PROFESSIONAL DEVELOPMENT AS A MEANS TO INCREASING TEACHERS'

SELF-EFFICACY FOR TECHNOLOGY INTEGRATION

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PROFESSIONAL DEVELOPMENT AS A MEANS TO INCREASING TEACHERS' SELF-EFFICACY FOR TECHNOLOGY INTEGRATION

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VITA

Carol Kay (Carson) Gaither, daughter of Arthur James (Kit) and Myra (Dorris) Carson, was born December 22, 1952, in Pineville, Louisiana. She graduated from Berry High School in Birmingham, Alabama in 1971. She attended Auburn University and graduated with a Bachelor of Science Degree in Elementary Education and a concentration in music in 1974. She graduated from Troy State University in 1996 with a Master of Education Degree in Elementary Education. She was employed with the Birmingham City School System from 1974–1981, where she taught at Wenonah Elementary School. She began teaching with the Eufaula City School System in 1983 where she was a classroom teacher for eight years at Eufaula High School, seven years at Admiral Moorer Middle School, and has worked for the past six years as an Instructional Technologist for the school system.

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DISSERTATION ABSTRACT

PROFESSIONAL DEVELOPMENT AS A MEANS TO INCREASING TEACHERS' SELF-EFFICACY FOR TECHNOLOGY INTEGRATION

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The purpose of this study was to explore the importance of the integration of technology into educational classrooms and why teachers are reluctant to embrace this integration. Further, this study systemically evaluated the effects of professional development on teacher change in beliefs in and use of the given workshop focus (technology) and on learning outcomes in participant's classroom. The Stages of Concern Questionnaire (SOCQ) was administered to a treatment group of teachers who agreed to participate in a 40-hour workshop of intense technology training and to a control group of teachers who attended other technology workshops on a volunteer basis.

Data were analyzed with the statistical software SPSS for Windows version 11.0. Two one-way repeated measures of Analysis of Variance (ANOVA) at the simple effect level were performed to examine the mean differences between the treatment group and the control group. The analysis results indicated a significant increase for the treatment group mean scores on the personal subscale and no significant increase or decrease for the control group. No significant differences (p = .05) occurred between the control group and the treatment group indicating that 40-hours of intense technology training may not be the answer to technology training for teachers. The data indicated an increase in all of the subscales, from pre-test to post-test, for the treatment group. The intense technology training workshop helped improve the integration of technology in the classrooms of the teachers who attended the workshop, but not to the extent that this workshop is the best way to provide professional development.

Style manuals or journals: *Publication Manual of the American Psychological Association,* 2001 (Fifth Edition).

Computer software: Microsoft® Word 2002 and SPSS (Statistical Package for Social Sciences) for Release 11.0.

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I. NATURE OF THE PROBLEM

Introduction and Background

Since the 1983 publication of *A Nation at Risk* by the National Commission on Excellence in Education, a strong emphasis has been placed on reforming education, including recommendations for integrating technology into instruction. While technology funding for school reform increased during the later part of the 1980's, instruction in classrooms of the early 1990's was still being provided by teachers using lectures, textbooks, and passive learning techniques (Kromhout & Butzin, 1993). Research findings by Marcinkiewicz, (1993/1994) showed that regardless of the number of computers available in schools, teachers typically underutilized them.

Research findings supported the modification of teacher training programs because teachers needed to learn ways to effectively use computers in order to achieve effective integration of technology into the classroom (Molebash & Milman, 2000). In 1993 the United States Department of Education mandated the integration of technology into the educational process for pre-service teachers through the development of technology standards. The International Society for Technology in Education (ISTE) served as the framework for, formed the department's plan, and developed the first set of technology standards used to integrate technology into instruction. In 2002 the National Educational Technology Standards (NETS) for Teachers were published and became the nationally recognized technology standards for teachers, replacing the ISTE Standards.

These standards also state that technology integration should start with pre-service teachers at the college level if they are to be adequately prepared (International Society for Technology in Education, 2002).

During the past twenty years, research has been conducted on integrating technology into the curriculum, teachers' attitudes toward computers, and student achievement through computer use in education. Hadley and Sheingold (1993) conducted a nationwide survey of teachers with experience integrating computers into the classroom. Based on an analysis of patterns, they developed five profiles reflecting characteristics of the participating teachers. These profiles included (a) enthusiastic beginners, (b) supported integrators, (c) high school naturals, (d) unsupported achievers, and (e) struggling aspirers. Another research (Evans-Andris, 1995) involved teachers whose schools had computers for at least five years. The findings revealed teachers shape their interaction with computers through their style of computing. For example, the three computing styles noted in this research were avoidance (60%), integration (28%), and technical specialization (8%).

Cafolla and Knee (1995) used an instructional transformation model to describe stages that reflected levels of technology integration. The five stages were noted as (a) familiarization, (b) utilization, (c) integration, (d) reorientation, and (e) evolution. Russell (1995) also presented stages of technology integration, and according to his research, adults learning new technology pass through the following six stages when becoming confident technology users: (a) awareness, (b) learning to process,
(c) understanding and application of the process, (d) familiarity and confidence,
(e) adaptation to other contexts, and (f) creative applications to new contexts.

Several studies have reported on teachers' knowledge of computers and their attitudes toward using computers. These studies found teachers' attitudes toward technology are an important component of the integration of technology into the classroom (Stein & Wang 1988), and teachers' attitudes toward technology have sometimes been overlooked (Christensen, 1998). Lillard (1985) surveyed teachers in Warren County, Pennsylvania, and found teacher knowledge of technology had a positive impact on teacher attitudes toward technology. Koohang (1987) reported computer experience was significant regarding teachers' attitudes toward computers, and he recommended computer experience be provided for pre-service teachers prior to their involvement in teaching. Summers (1988) stated one of the most common reasons for teachers' negative attitudes toward technology is their lack of knowledge of and experience with technology. Another study has shown teachers who were trained in technology coursework were more likely to use computers for their personal use and were also more likely to integrate computers into the classroom (Hochman, Maurer, & Roebuck, 1993).

Christensen (1998) also studied the effect of technology integration on teachers' attitudes toward information technology. She found when teachers gain knowledge of technology, their anxieties and fears tend to diminish and their self-assurance improves. Findings of her research noted it is possible for perceptions of the potential usefulness of computers to influence teachers' attitudes toward computers and the amount of confidence a teacher possesses in using technology may greatly influence his/her effective implementation of computers in the classroom. Teachers are the main gatekeepers allowing educational innovations to diffuse into classrooms, and therefore, one of the key factors for effective integration of computers in a school's curriculum is adequate preparation of teachers for utilizing and managing these tools in their daily instructional practices.

Educators are often resistant to using computer technology in the classroom (Christensen, 1998). Hsiung (2001) stated teachers' attitudes have not been considered when introducing computers into the classroom and recognized positive teacher attitudes toward computers are necessary for effective use of information technology in the classroom. Schunk (1991) reported teachers' attitudes are directly related to their self-efficacy which is the belief in one's ability to use technology and provide it for students in the classroom in a way that will enhance curriculum. Alexiou-Ray, Wilson, Wright, and Peirano (2002) concluded some educators assume once appropriate technological tools are in place in the classroom, students and teachers will change their attitudes toward technology and will overwhelmingly support the change toward a technologically based curriculum.

In research conducted to learn how teachers relate to technology, Martin, Heller, and Mahmoud (1992) found there must be teacher acceptance of technology to effectively integrate technology into the classroom. They also found there is more to technology integration than just installing computers in the classroom. For example, they found that in a classroom where technology is not taught as an individual class, but the integration of technology is evident, teachers and students were able to use technology to augment all areas of the teaching and learning process. Their findings also reported that while funds have been provided to place computers in schools and educators have recognized the effects new technology has on student learning, it is important for policy makers, educators, and researchers to understand how teachers relate to technology. With significant increases in funds allocated to technology training, Martin, Heller, and Mahmoud further recommended studies be conducted to determine the types of instruction that will prepare teachers to effectively integrate technology into the classroom.

Three major points for designing a professional development program for supporting technology integration into curriculum have been reported in the literature. First, the design of the professional development program or workshop should be created around teachers' concerns and needs, their beliefs about teaching and learning, and their views of technology. Second, the professional development program should provide a contextual learning environment which supports a network for teachers, such as the use of mentors. Finally, more research and instrumentation are needed to determine how teachers define technology and to determine how to measure teachers' levels of technology integration (Hsiung, 2001).

In his study of a professional development program and the level of technology integration of middle school teachers in New Jersey, Guenther (2002) stated technology has the power to engage students in higher levels of Bloom's Taxonomy -- analysis, synthesis, and evaluation. He found schools have noted improvement in student motivation and attendance, and a decrease in drop out rates and discipline problems because technology transformed the teaching and learning process. Teachers who used technology-based lessons generally guided their students to pursue their own inquiries and access information from multiple sources. Guenther also identified teachers' attitudes as well as expertise in using computers as major factors in the adoption of computers in the classroom and concluded it is critical for teachers to possess both positive attitudes and adequate computer literacy skills to successfully integrate technology. He further reported that teacher technology competence appears to present one of the greatest challenges to fully implementing the benefits of technology, and this lack of technology training is consistent throughout the profession regardless of teacher age or experience.

Some computer companies have developed intense technology workshops to facilitate the changing of teachers' attitudes about technology integration. These workshops last for forty or more hours using hands-on instruction. The training consisted of instruction on the effective use of technology in the classroom; and focused on the ways students and teachers can use technology to enhance learning through research, communication, and productivity strategies and tools. The workshops provided an emphasis on "hands-on" learning and the creation of curricular units and evaluation tools which address state and national academic and technology standards and offered ways to promote engaging opportunities for students through access to technology. Teachers were encouraged to work in teams, problem-solve, and participate in peer reviews of their units (Adkin, 2001).

