
- Using subject-specific (math, spelling) drill and practice software programs.

- Having students plan, compose, write, and/or edit stories, essays, or reports.
- Publishing student work electronically.
- Having students conduct web-based research.
- Having students communicate with others in their community or worldwide
- Creating school or classroom web pages
- My participation in professional development whether focused on technology or specific instructional interventions (SADIE, for example)

Stages of Concern Questionnaire

The purpose of this questionnaire is to determine what people who are using or thinking about using technology are concerned about at various times during the school year. The items were developed from typical responses of school and college teachers who ranged from no knowledge at all about technology to many years of experience in it. Therefore, a good part of the items may appear to be of little relevance or irrelevant to you at this time. For the completely irrelevant items, please circle “0” on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale, according to the explanation at the top of each of the following pages.

For Example:

0 1 2 3 4 5 **<u>6 7</u>** This statement is very true of me at this time.

0 1 2 **<u>3 4 5</u>** 6 7 This statement is somewhat true of me now.

0 **<u>1 2</u>** 3 4 5 6 7 This statement in not at all true of me at this time.

<u>0</u> 1 2 3 4 5 6 7 This statement seems irrelevant to me.

Please, respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with technology. We do not hold to any one definition of technology, so please think of it in terms of your own perception.

Thank you for taking time to complete this task.

1. I am concerned about students' attitudes toward technology.
2. I now know of some other approaches that might work better.
3. I don't even know what technology is.
4. I am concerned about not having enough time to organize myself each day.
5. I would like to help other faculty in their use of technology.
6. I have a very limited knowledge about technology.
7. I would like to know the effect of technology on my professional status.
8. I am concerned about the conflict between my interest and my responsibilities.
9. I am concerned about revising my use of technology.
10. I would like to develop working relationships with both our faculty and outside faculty using technology.
11. I am concerned about how technology affects students.

12. I am not concerned about technology.
13. I would like to know who will make the decisions about technology.
14. I would like to discuss the possibility of using technology.
15. I would like to know what resources are available if we decide to adopt technology.
16. I am concerned about my inability to manage all that technology requires.
17. I would like to know how my teaching or administration is supposed to change.
18. I would like to familiarize other departments or persons with the progress of technology.
19. I am concerned about evaluating my impact on students.
20. I would like to revise technology's instructional approach.
21. I am completely occupied with other things.
22. I would like to modify our use of technology based on the experiences of our students.
23. Although I don't know about technology, I am concerned about things in the area.
24. I would like to excite my students about their part in technology.
25. I am concerned about the time spent working with nonacademic problems related to technology.
26. I would like to know what the use of technology will require in the immediate future.

27. I would like to coordinate my effort with others to maximize technology's effects.
28. I would like to have more information on time and energy commitments required by technology.
29. I would like to know what other faculty are doing in this area.
30. At this time, I am not interested in learning about technology.
31. I would like to determine how to supplement, enhance, or replace technology.
32. I would like to use feedback from students to change the program.
33. I would like to know how my role will change when I am using technology.
34. Coordination of tasks and people is taking too much of my time.
35. I would like to know how technology is better than what we have now.

APPENDIX B

Permission to Conduct Survey

Dear Superintendent,

I would like to take this time to thank you for your interest and assistance in a research study being conducted by Ira Harris, a graduate student in the department of Education, under the direction of Dr. Jeffrey Maiden, department of Educational Leadership and Policy Studies and under the auspices of the University of Oklahoma Norman Campus titled "An Assessment of Teacher Concerns about Classroom Technology Integration in Southeast Oklahoma." The use of technology in public schools is an important component in academic achievement of our student population. As we go into the 21st century, staff and students alike must be technologically empowered in order to prepare youngsters to successfully compete in the global job market and to enjoy an enhanced quality of life.

I have attached a copy of the survey questions for your review in making your decision. This survey contains sections relating to Teacher Use of Technology and Stages of Concern with Technology Integration, and a short demographic survey. The surveys will be made available to all certified teachers in Choctaw, Latimer, Leflore, McCurtain, and Pushmataha counties of Oklahoma in school districts where permission to conduct research is granted. The survey packet will be mailed to the school districts in envelopes to be placed in the teacher's mail box and will include an informed consent to participate letter. The informed consent letter will contain the title of the research study, the purpose and importance of the research study, assurance of confidentiality, the voluntary nature of their participation and instructions for contacting me, my faculty advisor, or the University of Oklahoma Institution Review Board. Participation in this research study is voluntary and all data obtained from the surveys will be confidential. The results of the findings will be presented in summarized form with no individual participant or school district identifiable from the findings.