Student use of technology in the classroom has been shown to enable them to become reflective and critical learners as they find, organize, and interpret information (National Council for Accreditation of Teacher Education, 2000). These skills are seen as essential to lifetime success (Morgan, 1996). In a related study, teachers and principals reported 42 % of the variation in students' math scores and 12 % of the variation in students' English scores could be attributed to an increased use of technology (Mann & Shafer, 1997). Viadero (1998) also reported students in classrooms equipped with technology were writing more, were becoming independent thinkers, were self starters, worked collaboratively, and developed positive attitudes and spontaneity.

The use of technology has become more prevalent in education with each new school year since the 1990's. The pedagogical and curricular impacts of technology usage cannot be ignored. Recent research has shown vast changes are taking place in schools. Symonds (2000) asserted the high school of 2018 will look very different because it will be "High Tech High" (p. 190). Bennett (2002) addressed the changes that must take place for technology usage to make a difference in curriculum design and start the alteration to Symond's "High Tech High." He suggested changes in the roles of teachers and students and that their use of computers in the classroom would alter how the delivery and remediation of lessons would be provided. Specifically, teachers would become facilitators and mentors while the students would learn to interact collaboratively with the technology and teachers (Bennett, 2002; Dooling, 2000). Harris (2002) noted educators would need to be able to accept the changes taking place and support students as their roles change.

Addressing the issues dealing with technology integration training for teachers must be a priority before the aforementioned changes can take place. Technology cannot be part of the total curriculum without teachers having the tools and knowledge about how to integrate technology into their classrooms. Corcoran (1999) also noted the in-service provided in schools must be relevant and recurring for proper training in technology to be attained. Diem (2000) maintained few teachers actually use computers themselves due to the lack of support and little free time to learn the operation of technological devices. Technical support for teachers needs to be improved because "teachers who are supported are less likely to feel threatened and develop more positive attitudes toward technology, and teachers who are supported are more likely to become proficient users of technology in the classroom" (Diem, 2000, p. 495).

The research of Collier (2001) has reported many teachers who have been introduced to computers and encouraged to use them, have not been given the chance to provide suggestions for types and kinds of training. The Stages of Concern Questionnaire (SoCQ) dimension of the Concerns Based Adoption Model (CBAM) is an instrument used to survey teachers on the concerns of individuals involved in change (Hall, George, & Rutherford, 1979). Research has identified seven kinds of concerns that users, or potential users, of an innovation may have (Hall et al., 1979). These concerns are organized into the seven stages are awareness, informational, personal, management, consequence, collaboration, and refocusing.

Technology has become a vital part of life in the 21st century and a fundamental part of the educational community. Whether the mission is to explore resources of information, follow a chemistry experiment, write a short story, develop lesson plans, test a math concept, examine a dissimilar culture, or compile grades, technology has become a more important part of the teaching and learning process. Technology integration into the curriculum has become essential in preparing educators to teach in the 21st century (Burkholder, 1995; Bennett, 2002).

Purpose of Study

This study explored the importance of the integration of technology into educational classrooms and teacher self-efficacy as it pertains to the integration of technology. The amount of computer use, attitudes toward computer use, and factors associated with computer use or attitude toward computer use were studied. Many teachers who have been introduced to computers, who have been encouraged to use them, and who have been trained in their use are not making use of computers for instructional purposes. Even when classrooms have been equipped with computers, many teachers have not been using computers for significant instructional and educational advantages.

Research Questions

The following research questions were designed to address the purpose of this study:

1. Does an intense technology training workshop of 40 hours influence teachers' perceptions on technology integration into the classroom?

2. Is there a statistically significant difference in any of the stages between the teachers who participated in the intense technology training workshop and those who did not?

Hypotheses

The following hypotheses are presented in relation to the research questions:

1. The intense technology training workshop does not influence teachers' perceptions on technology integration into the classroom.

2. There will be no statistically significant difference in the stages between the teachers who participated in the intense technology training workshop and those who did not.

Methods

This study explored the importance of the integration of technology into educational classrooms and reasons why teachers are reluctant to embrace this integration. The amount of computer use, attitudes toward computer use, and factors associated with computer use or attitude were studied. Many teachers who have been introduced to computers, encouraged to use them, and who have been trained in their use have not been using computers for instructional purposes (Collier, 2001) even though classrooms have been equipped with computers that are not being used for significant instructive and educational advantage.

Data regarding teachers' interests in technology and how technology was being used in the classroom were gathered through individual teacher surveys. Data were analyzed statistically to determine the types of professional development that improve teacher self-efficacy with technology integration and the methods for presenting professional development program that would encourage teachers to use computers to enhance instruction.

This study sought to elucidate why many teachers who have been introduced to computers and have received training in the use of computers have been reluctant to use computers in their classroom to enhance instruction through the integration of technology in the curriculum. An objective of this study was to find methods of training that would be helpful to motivate teachers to use technology effectively. Motivating teachers to use technology in the classroom has been a hurdle trainers have tried to overcome for years. If a teacher cannot see the relevance of using technology in their classroom and are not shown how s/he can use it, then the teacher will not be motivated to attend additional training sessions and technology infusion in the classroom will take many years to complete.

One purpose of the study was to evaluate one professional development technology training program's implementation to determine its effectiveness. The research base for this study suggested that the professional development experience related to the participants' current work setting, the perceived quality of the professional development experience, and the extent of participation in professional development impacts a workshop's effectiveness. Effectiveness outcomes include increased teacher beliefs that technology enhances learning, increased use of technology, and improved student learning.

Description of Sample

The sample was collected from a possible 259 teachers who teach in an urban school system. One hundred and three teachers responded to the survey. Thirty-two participants were male and 71 were female. A treatment group, consisting of 20 females who signed up for the 40-hour workshop of intense training in technology integration, was surveyed separately, before and after the intense training. Generalizability was limited by the use of such a sample, but the sample size was large enough to avoid some of the generalizability problems caused by small size (n=30) in the 1993 Pajares and Johnson study of self-efficacy and outcome expectations. Although they stated that correlational studies do not require extremely large samples, Ary, Jacobs, and Razavieh (1996) did not recommend samples with fewer than 30 participants. The sample was reasonably homogenous, as recommended by Gall, Borg, and Gall (1996), to ensure that relationships between variables were not obscured by participants who vary widely from each other. It was a convenience sample. The characteristics of the sample are described in detail in Chapter Four.

To gather the data about teachers' concerns for technology integration in the classroom, each teacher was given a Survey of Concerns Questionnaire (SoCQ) (Hall, George, & Rutherford, 1979) to self-evaluate teacher self-efficacy as it pertains to technology and the use of technology in the classroom. The survey was administered at the beginning of a school year before any professional development training had been conducted. The same survey was given a second time at the end of that year to see if each teacher's responses had changed after a year of technology training through professional development workshops. Each teacher is required by the school system to obtain twenty professional development hours each school year. Of those twenty hours, at least five hours must be acquired in technology training. Workshops were made available to all teachers each month. The workshops were designed to meet these professional development requirement needs and to help integrate technology into the classroom. Every teacher in the system was given the opportunity to register for technology training. A statistical analysis was performed on the survey data to determine if the participating teachers felt the workshops provided during the year helped improve their self-efficacy in the use of technology in general and technology integration into the curriculum specifically.

Definition of Terms

Co-Mentoring – A term to describe when two people mentor each other in their areas of expertise.

Concerns – The composite representation of feelings, preoccupation, thought, and consideration given to a particular issue (Hall & Hord, 1987).

Intense Technology Training Workshop – Forty hours of hands-on instruction delivered via ten modules. The modules consisted of instruction on the effective use of technology in the classroom; focused on the ways students and teachers can use technology to enhance learning through research, communication, and productivity strategies and tools; provided an emphasis on "hands-on" learning and the creation of curricular units and evaluation tools which address state and national academic and technology standards; offered ways to promote engaging opportunities for students through access to technology; and encouraged teachers to work in teams, problem-solve, and participate in peer reviews of their units.

Mentor – A wise and trusted counselor or teacher who can instruct or model his/her expertise for another.

Project-based Learning – A method of learning based on the following ideas: using real-world problems as a base of learning ideally using multiple content areas; an opportunity for students to make active investigations enabling them to learn concepts, apply information, and represent their knowledge in a variety of ways; collaboration among students, teachers, and others in the community so knowledge can be shared and distributed between the members of the "learning community"; the use of cognitive tools in learning environments that support students in the representation of their ideas: use of cognitive tools such as computer-based laboratories, hypermedia, graphing applications, and telecommunications (Blumenfeld, Krajcik, Marx, & Soloway, 1994).

Technology Integration in Schools – The use of computers and other technologies to reinforce interdisciplinary instruction by focusing on outcomes, peer-based instruction, teachers as mentors, team teaching, project-oriented learning, attention to individual learning styles; bringing students and teachers into contact with people and places they would otherwise never have met or visited through e-mail; dramatically expanding the classroom resources by making the latest information, graphic images, and software available at the click of a mouse; and encouraging independent autonomous learning, which most educators agree helps students become lifelong learners.

Stages of Concern – The sequential stages through which one progresses when faced with change (Hall, 1978).

Stages of Concerns Questionnaire (SoCQ) – A questionnaire focusing on the concerns of individuals involved in change (Hall, George, and Rutherford, 1979). Research has identified seven kinds of concerns that users, or potential users, of an innovation may have. These concerns are organized in the model as Stages of Concern. The seven stages are awareness, informational, personal, management, consequence, collaboration, and refocusing.