Teachers will be given the opportunity to complete the survey electronically by accessing www.technologysurvey.net if they choose not to participate by hard copy but wish to participate electronically.

I believe the information can be valuable to teachers and administrators as we promote the integration of technology into classroom instruction. If you agree to allow your teachers to participate in this research study, please complete the bottom portion of this letter and return it to my office in the envelope provided.

Sincerely,

Ira Harris,
580.933.7232
580.933.7289 fax

I have read the research description above and grant permission for the recruitment of teachers in my district to participate in the study "An Assessment of Teacher Concerns about Classroom Technology Integration in Southeast Oklahoma". I understand that they may decline participation with no penalty.

______________________________, ______________, ______________________________
PRINT NAME TITLE SIGNATURE

______________________________ ________________
SCHOOL DISTRICT DATE

APPENDIX C

Dear Dr. Bober,

My name is Ira Harris and I'm a school superintendent that is a graduate student with The University of Oklahoma College of Education Department of Educational Leadership and Policy Studies. I am submitting a proposal titled Assessment of Teacher Concerns with Technology Integration in Southeast Oklahoma School Districts to my committee for partial fulfillment of the requirements to obtain a Ph.D. in Education Administration.

I am interested in using and would like permission to use the survey instrument 'Teacher Technology Survey' developed by you and your colleagues (Bober, Harrison, & Lynch, 1997). My purpose is to use the survey in my study in conjunction with the Stages of Concern Questionnaire (Hall, 1984) to determine if there are any relationships among teachers with regards to their stages of concern about instructional technology and relation to the technology integration into classroom instruction.

I hope to begin data collection the beginning of November 2003 and I am willing to share any information collected with you if you so desire. The use of your survey instrument in my study will greatly assist in the success of my doctoral studies. If I can be of service to you in any capacity, please let me know.

Good morning ...

Attached is the version of the survey that you should use, with necessary adaptations, of course. It supercedes the much earlier (and outdated) version you faxed over to me.

Use the same attribution information noted on that original survey (Bober, Harrison, & Harrison), but change the date to 2001.

In a footnote, you'll need to indicate that the survey was part of a federal *Technology Innovation Challenge Grant* (TICG) entitled *ACT Now!*, implemented in the Sweetwater Union High School District (Chula Vista, California) for a five-year period (1996-2001).

Just an FYI that the survey is described/referenced within several chapters of the following:

Johnston, J., & Barker, L. T. (Eds.) (2002). *Assessing the impact of technology in teaching and learning: A sourcebook for evaluators.* Ann Arbor, MI: University of Michigan, Institute for Social Research.

M.

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San Diego State University
Office: 619.594.0587; Fax: 619.594.6376

APPENDIX D

Tables

Correlations of Stage 0, Awareness

		S3	S12	S21	S23	S30
S3	Pearson Correlation		.076	-.056	.219**	.489**
	Sig. (2-tailed)	1.000	.147	.292	.000	.000
S12	Pearson Correlation			.171**	.338**	.314**
	Sig. (2-tailed)		1.000	.001	.000	.000
S21	Pearson Correlation				-.078	.138**
	Sig. (2-tailed)			1.000	.140	.008
S23	Pearson Correlation					.248**
	Sig. (2-tailed)				1.00	.000
S30	Pearson Correlation					
	Sig. (2-tailed)					1.000

Correlations of Stage 1, Informational

		S6	S14	S15	S26	S35
S6	Pearson Correlation		-.201**	.018	.118*	-.054
	Sig. (2-tailed)	1.000	.000	.762	.025	.308
S14	Pearson Correlation			.510**	.556**	.095
	Sig. (2-tailed)		1.000	.000	.000	.071
S15	Pearson Correlation				.558**	.053
	Sig. (2-tailed)			1.000	.000	.317
S26	Pearson Correlation					-.006
	Sig. (2-tailed)				1.00	.915
S35	Pearson Correlation					
	Sig. (2-tailed)					1.000

Correlations of Stage 2, Personal Concerns

		S7	S13	S17	S28	S33
S7	Pearson Correlation		.525**	.470**	.426**	-.091
	Sig. (2-tailed)	1.000	.000	.000	.000	.083
S13	Pearson Correlation			.533**	.346**	.103
	Sig. (2-tailed)		1.000	.000	.000	.050
S17	Pearson Correlation				.232**	.013
	Sig. (2-tailed)			1.000	.000	.807
S28	Pearson Correlation					.009
	Sig. (2-tailed)				1.00	.860
S33	Pearson Correlation					
	Sig. (2-tailed)					1.000