Teacher Self-Efficacy with Technology – The belief in one's ability to use technology and provide it for students in the classroom in a way that will enhance curriculum.

Technology Professional Development – Training classroom teachers about how to promote project-based learning and effectively integrate the use of computers into their existing curriculum so students will increase their levels of learning and achievement.

Teacher Buy-In – A term to describe the process of having teacher input and teacher backing or interest for a new innovation or change.

Limitations

The study was conducted with the following limitations acknowledged:

1. The representation of the sample was limited by the voluntary participation of teachers in the school system.

2. The accuracy of the data collected relies on the honesty of the subjects' responses and their accuracy and degree of completeness provided on the Stages of Concern Questionnaire.

3. The data collection was limited to one urban school system.

4. Only K-12 teachers were included in the study.

Assumptions

The following assumptions were made in regard to this study:

1. The subjects provided honest, accurate, and complete answers to the Stages of Concern Questionnaire.

2. The use of one school system in Alabama provided enough data for the study.

3. Participants understood the instrument.

4. The Stages of Concern Questionnaire (SoCQ) was the appropriate tool for this study.

5. Participants responding to the survey were representative of technology-using teachers in the United States.

II. REVIEW OF LITERATURE

Introduction

This study explored the importance of the integration of technology into educational classrooms and reasons why teachers are reluctant to embrace this integration. The amount of computer use, attitudes toward computer use, and factors associated with computer use or attitude were studied. Many teachers who have been introduced to computers, encouraged to use them, and who have been trained in their use have not been using computers for instructional purposes (Collier, 2001). Classrooms have been equipped with computers that are not being used for significant instructive and educational advantage.

Rakes and Casey (2002) found that teachers need to understand the innovation of technology integration and be trained in how to integrate technology into their classroom, not just learn how to use computers and computer programs. They stated that it is very important for teachers to receive personal support and training for the integration of technology to take place and that the more training and experience teachers have integrating technology into the curriculum, the sooner they accept and optimally use technology.

The review of literature explored the benefits of technology in the educational setting; the problems with the implementation and use of technology and why teachers were not using technology in their classrooms; what school expectations were and why these expectations have failed to motivate teachers to use technology; the need for professional development to be provided for teachers and why each school system needed an individual professional development plan; how using technology could enhance professional development; two theoretical frameworks supplying reasons why technology could enhance instruction; sources of self-efficacy for teachers; and teachers beliefs about their effectiveness in using technology to enhance instruction in the classroom. Each of these areas helped to frame or inform the study and/or interpretation of the findings.

The Educational Benefits of Technology

Many benefits for integrating technology in the classroom have been noted by both teachers and students. For example, researchers have found that technology can assist teachers with their clerical tasks and thereby allow for more instructional time. Further, educators have discovered computers can enhance children's learning through the individualization of student instruction (Bohlin, 1998). Technology use has helped promote effective instruction by encouraging the development of higher-order thinking and information-reasoning skills among students (Kromhout & Butzin, 1993). Technology has helped learning become more student-centered, interdisciplinary, more closely related to real-life events and processes, and adaptive to individual learning styles, all of which are increasingly required in today's knowledge-based global economy (Carlson & Gadio, 2002). Mann (1994) stated that technology can be used to motivate educational reform and promote teacher professional development if teachers use technology-enhanced materials to meet students' needs. Guenther (2002) noted that technology is changing rapidly; it is dynamic; and it holds potential for all segments of society.

Guenther (2002) further reported that although requiring little space, technology has been used to provide access to a wealth of informational resources that cannot be matched by local libraries and resource rooms. Through electronic texts, CD-ROMs, the Internet, and computer networks, students have been able to access rapidly changing information potentially transforming the teaching and learning process. Teachers who used technology-based lessons could guide students to pursue their own inquiries and access information from multiple sources.

Within the last century, technology advanced from electromechanical computers in 1944 to transistor computers in 1959 to integrated circuit computers in 1964 to the microcomputers used today (Bitter & Pierson, 2002). Bitter and Pierson (2002) stated that the increase in technology use within the last ten years can be attributed to the availability of microcomputers and how the World Wide Web has amplified the information it can provide, especially in education and educational research. In 1996 President Clinton challenged the nation in his State of the Union Address to ensure that every classroom is "connected to the information superhighway with computers and good software and well trained teachers." Many schools have installed more computers and provided more curricular materials related to the use of technology; however, these technological tools have not become integrated into the curriculum (Bitter & Pierson, 2002).

Ariza, Knee, and Ridge (2000) reported findings which confirmed that technology integration is effective in the classroom, but that teachers have not been consistently using these technologies. Although our country has invested millions of tax dollars into instructional technologies, many students are still being taught the curriculum without using these tools (Ariza, Knee, & Ridge, 2000).

According to the U. S. Department of Education (2000), less than 20% of American teachers felt adequately equipped with the skills necessary to integrate technology into their classrooms. Therefore, although technology offers the potential to enhance and improve the students' learning experience, there has been a lack of consensus on how to combine computers with other learning tools (Woodbridge, 2003).

Since the release of *America 2000: An Education Strategy* (U.S. Department of Education, 2000), a new direction has been established for our educational system. Several states have authorized laws requiring teachers to implement new technologies in the classroom. Many other states developed new curriculum standards requiring computer literacy as a basic skill. Teachers have been given more responsibility for carrying out the curriculum requirements, including technology; however, teacher guidelines for how to integrate technology are often written without any input from teachers. Schools administrators have been rushing to put computers in every classroom regardless of the degree of teacher "buy-in." In response to the call to prepare teachers to teach with technology (Office of Technology Assessment, 1997), standards have been created and implemented, detailing how teachers should be able to use technology in the classroom to plan and design learning environments and experiences, as well as to support teaching, learning, and the curriculum (INTASC, 1992, ISTE, 2002).

The "2000 Report on the Effectiveness of Technology in Schools" reported education technology has increased student achievement, enhanced student self-concept and attitude about learning, and improved interaction involving educators and students in the learning environment (SIIA, 2000). The report also states that students are more successful in school, are more motivated to learn, and have increased self-confidence and self-esteem when technology is present in the educational environment (Software and Information Industry Association, 2000). Technology has been shown to be a catalyst for successful collaborative learning and teamwork in small groups and provides a way for students who seldom participate in class discussions to become more involved in the learning process (SIIA, 2000).

"Technology improves teaching and learning, but the simple addition of computers in schools does not directly translate to higher test scores and never will." (SIIA, 2000, pg. 44). "The process of technology integration into the curriculum is just as important as the technology itself" (SIIA, 2000). Variables identified in the report that influence the effectiveness of education technology include attributes of the student population, software design, the educator's role, student grouping, educator training, and the level of student access to technology. The leading variable is educator training, as students of teachers with more than ten hours of training significantly out-perform students of teachers with five or fewer training hours (SIIA, 2000).

Problems with the Implementation and Use of Technology

True technology integration, involving students in the construction of their own learning while using both hardware and software tools and allowing for student-centered approaches for both teacher and student, has been rare (Hsiung, 2001). Pierson (2001) argued educational reform efforts should not only focus on acquiring more machines for classrooms but also on developing teaching strategies that complement technology use within the curriculum. Integrating technology into the teaching-learning transaction has been found to transform the teacher's role from being the traditional "sage on the stage" to also being a "guide on the side", and student roles can also change from being passive receivers of content to being more active participants and partners in the learning process. The transition from teacher-directed to more student-centered instruction has coincided with the shift from predominately behaviorist to more constructivist approaches to learning (Jacobsen, 2001).

While technology integration can have many benefits, many challenges regarding the integration of technology have become evident. Some of the challenges noted include reluctance, lack of time, lack of teacher training, and lack of motivation. Carlson and Gadio (2002) stated teachers are generally reluctant to change their teaching styles and habits, are cautious of time-consuming activities that may take away from other high-priority obligations, have difficulty beforehand seeing the potential payoff of technology training, and may feel so threatened by technology they want to distance themselves from it rather than embrace it. Even so, there have been a growing number of faculty who are enthusiastic about adopting technology because of the potential benefits for their students, there has remained a large number of mainstream faculty who seem hesitant or reluctant to adopt technology use for their tasks (Jacobsen, 2001).

Johnson and Liu (2000) stated that while everybody has been talking about technology integration, few practicing teachers profess knowing how to proceed. These researchers noted real technology integration requires change; however, what seems to be lacking has been a model teachers can use to guide them through the necessary changes they will need to make to be successful when integrating new technology into their classrooms. Even as school administrators have been busily placing computers in classrooms, a large percentage of educators remain reluctant and skeptical, lacking the necessary skills and self-efficacy to effectively use them.

Barriers to Technology Integration

Although the integration of technology has been proven to be effective in classrooms, a review of the literature showed the number of teachers who integrate technology remained very low (Hadley & Sheingold, 1993). Woodbridge (2003) reported technology integration means viewing technology as an instructional tool for delivering subject matter in the curriculum already in place. Educators need to understand technology integration more completely (Woodbridge, 2003). Research has shown that as many as 70 % of the teachers in American schools have been labeled "reluctant" when it comes to using computers and other technologies. Identified barriers to teacher use of technology include lack of a definition for technology integration, teacher perceptions, access, teacher self-efficacy, a lack of training and support, school expectations and lack of computer experience (Brickner, 1995).

Teachers' perceptions of the integration of technology could be greatly enhanced if there were a universal definition for technology integration. Researchers have found several different opinions regarding what teachers should know about technology, how it should be used, and how much it should be used in the classroom. Willis and Mehlinger (1996) argued that a lack of universal agreement about what teachers should know is a major reason why technology is not being integrated into the curriculum. Hsiung (2001) stated that teachers think they will not be able to successfully integrate technology because they do not truly understand the concept of integration. The lack of a universal definition for technology integration has become a barrier for the integration of technology in the classroom.