Correlations of Stage 3, Management Concerns

		S4	S8	S16	S25	S34
S4	Pearson Correlation		.233**	.124*	.086	.007
	Sig. (2-tailed)	1.000	.000	.018	.103	.894
S8	Pearson Correlation			.133*	.581**	.025
	Sig. (2-tailed)		1.000	.011	.000	.639
S16	Pearson Correlation				.096	-.013
	Sig. (2-tailed)			1.000	.069	.799
S25	Pearson Correlation					.024
	Sig. (2-tailed)				1.00	.647
S34	Pearson Correlation					
	Sig. (2-tailed)					1.000

Correlations of Stage 4, Consequence Concerns

		S1	S11	S19	S24	S32
S1	Pearson Correlation		.371**	-.201**	.040	.139**
	Sig. (2-tailed)	1.000	.000	.000	.451	.008
S11	Pearson Correlation			.137**	.442**	.372**
	Sig. (2-tailed)		1.000	.009	.000	.000
S19	Pearson Correlation				.338**	.202**
	Sig. (2-tailed)			1.000	.000	.000
S24	Pearson Correlation					.504**
	Sig. (2-tailed)				1.00	.000
S32	Pearson Correlation					
	Sig. (2-tailed)					1.000

Correlations of Stage 5, Collaboration Concerns

		S5	S10	S18	S27	S29
S5	Pearson Correlation	1.000	.016	.657**	.434**	.205**
	Sig. (2-tailed)		.755	.000	.000	.000
S10	Pearson Correlation		1.000	.051	-.037	.123*
	Sig. (2-tailed)			.338	.479	.019
S18	Pearson Correlation			1.000	.434**	.307**
	Sig. (2-tailed)				.000	.000
S27	Pearson Correlation				1.00	.327**
	Sig. (2-tailed)					.000
S29	Pearson Correlation					1.000
	Sig. (2-tailed)					

Correlations of Stage 6, Refocusing Concerns

		S2	S9	S20	S22	S31
S2	Pearson Correlation	1.000	-.183**	.443**	.109*	.237**
	Sig. (2-tailed)		.000	.000	.037	.000
S9	Pearson Correlation		1.000	.308**	.159**	.214**
	Sig. (2-tailed)			.000	.002	.000
S20	Pearson Correlation			1.000	.298**	.374**
	Sig. (2-tailed)				.000	.000
S22	Pearson Correlation				1.00	.496**
	Sig. (2-tailed)					.000
S31	Pearson Correlation					1.000
	Sig. (2-tailed)					

Frequency of Teacher Instructional Practices Rating

Question Number	Isn't really part of my everyday teaching practice	Is generally a part of my everyday practice	Is fundamentally a part of my everyday practice	Is integral to my everyday teaching practice
1	260	75	14	13
2	54	96	69	143
3	50	111	97	104
4	121	113	60	68
5	14	132	130	26
6	43	60	163	96
7	37	88	109	128
8	42	140	114	66
9	0	146	144	72
10	60	62	148	92
11	164	82	91	25
12	114	94	147	7
13	191	96	66	9
14	247	63	47	5
15	31	102	104	125
16	61	106	122	73
17	58	77	157	70
18	95	131	130	6
19	40	146	175	1
20	0	121	149	92
21	227	76	59	0
22	71	126	165	0
23	80	96	186	0
24	51	139	163	9
25	224	88	49	0

Correlation of Teacher Concerns and Instructional Practices – Question 4

	Application	Software	Proficiency	Impact	Concerns
Concerns					
Pearson Correlation	.000	.050	.042	-.018	1.000
Sig. (2-tailed)	.994	.347	.421	.732	
N	362	362	362	362	362

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Correlation of Stages of Concern and Teacher Beliefs

	DEVELOPING SKILLS	USE OF TECHNOLOGY	TEACHING AND LEARNING	CONCERNS
CONCERNS				
Pearson Correlation	.075	.045	-.023	1.000
Sig. (2-tailed)	.156	.398	.665	
N	362	362	362	362

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Survey Question 1: What is your age?

Age Group	Frequency	Percent	Valid Percent	Cumulative Percent
25-29	68	18.8	18.8	18.8
30-34	74	20.4	20.4	39.2
35-39	61	16.9	16.9	56.1
40-44	73	20.2	20.2	76.2
45-49	26	7.2	7.2	83.4
50-54	18	5.0	5.0	88.4
55-59	39	10.8	10.8	99.2
60+	3	.8	.8	100.0
Total	362	100.0	100.0	

Survey Question 5: How many years have you been teaching?

Years Teaching	Frequency	Percent	Valid Percent	Cumulative Percent
0-9	88	24.3	24.3	24.3
10-19	56	15.5	15.5	39.8
20-29	119	32.9	32.9	72.7
30+	99	27.3	27.3	100.0
Total	362	100.0	100.0	

Survey Question 7: How would you rate your technology experience?

	Frequency	Percent	Valid Percent	Cumulative Percent
Very Little	15	4.1	4.1	4.1
Some	104	28.7	28.7	32.9
More Than Most	217	59.9	59.9	92.8
Very Experienced	26	7.2	7.2	100.0
Total	362	100.0	100.0	

Survey Question 6: What is the highest degree you have completed?

Degree	Frequency	Percent	Valid Percent	Cumulative Percent
Bachelors	222	61.3	61.3	61.3
Masters	140	38.7	38.7	100.0
Total	362	100.0	100.0	

Survey Question 4: What is your total school district enrollment?

District Enrollment	Frequency	Percent	Valid Percent	Cumulative Percent
0-500	253	69.9	69.9	69.9
501-1,000	86	23.8	23.8	93.6
Over 1,000	23	6.4	6.4	100.0
Total	362	100.0	100.0	

Survey Question 2: What grade level(s) do you teach?

Grade Level Teaching	Frequency	Percent	Valid Percent	Cumulative Percent
EC Exclusive	9	1.7	1.7	1.7
KDG Exclusive	14	2.7	2.7	4.4
1st Exclusive	33	6.3	6.3	10.7
2nd Exclusive	25	4.8	4.8	15.5
3rd Exclusive	21	4.0	4.0	19.5
4th Exclusive	11	2.1	2.1	21.6
5th Exclusive	21	4.0	4.0	25.6
Elementary Multi-Level	71	13.6	13.6	39.2
Middle School 6-8	57	10.9	10.9	50.1
High School 9-12	87	16.7	16.7	97.5
K-12 Multi-Level	13	2.5	2.5	100.0
Total	362			

Survey Question 3: What subject area do you teach?

Subject Teaching	Frequency	Percent	Valid Percent	Cumulative Percent
Elementary	180	49.7	49.7	49.7
Reading	28	7.7	7.7	57.5
Math	14	3.9	3.9	61.3
Science	12	3.3	3.3	64.6
Social Studies	30	8.3	8.3	72.9
Language Arts	13	3.6	3.6	76.5
Other	85	23.5	23.5	100.0
Total	362	100.0	100.0	

ANOVA Highest Degree Earned and Teacher Concerns

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	40.917	1	40.917	.126	.723
Within Groups	116663.226	360	324.065		
Total	116704.144	361			

ANOVA School Size and Teacher Concerns

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	512.568	2	256.284	.792	.454
Within Groups	116191.576	359	323.653		
Total	116704.144	361			

ANOVA Grade Level Assignment and Teacher Concerns

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3649.744	10	364.974	1.133	.336
Within Groups	113054.400	351	322.092		
Total	116704.144	361			

ANOVA Subject Area Assignment and Teacher Concerns

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1932.965	6	322.161	.996	.427
Within Groups	114771.179	355	323.299		
Total	116704.144	361			

ANOVA of Highest Degree Earned

	Sum of Squares	Df	Mean Square	F	Sig.
Application of Skills					
Between Groups	.686	1	.686	.068	.795
Within Groups	3650.190	360	10.139		
Total	3650.876	361			
Software					
Between Groups	1.933	1	1.933	.231	.631
Within Groups	3012.011	360	8.367		
Total	3013.945	361			
Proficiency					
Between Groups	.787	1	.787	.135	.713
Within Groups	2093.334	360	5.815		
Total	2094.122	361			
Impact	18.879	1	18.879	.480	.489
Between Groups	14146.691	360	39.296		
Within Groups	14165.569	361			