Perception of Integration

A review of the literature found two major categories of teachers' perceptions: experience with integration and knowledge about integration (Hazzan, 2000). Hsiung (2001) reported teachers are practical and often autonomous individuals. They may not mind learning new skills, such as how to use the computer, but they desire flexibility and control in implementing those skills. Teachers want to personalize the lessons they teach and decide for themselves which tools they should use.

Guenther (2002) found that most teachers are inadequately prepared to implement technology-based lessons. Teachers' perceptions of the nature of technology have been shown to also be a barrier to technology integration (Ertmer & Hruskocy, 1999). Teachers who were educated through more traditional methods tend to question the role of technology and may feel insecure with integrated instruction (Hazzan, 2000). Slough and Chamblee (2000) reported teachers who have had positive experiences with using technology tend to teach their students with technology. These beliefs about technology use have not been experienced by many of those teachers who did not grow up with computers. Lack of experience can become an obstacle to the integration of technology into the classroom.

A lack of knowledge about technology can also be an obstacle to technology integration in the classroom. Coffland (2000) found that teachers who do not know about technology tend to let their perceptions of integration be affected by this lack of knowledge and that teachers who have higher levels of awareness about technology tend to have better attitudes toward using technology. This lack of knowledge is not the only factor, but the lack of knowledge of methods to integrate technology into the curriculum contributes to the lack of use of technology in the classroom (Ertmer & Hruskocy, 1999). Ertmer and Hruskocy (1999) affirmed that because of the ever changing nature of technology, teachers are often reluctant about embracing its use and less likely to integrate technology into their lesson plans.

Access

Access to technology has also been shown to be a barrier to the integration of technology. Guenther (2002) reported that teachers with a larger number of computers available in classrooms demonstrate greater and more sophisticated use of technology to support the teaching and learning process, and they used computers more frequently than teachers with access to computer labs with fifteen or more computers. In 1999 the National Center for Educational Statistics reported 53% of teachers used computers or the Internet for instruction in the classroom. Word processing and spreadsheet functions were the applications most frequently used by teachers. Computer use in the classroom for Internet research, drills, and problem solving was reported by approximately 50% of the teachers. However, a majority of the teachers participating in the survey reported using these applications to a moderate or small extent with their students (Smerdon, Cronin, Lanahan, Anderson, Ionetti, & Angeles, 2000). Many schools had access problems including a limited number of adequate equipment and lack of access to educational software (Smerdon et al., 2000). When faced with these problems of access, teachers found it harder to integrate technology into their classes (Smerdon et al., 2000). Scheduling computer labs for student use during class time was also found to be difficult.

Access problems have been noted as a barrier for such use, both for the teachers who use technology, as well as for facilitating the integration of technology into the curriculum.

Teacher Self-Efficacy

Teacher self-efficacy in the context of technology integration in the classroom has been defined as the belief in one's ability to use technology and provide it for students in the classroom. Teachers' past experience with technology affects their beliefs about their ability to integrate technology. Experience in both learning with technology and teaching with technology greatly affected teachers' confidence in integrating technology (Hsiung, 2001). Molebash and Milman (2000) reported confidence in computer use is highly related to technology use in the classroom.

Training and Support

Technology training has been recommended as one way to increase the use of technology by teachers. A lack of in-service support has been found to be one reason why teachers do not integrate technology. In one experiment, after participation in a well-planned training and support program, teachers increased the uses of technology for professional tasks such as record keeping and creating instructional materials (Ertmer & Hruskocy, 1999). Some researchers argued that in-service professional development has been ineffective because it uses the wrong innovation adoption model. Some researchers also argued that providing workshops in the summer during vacation, away from the context of the classroom, is an ineffective way to develop integration of technology in the classroom (Hsiung, 2001). Jacobsen (2001) stated the trend in professional development has moved from skill training to pedagogical reform, but neither approaches are effective compared to the new movement of targeting the teachers' individual needs by using onsite mentors as constant support. Bowman, Newman, and Masterson (2001) presented a six-stage model for technology adoption that involves teacher planning with the administration, application training, product development, implementation, assessment and peer review/re-design. In Pansegrau's study (1984), the focus was on the teachers' perspectives on in-service education, and the results of this study found that while there are different types of workshops (formal, informal, mandatory, or voluntary), teachers do want to keep informed and improve on their ability to help their students learn better, but they use a variety of resources, not just in-services, to achieve this goal.

In a study of the self-concept of pre-service elementary teachers related to technology integration into a mathematics curriculum, Hsiung (2001) reported that teachers rely heavily on each other for professional growth. The findings of this study also reported another problem with the adoption models used in professional development was the assumption of adoption after introduction. Without long-term follow up, and a support system, teachers were unlikely to use what they were presented in the in-service workshop (Hsiung, 2001).

School Expectations

The school's expectations regarding technology integration has been found to be a factor in the integration of technology. Dexter (2004) reported on expert teachers' knowledge of technology integration and states that a teacher whose administrator is indifferent or negative toward the integration of technology will be less likely to integrate technology into the curriculum because the teacher's attitude toward technology tends to correlate with the administrator's attitude. Findings of this study supported the premise that if technology was important to the principal, then technology was found to be important to the teachers led by that principal. Other findings of this study noted that the lack of time for technology integration planning was directly related to the number of classes a teacher taught, and if the school expected a teacher to teach an overload of classes, then the teacher could not be expected to have time to plan for the effective implementation of technology into those classes.

Lack of Computer Experience

Teacher technology competence appeared to present one of the greatest challenges to fully implementing the benefits of technology into the classroom (Hsiung, 2001). The U. S. Department of Education (2000) reported only 20% of teachers felt well prepared to integrate technology into their instructional practices. The National Center for Educational Statistics report that teacher technology preparedness levels increased, with approximately 33% of the teachers surveyed reporting feeling well prepared or very well prepared to use computers and the Internet (Smerdon et al., 2000).

Teachers' feelings of technology preparedness have been found to have an impact on the frequency and complexity of the computer-based activities they assign to their students (Guenther, 2002). The 2000 survey conducted by the National Center for Education Statistics reported that problem solving and data analysis activities are assigned by 66 % of the teachers who feel well prepared to use computers and the Internet (Guenther, 2002).

In a study for the U. S. Department of Education, Smerdon, Cronen, Lananhan, Anderson, Iannotti, and Angeles (2000) reported on several factors that affect teacher attitudes toward technology. They found that a lack of computer experience has been identified as a factor in a teacher's reluctance toward using technology and a teacher's negative attitudes toward computer-based instruction. They noted teachers' lack of computer experience and negative attitudes also caused computer anxiety. Computer anxiety resulted when teachers felt they were unfamiliar with the context of the material, worried about the hardware working, and felt uncertain about the behavior of the learners. Furthermore, they stated very few teachers have begun to feel as comfortable with technology as they are with their traditional curriculum and pedagogy. Teachers they interviewed felt pressured to prove they feel that instructional technology can make a difference in the classroom by exhibiting some infusion of technology into the curriculum. Finally, they summarized that a lack of experience, along with pressure from the administration, increased teachers' anxiety toward technology integration and that computer anxiety became a negative factor for technology integration (Smerdon et al., 2000).

Although teachers have become more familiar with technology, they may have experienced difficulty and frustration as they attempted to integrate technology into their instructional practices (Guenther, 2002). The NEA estimated that 94% of its members, and 99% of people age 35 and under can use the Internet. However, even with increased technology exposure, younger and older teachers expressed concerns about applying their technology skills to the teaching and learning process as reported to the Web-based Education Commission (U. S. Department of Education, 2000). Other findings in the Commission's report included the prospect of using computers in the classroom and the challenges teachers faced in various ways that became a disincentive to their use of computers. The Commission found that teachers had to individualize lessons, match software to the curriculum, schedule student computer time, monitor computer use, provide computer assistance, and troubleshoot computer problems. All of these aspects were noted as added burdens to the teacher's time, and because of these "added" burdens and the already insufficient amount of planning time, teachers were not infusing technology into the curriculum. Teachers often spent much time and valuable resources trying to match technology software to the curriculum. Further, the Web-based Education Commission noted it would take planning time for teachers to work on scheduling for individual student computer time and that teachers spent teaching time trying to supervise multiple students, each having individual computer time. Effective troubleshooting when technology failed took even more of the teacher's time. With these problems confronting teachers, it was understandable why many teachers continued to have negative attitudes toward technology integration.

A lack of technology training was a further reason why only a small percentage of the teachers in the nation use computers in their classes (U. S. Department of Education, 2000). The teacher technology training gap may have been exacerbated by the rush to connect the Internet, not only to the nation's schools, but also to each individual classroom (Guenther, 2002). Internet access in public schools increased from 35% in 1994 to 89% in 1998 (NCES, 1999). Teachers felt that it is more valuable to acquire training in their area of expertise or in methods of helping students and not in computer basics, because most teachers did not see the importance of technology in the classroom or put into practice what they learned in classroom computer basics. The main expected outcome of technology training was to equip teachers with the necessary knowledge, skills, and understanding to make sound decisions about when, when not, and how to use instructional technology effectively in teaching particular subjects (Slaouti, 1998). The ability to transfer the knowledge, skills, and understanding from teacher training to classroom practice has been limited (Hsiung, 2001). Further, this lack of transfer has been identified as the weakest link of most educational programs (Hsiung, 2001). For lessons learned these training initiatives to be transferred from training to the classroom, one would have to facilitate change in the classroom. Traditionally, initiating change in classroom practice has been accomplished through in-service training. Unfortunately this process has had limited success because many in-service programs simply provide knowledge to teachers but do little to help transfer these skills to actual classroom practice (Hsiung, 2001). For many teachers, it is the lack of training, and the lack of implementation after training, that keeps them from infusing technology into curriculum lessons and activities (Schrum, 1999). There remains a need for the development of teachers' knowledge and skills through meaningful professional development programs.