Total

ANOVA of School Size

	Sum of Squares	Df	Mean Square	F	Sig.
Application of Skills					
Between Groups	15.548	2	7.774	.768	.465
Within Groups	3635.328	359	10.126		
Total	3650.876	361			
Software					
Between Groups	62.127	2	31.064	3.778	.024
Within Groups	2951.817	359	8.222		
Total	3013.945	361			
Proficiency					
Between Groups	17.962	2	8.981	1.553	.213
Within Groups	2076.160	359	5.783		
Total	2094.122	361			
Impact					
Between Groups	15.534	2	7.767	.197	.821
Within Groups	14150.035	359	39.415		
Total	14165.569	361			

ANOVA of Grade Level Teaching

	Sum of Squares	Df	Mean Square	F	Sig.
Application of Skills					
Between Groups	92.349	10	9.235	.911	.523
Within Groups	3558.527	351	10.138		
Total	3650.876	361			
Software					
Between Groups	72.717	10	7.272	.868	.564
Within Groups	2941.228	351	8.380		
Total	3013.945	361			
Proficiency					
Between Groups	60.006	10	6.001	1.035	.413
Within Groups	2034.116	351	5.795		
Total	2094.122	361			
Impact					
Between Groups	335.719	10	33.572	.852	.579
Within Groups	13829.850	351	39.401		
Total	14165.569	361			

ANOVA of Subject Area Assignment

	Sum of Squares	Df	Mean Square	F	Sig.
Application of Skills					
Between Groups	69.411	6	11.568	1.147	.335
Within Groups	3581.465	355	10.089		
Total	3650.86	361			
Software					
Between Groups	42.764	6	7.127	.852	.531
Within Groups	2971.180	355	8.370		
Total	3013.945	361			
Proficiency					
Between Groups	52.777	6	8.796	1.530	.167
Within Groups	2041.345	355	5.750		
Total	2094.122	361			
Impact					
Between Groups	217.192	6	36.199	.921	.480
Within Groups	13948.377	355	39.291		
Total	14165.569	361			

Multiple Comparisons
Dependent Variable: IMPPERF
Tukey HSD

		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) GRADE	(J) GRADE				Lower Bound	Upper Bound
1	2	-.90	1.383	1.000	-5.38	3.59
	3	-2.84	1.218	.415	-6.78	1.11
	4	-3.87	1.259	.080	-7.95	.21
	5	-1.63	1.290	.974	-5.82	2.55
	6	-2.11	1.455	.934	-6.83	2.60
	7	-1.54	1.290	.983	-5.72	2.64
	8	-2.14	1.146	.738	-5.85	1.57
	9	-3.04	1.161	.243	-6.80	.72
	10	-2.97	1.134	.241	-6.65	.70
	11	-2.26	1.404	.876	-6.81	2.28
2	1	.90	1.383	1.000	-3.59	5.38
	3	-1.94	1.033	.730	-5.29	1.40
	4	-2.97	1.081	.182	-6.48	.53
	5	-.74	1.117	1.000	-4.36	2.88
	6	-1.21	1.305	.998	-5.44	3.01
	7	-.64	1.117	1.000	-4.26	2.98
	8	-1.24	.947	.966	-4.31	1.83
	9	-2.14	.966	.492	-5.27	.99
	10	-2.08	.932	.487	-5.10	.94
	11	-1.37	1.247	.991	-5.41	2.67