One additional challenge to technology integration is a lack of motivation on the part of the teachers to integrate technology. To effectively integrate technology, teachers must be motivated to do so. Keller (1983) wrote that motivation attracted learners toward something and increased their effort in relation to that object. Bohlin (1998) found that a motivated computer user was one who willingly and intrinsically chose to use computers in a number of ways even under adverse conditions. Proper instruction on the use and benefits of technology could provide motivation for its continued use. The first requirement for "motivation instruction" is to acquire and maintain the attention of the learner. Second, the instruction must be perceived as relevant and beneficial to the immediate and long range personal needs of the learner. Third, the instruction must foster confidence, expectancy for success, a low-risk environment and provide feedback. Finally, the individual should receive some degree of satisfaction from the experience in order to facilitate continued motivation.

In describing a model of learner-instruction interactions, Bohlin (1998) stated that a lack of motivation to use computers could have been caused by a negative attitude toward the technology and that a negative attitude toward computers also caused teachers to shy away from technology use in the classroom. Past experiences with computers could have an influence on an individual's attitude as they approach new situations. If the experiences in the past or the learned cognitions have been negative ones, then the individual will carry a negative attitude into the new situation (Bohlin, 1998).

In a study to determine how secondary science teachers integrated technology into their classrooms, Slough and Chamblee (2000) reported that trying to change an individual's attitude toward computers after having had a negative experience required a change in the individual's cognitions. They also found that both internal and external factors affected changing an attitude, and before technology infusion could be a success in the classroom, negative attitudes about computers would have to be addressed and eventually changed. They suggested that to alleviate some of the negative attitudes regarding computers in the classroom, teachers could be empowered to help make decisions regarding technology infusion. They noted that in most cases related to their study, the administration wrote the plan for the integration of technology, delivered it to the teachers, and required each teacher to immediately begin integrating technology. The often prevailing division of power between the administration and the teachers created a power barrier for the infusion of technology because the administrator, who did not spend much time teaching in the classroom, had the power to make decisions regarding the use of technology in the classrooms. They concluded that teachers needed to feel an ownership for technology infusion, and they needed to be involved in the decision-making process (Slough & Chamblee, 2000).

While the possession of technology tools should encourage teachers to use technology, many teachers did not have adequate time to plan for the infusion of technology (Hsiung, 2001), and this lack of adequate planning time has also been shown to cause negative feelings toward computers (Bohlin, 1998). Another reason teachers have been found to have negative attitudes toward computers is that technology infusion caused a tremendous change in the way they taught, and most teachers resisted the change (Hisung, 2001). If teachers were given the chance to help make decisions about using technology in the curriculum, and if they had more time to effectively plan for technology use in class activities, perhaps negative attitudes about computers in classrooms could be changed (Slough & Chamblee, 2000). The research literature emphasizes how critical teachers' planning and interactive decisions are in determining what they did, or did not do, in the classroom (Dexter, 2004).

Motivation was also stifled by teacher frustration because of lack of time and access. Lack of time to train caused another major barrier to teacher use of technology. It was reported in the SIIA (2000) that 50% of the teachers cited a lack of time to train as an impediment to the integration of technology (Guenther, 2002). Hsiung (2001) found that many teachers have indicated frustration with their computer skills and feel constricted by the lack of time during school hours to discuss, analyze and develop those skills. When teachers had time to experiment with technology they are less fearful of using it as an instructional tool. When teachers want to begin using technology it is important to provide them with instructional models and assistance during their first attempts (Guenther, 2002). Bohlin (1998) reported that teachers are overwhelmed with computers and frustrated at first. If they are given time to play with computers and reflect on what they are learning, then the implementation process is simpler and more efficient. Personal access to a computer, when needed, was very important for teachers. Teachers need time to be able to explore different technologies and to experiment with a variety of software and instructional applications (Hsiung, 2001). With adequate access to software, the Internet, and time to incorporate technology into instructional goals, teachers may be motivated to use the computer as an instructional tool (Guenther, 2002).

The Need for Professional Development

For many years, schools and education systems have focused primarily on acquiring computer hardware and software. In recent years, possibly because computers have become more common-place in schools, the focus has shifted to issues of teacher professional development and classroom use (Delannoy, 2000). Even teachers who were already computer users require professional development assistance in order to integrate computer use into their teaching practices and to redefine the teacher's role in a technological classroom (National Council for Accreditation of Teacher Education, 1997). According to the National Center for Education Statistics (NCES, 2000), nearly 70 % of teachers reported not feeling well-prepared to use computers and the Internet in their teaching. The Technology in Education Report (Market Data Retrieval, 1998) noted that only 7 % of schools nationwide had a majority of teachers at an advanced skill level.

Most teachers realized, however, that technology may enhance learning and that it may be used as a tool for instruction (Bohlin, 1998). Until recently, many educators rejected technology because a vision for the integration of technology into teaching and learning had not been articulated. Now that educators have been trying to embrace technology, to some extent, for teaching and learning, it was important to provide them with the appropriate infrastructure, professional development, and technical support (Gullickson, 2000).

Many teachers who used computers considered themselves insufficiently trained (Bohlin, 1998). Through a recent survey, it was found that most teacher education faculty felt that technology use was not being effectively modeled for our future teachers (Guenther, 2002). Few of our current or future teachers have either observed or experienced learning with or from computers. Without such experiences, teachers were unlikely to develop specific ideas about what technology integration looks like or how they might accomplish it. Furthermore, confidence for achieving something that has been neither observed nor experienced will develop slowly, if at all (Schunk, 2000). For meaningful integration to occur, teachers need ideas and confidence. If they do not have knowledge or skill, the integration of technology is not possible, and if there is no self-efficacy, the integration may not even be attempted.

Guenther (2002) studied the relationship between technology professional development programs and the level of technology integration in New Jersey and found an obvious need for substantial technology training for teachers. The study reported that staff development programs need to be designed to facilitate the integration of technology to improve the teaching and learning process. Additionally, a significant finding was that the technology staff development programs creationg the highest level of integration by teachers should be identified and implemented (Guenther, 2002).

According to Carlson and Gadio (2002), teacher professional development in the use of technology should embody and model the forms of pedagogy that teachers can use in their classroom. For example, training programs should accomplish the following: empower teachers to develop their skills actively and experimentally, in a variety of learning environments both individually and collaboratively; include a variety of learning strategies, encompassing direct instruction, deduction, discussion, drill and practice, induction, and sharing; aim at higher-order thinking skills; provide an authentic learning environment so that teachers engage in concrete tasks within realistic scenarios; emphasize ways that technology can facilitate and enhance teachers' professional lives; encourage teachers to be mentors, tutors and guides of the students' learning process; develop teachers' skills in learning how to learn; promote cooperative and collaborative learning; be sensitive to the culture and diversity of teachers as learners, using a multifaceted approach to respond to different learning styles, opportunities, environments, and starting points; and enable learning independent of time and place. They stated that a key to successful teacher professional development programs is a modular structure, corresponding to different levels of teacher experience and expertise using technology. Adapting materials to teachers' comfort level and starting point is essential. This implies that the program should be highly social and cooperative with opportunities to share experiences and combine instruction with discussion, reflection, application and evaluation (Showers, 1990; Carlson & Gadio, 2002).

In providing professional development, some teacher educators have turned to modeling as a feasible, yet powerful method for increasing teachers' ideas about technology integration and their self-efficacy for technology integration (Schrum, 1999). A model can be another teacher who demonstrates the effective use of technology integration or a written description of how one can effectively use technology in the classroom. Schrum (1999) stated that the models that are provided can help teachers find and implement meaningful technology and increase each observer's confidence for generating the same behaviors. As a means of providing professional development, however, the models do not guarantee either learning or later performance (Schrum, 1999).

Preparing faculty to model the effective use of technology as a teaching and learning tool is a major challenge facing schools today. Some experienced teachers may have felt too old to be completely comfortable using technology, but too young to ignore it (Bohlin, 1998). One of the arguments postulated regarding the challenges teachers have with technology integration was that teachers (adults) did not grow up with technology as did the present generation (Towsend, 1997).

In 2000, the need for substantial and ongoing faculty training could not be overstated. Most teacher in-service programs and workshops consisted of short sessions devoted to teacher cognitions. In-service training could be enhanced by attending to teachers' beliefs about themselves (Collier, 2001). Teachers needed to be given the opportunity to foster change in their beliefs about themselves as well as their beliefs about technology integration (Hazzan, 2000). In-service training needed to demonstrate methods of effectiveness and provide opportunities for implementation in order to see an impact on a teacher's efficacy beliefs. Skill training could enhance teacher efficacy and their beliefs about their effectiveness, for some teachers, but not for all (Hsiung, 2001). Unless innovative development and teaching activities involving technology were considered in hiring, promotion, and tenure decisions, faculty would struggle with finding time during their planning to advance their technology skills (Hsiung, 2001).

Research findings agreed on several aspects of technology training. First, they all seem to reject the idea of the one-day workshop in a central location, away from the actual teaching environment. Second, none of them advocate for more technology skill training for the teachers. Instead, they explore issues beyond technical training. Third, they all seem to endorse the notion that professional development workshops must be supported by a network of either colleagues or mentors. Fourth, teachers' perspectives are important for a successful adoption of any innovation (Hsiung, 2001).

Some teachers require additional motivation and incentives to participate actively in professional development activities. Teachers need to be encouraged by administrators, particularly their school directors, to participate in training activities. Administrators need to ensure that teachers have adequate time to participate, and do not have to sacrifice personal time to do so (Carlson & Gadio, 2002). In addition to time allocation, supervisors should publicly recognize teachers who successfully completed professional development courses. Many teachers lead an isolated professional existence, with little input from or collaboration with their peers or supervisors. Another incentive for learning new technological skills, especially if they include Internet and e-mail, allows teachers to break down the walls of their classroom and share lesson plans, evaluation strategies, student assessments, and even just the joys and frustrations of teaching (Carlson &

Gadio, 2002). According to Carlson and Gadio (2002) more than 80 % of teachers in both Africa and Latin America who responded to the survey included in the 1999 evaluation of the World Links professional development program, conducted by SRI International, indicated the highest possible ranking to the program's impact on their motivation and satisfaction as teachers. In other words, technology reduced their isolation and made them more excited about teaching. Enhancing teacher productivity could be a fourth incentive. Technology could increase the efficiency of a range of non-instructional teacher activities such as student attendance, grading, textbook distribution, and preparation of administrative reports, and it also could enhance the productivity of basic instructional tasks, such as preparing lesson plans and class outlines, developing quizzes and examinations, and writing up comments on student papers and reports.

Professional development of teachers in the use and application of educational technology should be designed and implemented as part of a broader educational reform program that, at a minimum, combines technology access with teacher professional development and local content development (Carlson & Gadio, 2002). No strategy that ignores any of these three elements is likely to succeed beyond superficial applications (Carlson & Gadio, 2002). While it is neither easy nor inexpensive to design and implement teacher professional development programs in the use of new technologies, it is an absolutely critical element of any initiative to introduce technology into schools to improve teaching and learning (Carlson & Gadio, 2002). Failure to invest sufficient resources in teacher training would result in failure of school-based technology initiatives, which would result in substantial wasted investments that very few school systems, if any, can afford (Carlson & Gadio, 2002).

Since 1996, the U.S. Department of Education has awarded 100 Technology Innovation Challenge Grants (TICG) (Adkin, 2001). Of the 100 grants awarded, 73 grants have the improvement of teaching and learning through the integration of technology a major goal. The grants required that 25 % of the monies awarded be used to provide professional development for teachers. This study could be useful to others who are concerned with finding a good model for technology professional development.

Adkin (2001) stated it is too early to know exactly what federal funds will be available as a result of President Bush's educational reform initiatives. We do know from the President's plan, *No Child Left Behind* (2002), that improving teacher quality and enhancing education through technology are important initiatives of the new administration. Further, Bush has evidenced in his plan and his various addresses to the educational community that measures of accountability will have increased emphasis during his administration (Adkin, 2001).

Using Technology to Enhance Professional Development

According to Caldwell (1997), today's educators have recognized the strong link between successful staff development practices and educational change. Through staff development initiatives, teachers can be trained to successfully integrate technology in the classroom. Teachers who have solid training, preparation, and strong institutional support learn how to become "techno-literate" quickly (Collier, 2001). As a result, they learn how to successfully use and teach using technology (Collier, 2001). Technology for staff development is not limited to the use of computers or formal classroom activities. However, computer technology can be used as a primary means of delivering staff development training (Ariza, Knee, & Ridge, 2000). Training can be made available in a number of different ways and settings. It can be onsite, through training with an instructor, training through books, or through manuals. The training can also be off-site which entails using distance learning media (Gullickson, 2000), teleconferencing, satellite connections, television, radio, videos, CD-ROM's, DVD's, the Internet, and the World Wide Web (Maurer & Davidson, 1999). Teachers across school districts could collaborate forming networks as they work together and are exposed to similar staff development initiatives.

Artkins (1997) suggested three phases through which teachers can manage technology that must be taken into consideration. He suggested that inexperienced teachers are concerned with developing and perfecting skills. Teachers having more experience are concerned with the support needed for the tasks to be carried out. Finally, all teachers need time for reflection on how to use technology to enhance student learning. Staff development training activities must be designed for "goodness of fit" to meet the needs of teachers at each phase of their career development (Collier, 2001).

Artkins (1997) suggested that for the true potential of technology to be realized in educational institutions, the institution has to provide a teaching/learning environment that has classroom practices, curricular development, classroom activities, and the roles of teachers towards technology well integrated and unified. An alignment of these factors with a clear vision, administrative support, adequate funding, access, equitable resource allocation, a dedicated and trained staff, as well as consistent patterns of expectations and a clear system of evaluation for technology integration, was essential for the immersion of technology into the curriculum (Office of Technology Assessment, 1997).

Theoretical Framework

In social cognitive theory, self-efficacy has been defined as "belief in one's capabilities to organize and execute the courses required to produce given attainments" (Bandura, 1997). Self-efficacy influenced behavior through cognitive processes (especially goal setting), motivational processes (especially attributions for success and failure), affective processes (especially control of negative feelings), and selection processes (Bandura, 1993). Individuals who feel they would be successful on a given task are more likely to be so because they adopt challenging goals, try harder to achieve them, persist despite setbacks, and develop coping mechanisms for managing their emotional states. Because human agency is mediated by our efficaciousness, self-efficacy beliefs influence our choices, our effort, our persistence when facing adversity, and our emotions (Pajares, 1992) thereby making the self-efficacy theory a common theme in the current views of motivation (Graham & Weiner 1996). Individuals who, believe they would fail avoided expending effort because failure after trying hard threatens self-esteem. Results from research on self-efficacy beliefs indicate that judgments of personal competence are often stronger predictors of behavior than are prior accomplishments, skill, or knowledge (Schunk, 1991). According to Bandura's (1986) social cognitive theory, individuals possess a "self" system that enables them to exercise a measure of control over their thoughts, feelings, motivation, and actions. How well skills and knowledge are acquired is determined by the self-efficacy beliefs of the individual. The role of self-efficacy has received extensive support from a growing body of findings from diverse fields for meta-analyses of research on the relationship between self-efficacy beliefs and achievement outcomes, prompting Graham and Weiner to conclude that self-efficacy has proven to be a more consistent predictor of behavior outcomes than have other self beliefs (Graham & Weiner, 1996). Self-efficacy is situation-specific and task-specific; it is not a generalized expectancy. Self-efficacy develops from a person's appraisal of past experience with the task or with activities similar to it, although perceptions of efficacy could be modified by other sources of information such as observing the performances of others (Bandura, 1997).

Bandura's social learning theory states that people learn by watching others and how others' actions are implemented. This theory includes three distinct elements that separate it from the behaviorist perspective (Bandura, 1997). First, it emphasizes the prominent role played by vicarious, symbolic, and self-regulatory processes. Observation could dramatically affect human thought and behavior. Learning is seen as a socially mediated experience. Second, the ability of people to use symbols helps them to communicate with others, plan, create, and imagine. Third, people are seen as self-regulating. People influence and are determinants of their own behavior. Social learning theory explains human behavior as interactions between cognitive, behavioral, and environmental determinants. The capacity to learn by observation allows people to acquire patterns of behavior without having to form them gradually by tedious trial and error (Bandura, 1997). A significant difference between high and low self-efficacy teachers is indicated by the way they view good teaching, their learners, their teaching, and their professionalism, all of which they carry into the learning setting (Ladson-Billings, 1994). People avoid activities and situations they believe exceed their coping capabilities, but undertake challenges and choose situations they judge they can handle. As Graham and Weiner (1996) observed, what cannot be disputed is Bandura's argument that self-efficacy has been a much more consistent predictor of behavior and behavior change.

Sources of Self-Efficacy

Self-efficacy is developed form four sources. The most influential is mastery experience where individuals gauge the effects of their actions and their interpretations of these effects help create their efficacy beliefs. The outcomes that are perceived as successful raise self-efficacy and those perceived as failures lower self-efficacy.

The second source of efficacy information is the vicarious experience of the effects produced by the actions of others. When people have limited prior experience or are uncertain about their own capabilities, they become more sensitive to the experience. Another person's failure on a certain task has a negative effect on the self-efficacy of the observer when the observer judges himself or herself to have the same capabilities as the person who failed.

Creating and developing self-efficacy beliefs as a result of the verbal persuasions of another person is the third source of self-efficacy. Persuaders cultivate people's beliefs in their capabilities while at the same time ensuring that the envisioned success is attainable.

The fourth source comes from physiological states. Because of stress, anxiety, arousal, fatigue and mood states, an individual has the ability to alter their own thinking. Therefore, self-efficacy beliefs could in turn affect an individuals' physiological state. Some individuals gauge their confidence on an action by the emotional state in which they find themselves. When people experience fears about their inability to accomplish a task, the negative feelings affect their perceptions of capability and cause stress or anxiety and further ensure that the task will not be completed. Educationally, self-efficacy beliefs are related to academic performance and self regulated learning (Zimmerman, 1995). Strong self-efficacy beliefs enhance human accomplishment and teachers with high assurance in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided. Conversely, teachers who doubt their capabilities shy away from difficult tasks they view as personal threats. They have low aspirations and weak commitments to the goals they choose to pursue. When faced with difficult tasks, they dwell on their personal deficiencies, on the obstacles they would encounter, and on all kinds of adverse outcomes rather than concentrating on how to perform successfully (Bandura, 1994).