Tukey HSD IMPPERF

		Mean Difference	Std. Error	Sig.	95% Confidence Interval	
(I) GRADE	(J) GRADE				Lower Bound	Upper Bound
3	1	2.84	1.218	.415	-1.11	6.78
	2	1.94	1.033	.730	-1.40	5.29
	4	-1.03	.859	.982	-3.81	1.75
	5	1.20	.904	.963	-1.73	4.13
	6	.73	1.127	1.000	-2.93	4.38
	7	1.30	.904	.938	-1.63	4.23
	8	.70	.682	.995	-1.51	2.91
	9	-.20	.708	1.000	-2.50	2.09
	10	-.13	.662	1.000	-2.28	2.01
	11	.57	1.060	1.000	-2.86	4.01
4	1	3.87	1.259	.080	-.21	7.95
	2	2.97	1.081	.182	-.53	6.48
	3	1.03	.859	.982	-1.75	3.81
	5	2.24	.959	.414	-.87	5.34
	6	1.76	1.172	.918	-2.04	5.56
	7	2.33	.959	.349	-.77	5.44
	8	1.73	.753	.436	-.71	4.17
	9	.83	.777	.993	-1.69	3.35
	10	.90	.735	.980	-1.48	3.28
	11	1.61	1.107	.934	-1.98	5.19
5	1	1.63	1.290	.974	-2.55	5.82
	2	.74	1.117	1.000	-2.88	4.36
	3	-1.20	.904	.963	-4.13	1.73
	4	-2.24	.959	.414	-5.34	.87
	6	-.48	1.205	1.000	-4.38	3.43
	7	.10	.999	1.000	-3.14	3.33
	8	-.50	.804	1.000	-3.11	2.10
	9	-1.41	.827	.834	-4.08	1.27
	10	-1.34	.787	.835	-3.89	1.21
	11	-.63	1.143	1.000	-4.33	3.07
6	1	2.11	1.455	.934	-2.60	6.83
	2	1.21	1.305	.998	-3.01	5.44
	3	-.73	1.127	1.000	-4.38	2.93
	4	-1.76	1.172	.918	-5.56	2.04
	5	.48	1.205	1.000	-3.43	4.38
	7	.57	1.205	1.000	-3.33	4.48
	8	-.03	1.049	1.000	-3.43	3.37
	9	-.93	1.066	.999	-4.39	2.53
	10	-.86	1.036	.999	-4.22	2.50
	11	-.15	1.327	1.000	-4.45	4.14

Tukey HSD IMPPERF

		Mean Difference	Std. Error	Sig.	95% Confidence Interval	
(I) GRADE	(J) GRADE				Lower Bound	Upper Bound
7	1	1.54	1.290	.983	-2.64	5.72
	2	.64	1.117	1.000	-2.98	4.26
	3	-1.30	.904	.938	-4.23	1.63
	4	-2.33	.959	.349	-5.44	.77
	5	-.10	.999	1.000	-3.33	3.14
	6	-.57	1.205	1.000	-4.48	3.33
	8	-.60	.804	1.000	-3.21	2.01
	9	-1.50	.827	.770	-4.18	1.18
	10	-1.43	.787	.767	-3.98	1.12
	11	-.73	1.143	1.000	-4.43	2.98
8	1	2.14	1.146	.738	-1.57	5.85
	2	1.24	.947	.966	-1.83	4.31
	3	-.70	.682	.995	-2.91	1.51
	4	-1.73	.753	.436	-4.17	.71
	5	.50	.804	1.000	-2.10	3.11
	6	.03	1.049	1.000	-3.37	3.43
	7	.60	.804	1.000	-2.01	3.21
	9	-.90	.576	.896	-2.77	.96
	10	-.83	.518	.877	-2.51	.84
	11	-.13	.977	1.000	-3.29	3.04
9	1	3.04	1.161	.243	-.72	6.80
	2	2.14	.966	.492	-.99	5.27
	3	.20	.708	1.000	-2.09	2.50
	4	-.83	.777	.993	-3.35	1.69
	5	1.41	.827	.834	-1.27	4.08
	6	.93	1.066	.999	-2.53	4.39
	7	1.50	.827	.770	-1.18	4.18
	8	.90	.576	.896	-.96	2.77
	10	.07	.552	1.000	-1.72	1.86
	11	.78	.995	.999	-2.45	4.00
10	1	2.97	1.134	.241	-.70	6.65
	2	2.08	.932	.487	-.94	5.10
	3	.13	.662	1.000	-2.01	2.28
	4	-.90	.735	.980	-3.28	1.48
	5	1.34	.787	.835	-1.21	3.89
	6	.86	1.036	.999	-2.50	4.22
	7	1.43	.787	.767	-1.12	3.98
	8	.83	.518	.877	-.84	2.51
	9	-.07	.552	1.000	-1.86	1.72
	11	.71	.963	1.000	-2.41	3.83

Tukey HSD IMPPERF

		Mean Difference	Std. Error	Sig.	95% Confidence Interval	
(I) GRADE	(J) GRADE				Lower Bound	Upper Bound
11	1	2.26	1.404	.876	-2.28	6.81
	2	1.37	1.247	.991	-2.67	5.41
	3	-.57	1.060	1.000	-4.01	2.86
	4	-1.61	1.107	.934	-5.19	1.98
	5	.63	1.143	1.000	-3.07	4.33
	6	.15	1.327	1.000	-4.14	4.45
	7	.73	1.143	1.000	-2.98	4.43
	8	.13	.977	1.000	-3.04	3.29
	9	-.78	.995	.999	-4.00	2.45
	10	-.71	.963	1.000	-3.83	2.41