Teachers' Beliefs about Effectiveness

Pajares (1992) found that there was a strong relationship between teachers' educational beliefs and their planning, instructional decisions, and classroom practices. Teachers' beliefs in their ability to work effectively with technology can determine patterns of classroom computer use. Honey and Moeller (1990) found that teachers with more traditional beliefs have to undergo a much greater change in their teaching practices in order to integrate technology. Self-efficacy in teaching with computers ia a form of teacher efficacy, defined as a teacher's expectation that he or she will be able to bring about student learning. Teachers with high self-efficacy are more likely to try out new teaching ideas, particularly techniques that are difficult to implement and involve risks (Czerniak & Shriver-Waldon, 1991). Teacher efficacy contributes to achievement because high efficacy teachers tried harder, use management strategies that stimulate student autonomy, attend more closely to low ability student needs, and modify students' ability perceptions (Ross, 1998). Teachers with high efficacy tend to experiment with methods of instruction, seek improved teaching methods, and experiment with instructional materials (Stein & Wang, 1988). Teacher confidence in their personal computer use can affect students through vicarious experience (Guenther, 2002). Students develop expectations about their future success by observing the ability of others. Sandholtz, Ringstaff, and Dwyer (1997) stated that teachers who fail in basic computer operations could depress student performance expectations. They also noted that teachers are reluctant to reveal their lack of computer skill to their students and are unwilling to use computers in the classroom until they feel comfortable with the technology.

Bandura (1997) proposed that construction of self-efficacy measures be guided by a conceptual analysis linking competencies to outcomes within a specific domain. Schunk (1991) suggested that variables such as perceived control, outcome expectations, perceived value of outcomes, attributions, goals, and self concept may provide a type of cue used by individuals to assess their efficacy beliefs. There are studies being conducted on linking teacher efficacy to student outcomes. The first type, representing the majority of studies, is correlational, measuring criterion and predictor variables at a single time, and the findings show that students in classrooms taught by teachers with high scores on a teacher efficacy, measure outperformed students in classrooms taught by teachers with lower teacher efficacy scores. Teacher efficacy was also related to students' own sense of efficacy and student motivation in that efficacious teachers persisted with struggling students and criticize less after incorrect student answers are given (Gibson & Dembo, 1984).

The most persuasive evidence for the importance for teachers to integrate technology came from studies of the second type in which teachers increase teacher efficacy scores and examine the effects on student performance. These studies were rare, but one study found that teacher and student outcomes significantly improved in classrooms that implemented technology in-service for teachers (Artkins, 1997). Teacher candidates who were confident in their ability to perform computer tasks also were less anxious about using computers in the classroom, held more positive attitudes toward technology and computers, and were more confident in their ability to perform computer coping strategies. Significant positive change in students' reported technology proficiency, computer self-efficacy, and use of computer coping strategies was found (Ertmer, Addison, Lane, Ross & Woods, 1999). The analyses indicate technology-related activities provided students with metacognitive knowledge, often prompt metacognitive experiences and strategies essential for self-regulated learning, and show the importance of prior experience.

Educators have beliefs about technology, as well as about their own learning, that impacts how they interact with new instructional technologies. Most research has not been able to explore the visceral-level values, attitudes, and beliefs about technology that lurk at the core of teachers as they participate in technology training and in teaching. Exploring how they view their own values, attitudes, and beliefs about technology training may inform staff development planners to maximize participant learning and increase teacher efficacy (Ertmer et.al., 1999). Individual beliefs are paradigms with which a person makes sense of experience (Honey & Moeller, 1990). These beliefs are deeply rooted and difficult to change, which has made understanding teacher beliefs in technology and professional development a critical issue. Self-beliefs, such as self-efficacy, are cornerstones of social cognitive theory, in which individual cognitive processes are central to transfer of behavior to outcomes (Gredler, 1992). Teachers' beliefs are the best indicators of how they will make decisions about professional preparation and teaching practices (Pajares, 1992).

Training will be the key to motivating teachers to use the technology they know has worth and usefulness. Motivating teachers to use technology in the classroom is a hurdle that trainers have tried to overcome for years. If the teachers cannot see the relevance of the technology in their classroom and are not shown how it can be used with the subjects taught, then the teacher will not be motivated to attend training sessions and technology infusion in the classroom will take many years to complete.

III. METHODS

Introduction

The focus of this study was to explore the importance of the integration of technology into educational classrooms and reasons why teachers are reluctant to embrace this integration. The amount of computer use, attitudes toward computer use, and factors associated with computer use or attitude were studied. Many teachers who have been introduced to computers, encouraged to use them, and who have been trained in their use have not been using computers for instructional purposes (Collier, 2001). Classrooms have been equipped with computers that are not being used for significant instructive and educational advantage.

Individual teacher surveys were used to gather data on teachers' interests in technology and how technology was being used in the classroom. Data were analyzed statistically to determine types of professional development to improve self-efficacy and ways of presenting technology through professional development to improve the self-efficacy of teachers and encourage them to use computers to enhance instruction in the classroom.

This study sought to understand why many teachers who have been introduced to computers and have received training in the use of computers have been reluctant to use computers in their classroom to enhance instruction through the integration of technology in the curriculum. An objective of this study was to find methods of technology training that would be helpful to motivate teachers to use technology effectively. Motivating teachers to use technology in the classroom has been a challenge for technology trainers for many years. If teachers cannot see the relevance of using technology in their own classroom and cannot be shown how they can use it, then teachers will not be motivated to attend a training session and technology integration in the classroom will take many years to complete.

One purpose of the study was to evaluate professional development technology training implementation to determine its effectiveness. The research base for this study suggested that the professional development experience related to the participants' current work setting, the perceived quality of the professional development experience, and the extent of participation in professional development impact workshop effectiveness. Effectiveness outcomes include increased teacher beliefs that technology enhances learning, increased use of technology, and improved student learning.

Description of Sample

The sample was collected from a possible 259 teachers who teach in an urban school system in Alabama. One hundred and three teachers responded to a survey of technology concerns. Thirty-two participants were male and 71 were female. A treatment group, consisting of 20 females who registered for a 40-hour workshop of intense training in technology integration, was surveyed separately, before and after the intense training. Generalizability was limited by the use of such a sample, but the sample size was large enough to avoid some of the generalizability problems caused by small size ($\underline{n}$=30) in the

1993 Pajares and Johnson study of self-efficacy and outcome expectations. Although they stated that correlational studies do not require extremely large samples, Ary et.al. (1996) did not recommend samples with fewer than 30 participants. The sample was reasonably homogenous, as recommended by Gall, Borg, and Gall (1996), to ensure that relationships between variables were not obscured by participants who vary widely from each other. Because it was a convenience sample, the characteristics of the sample are described in detail in Chapter Four of this dissertation.

To gather the data on teachers' concerns for technology integration in the classroom, each teacher was given a Survey of Concerns Questionnaire (SoCQ) (Hall, George, & Rutherford, 1979) to self-evaluate teacher self-efficacy as it pertains to technology and the use of technology in the classroom. The survey was administered at the beginning of a school year before any professional development training had been conducted. The same survey was given a second time at the end of that year to see if teachers' responses had changed after a year of technology training through professional development workshops. Each teacher is required by the school system to obtain twenty professional development hours each school year. At least five hours of the professional development must be acquired in technology training. Technology training workshops were made available to all teachers each month of the school year. The workshops were designed to provide for the required technology professional development and to help integrate technology into the classroom. Every teacher in the system was given the opportunity to register for the training. A statistical analysis was performed on the survey data to determine if the teachers felt the workshops provided during the year helped improve their self-efficacy in the use of technology in general and technology integration into the curriculum specifically.

The only criterion for participation in this study was that the participant be a teacher in a specific city school system in Alabama. Teachers were asked to fill out the survey/questionnaire of their own free will and at their leisure. All participants understood the survey would be use to acquire a base line of technology integration interest for the school system. Teachers were given a choice of technology training or academic professional development training and were grouped accordingly. There was no compensation for the participants. To reduce the possibility of non-volunteers and thereby avoid sampling bias, the researcher followed the recommendations of Rosenthal and Rosnow (1975) to improve the rate of volunteering. These methods included making the appeal for volunteers as interesting and non-threatening as possible, emphasizing the theoretical and practical importance of the study, and stressing that by volunteering, participants could help others. As with all self-report instruments, there is the potential for respondents to misrepresent their responses. However, to reduce the chances of falsified responses, each participant was assured that he or she would remain anonymous (Gall, Borg, & Gall. 1996). They also were assigned code numbers based upon the last four digits of their social security numbers. Participants were assured that under no circumstances would their individual test data be revealed to anyone other than the researcher or technology coordinator of the school system.

The treatment group consisted of 20 teachers who signed up to take 40 hours of intense technology training. Each of the trained teachers, called Master Teachers, was required to train two additional teachers from their respective schools in after school sessions throughout the school year.

Two teachers from each of the five schools in the system agreed to participate in the training, and afterwards, return to their respective schools to provide the same training they had received, through workshops, to two of any of the teachers at their school who had an interest in technology integration in their classroom. These teachers were the participating teachers.

As the Master Teachers began the training of the participating teachers, they were encouraged to build a trusting relationship with each teacher if one had not already been established. It was hoped that the Master Teachers be able to help the participating teachers cope with the integration of the new program because they have already experienced frustrations the participating teachers might experience during the workshop. Master Teachers were also asked to have respect for each teacher and treat him or her as their equal. For most of these teachers, trust and respect was not an issue, but for some, conflicts had to be resolved. Once trust and respect were established the mentoring relationship could begin. The mentoring relationship continued through the 40-hour workshop. Each participating teacher decided if they wanted to continue the relationship or move into a co-mentoring relationship with other participating teachers. It was hoped the mentoring process would blossom into the participating teachers becoming mentors of other teachers in their respective schools who had not participated in the workshop.

After training was completed the Survey of Concerns Questionnaire (SoCQ) concerning issues of change and integration of a new innovation was issued for a second time. The reason for administering the pre and post surveys was to find out if the training changed the teachers' feelings about the change and innovation after the integration had taken place. A statistical analysis was performed on this data and compared to the data provided from the other teachers in the system to see if there was a difference in the increase of teacher self-efficacy and interest in technology integration for the treatment group or the control group.

Subjects and Treatment Group

The sampling was composed of 259 teachers who teach in a city school system in Alabama. The city is located in a rural community with a diverse population. There is a history of community support for its local schools. Due to the geographical location in east Alabama, the economy is relatively self-sustaining without depending on a major population center for employment and commerce.

The city's high tech industrial base provides the majority of the employment for the city and its surrounding area. The school system consists of five schools: one grade 9-12 high school, one grade 6-8 middle school, and three K-5 elementary schools with a total enrollment of approximately 3200 students. The percentage of economically disadvantaged students, as defined in the federal child nutrition program, is 57%. The racial composition of the system is approximately 50% white, 49% black, and one percent Hispanic and Asian.

Two hundred fifty-one teachers were given the Stages of Concern Questionnaire (SoCQ) to acquire a self-evaluation of the teacher's self-efficacy as it pertains to technology and the use of technology in the classroom. One hundred three teachers responded to the survey. This subject pool consisted of 71 females and 32 males. Each of these teachers answered the survey before any technology professional development training was provided. The same survey was given a second time at the end of that year to see if the teachers' responses had changed after a year of technology training through professional development workshops. Workshops were provided each month and made available to all teachers. Because it was a school system requirement that each teacher obtain five hours of technology training, the technology workshops were provided to meet that requirement and to help integrate technology into the classroom.

The treatment group consisted of 20 teachers who agreed to participate in a 40-hour workshop of intense technology training throughout the year. Every teacher in the system was given the opportunity to sign up for the training on a first come, first serve basis. The first 20 to sign up for the workshop became the treatment group. This group already participated in the SoCQ the first day of school and completed the survey again after the 40-hour workshop.

Table 1 represents the data of teacher demographics. The sample group of 103 shows more elementary teachers responding than secondary teachers, more females responding than males, and more teachers holding bachelor degrees responding than teachers holding higher degrees. The treatment group of 20 teachers also shows more elementary teachers participating than secondary teachers, more females participating than males and more teachers holding bachelor degrees participating than teachers holding higher degrees. The group with the highest representation included female elementary teachers who hold bachelor degrees.

Table 1

Demographic Data of Teachers

Categories	Control (n = 103)	Treatment (n = 20)	Percent Sample	Percent Treatment
Grades Taught				
K-5	51	12	50	60
6-8	29	4	28	20
9-12	23	4	22	20
Gender				
Male	32	0	31	0
Female	71	20	69	100
Highest Degree				
Bachelor	57	10	55	50
Masters	34	9	33	45
Specialist	12	1	12	5
Doctorate	0	0	0	0
Highest Certification				
B (Bachelor)	54	9	52	45
A (Masters)	26	8	25	40
AA (Specialist)	12	1	12	5
Doctorate	0	0	0	0
Alternative	8	2	8	10
Emergency	3	0	3	0

Research Design and Instrumentation

The Stages of Concern Questionnaire (SoCQ) dimension of the Concerns Based Adoption Model (CBAM) was the instrument used to survey the teachers. This instrument focuses on the concerns of individuals involved in change (Hall et al., 1979). Research has identified seven kinds of concerns that users, or potential users, of an innovation may have (Hall et al., 1979). These concerns are organized in the model as Stages of Concern. While the seven Stages of Concern are distinctive, they are not mutually exclusive (Hord, Rutherford, Huling-Austin, & Hall, 1987). Hall states that an individual is likely to have some degree of concern at all stages at any given time, yet the Hord et.al. (1987) studies have documented that the stage or stages where concerns are more (and less) intense will vary as the implementation of change progresses. These variations in intensity mark the developmental nature of individual concerns (Hord et al., 1987).

The Stages of Concern Questionnaire (SoCQ) uses a Likert scale response to measure seven hypothesized stages of concern individuals have toward implementing change. The questionnaire contains 35 statements (five statements for each stage) that allow respondents to describe a concern they currently feel based on a scale of 0 to 6. A response of 0 indicates a very low level of concern; a response of 6 indicates a very high level of concern.

The SoCQ (Hall, George, & Rutherford, 1979) is a 35-item paper and pencil measure that typically requires only 10-15 minutes to complete. Scoring can be done by hand or via computer. The SoCQ strengths are 1) accuracy of assessment because it was developed through extensive research that has assured its validity and reliability, identifying concerns by quantitative scores for each stage, eliminating the need for inferring concerns from verbal or written statements; 2) it provides completeness of data because for each individual a profile is developed that shows intensity level on each of the seven stages, thereby presenting a useful pattern of concerns; and 3) its versatility, because it can be administered to the same persons several times during the course of a year and the profile will not only show current concerns, but any changes that have occurred in the pattern of concerns (Hord et al., 1987).

The SoCQ has been successfully validated since its introduction in 1979. Its internal validity was established by way of Cronbach's alpha. Cronbach's alpha established the instrument's internal validity, with a sample (n=830) of teachers involved in team teaching and professors concerned about the innovation. A sub sample (n=132) participated in a test-retest of the instrument over a two week period. Alpha coefficients ranged from .64 to .83, and the test-retest correlations ranged from .65 to .84, indicating internal consistency and stability for each of the seven stages (Hall et. al., 1979).

Methodology

This research study was conducted through the use of a pre and post survey. When using the survey honest responses are expected from each teacher about how effective s/he feels their teaching is using technology. Questions on the survey required answers concerning the innovation of a new teaching method (technology); how they felt about making a change in their teaching styles; and, the method of presentation they used to present information in their classrooms.

This study systematically evaluated the effects of professional development on teacher change in beliefs in, and use of, the given workshop focus (technology) and on learning outcomes in each participant's classroom. This study was an attempt to provide a plausible model to deliver technology professional development that will enhance teacher self-efficacy and encourage technology integration into the classroom. This study was also an attempt to increase the knowledge base about the impact of professional development in technology on teacher-related outcomes, and to show if it is important to link professional development to the specific work of the teachers.

Theoretical Perspective

Research has found technology to be a motivator of students and that materials and instruction enhanced by technology can meet students' needs and make them more productive citizens (Alexiou-Ray, Wilson, Wright & Peirano, 2003). Gredler (1992) believes technology-enhanced instruction to be a very practical form of instruction and encourages teachers to use technology-enhanced instruction to help students learn. Pierson (2001) promotes a learning theory that falls under the title of individualized instruction. His learning theory endorses the use of individualized instruction in the classroom where each student is given student-centered projects and curricula to support the needs and weaknesses of each student. Sandholtz, Ringstaff, and Dwyer (1997) reported that through individualized instruction of teachers, technology training can improve instructional technology and enhance the integration of technology into the classroom curriculum and through the individualized instruction of the students, learning styles can be provided for each student and learning is more apt to take place.

This research is grounded in studies linking professional development to changed teacher behavior and the resulting impact on technology integration in the classroom. Such research is usually called process-product (or process-outcome) research (Brophy, 1986). The process-product paradigm goes back at least 50 years and analyses of process-product studies lend themselves to pattern matching, logic/path analysis.

Epistomology

Constructivism deals with the idea that truth or meaning comes from our interplay with something within the environment, and that we are taught to associate with the object and therefore not remain in conventional meanings. Technology is in no way conventional. Interaction with technology is the only way technology integration will work. To understand a new innovation, one must participate in some type of interaction with the new innovation (Bandura, 1997). Adkin (2001) states that the more the participant perceives the activity as valuable or appropriate for their own work setting, the stronger the participants' belief in and use of the particular technology. Time intensity of the professional development experience has an effect on teacher outcomes regarding beliefs in and use of technology (Adkin, 2001). There seems to be an impact on technology integration into the classroom through technology professional development, however, a good model for technology professional development needs to be researched.

The research base for this study suggests that the professional development experience relates to the participants' current work setting, the perceived quality of the professional development experience, and the extent of participation in professional development impact workshops. Effectiveness outcomes should include increased teacher beliefs that technology enhances learning, increased use of technology and improved student learning.

IV. STATISTICAL ANALYSIS AND RESULTS

Introduction and Restatement of the Study

This study explored the importance of the integration of technology into educational classrooms and why teachers are reluctant to embrace this integration. The amount of computer use, attitudes toward computer use, and factors associated with use or attitude were studied.

Data were analyzed with the statistical software SPSS for Windows version 11.0. The mean scores and standard deviations for pre and post-tests for seven subscales of the Stages of Concern Questionnaire (SoCQ) were calculated for the dependent and independent variables. To test the seven primary hypotheses, Analyses of Variance for the seven subscales and Alpha coefficients were performed for each subscale in the tests.

Instrumentation

The survey instrument was the Stages of Concern Questionnaire (SoCQ) dimension of the Concerns Based Adoption Model (CBAM). The SoCQ focuses on the concerns of individuals involved in change (Hall et al., 1979). Research has identified seven kinds of concerns that users, or potential users, of an innovation may have. These concerns are organized in the model as Stages of Concern. The seven stages are awareness, informational, personal, management, consequence, collaboration, and refocusing. The SoCQ (Hall et al., 1979) is a 35-item paper and pencil measure that typically requires only 10-15 minutes to complete. The questionnaire included five questions for each stage of concern in random order. The teacher participants were asked to rate each statement on a scale of 0 to 7, where 7 expresses a high level of concern and 0 expresses a low level of concern. The SoCQ has been successfully validated since its introduction in 1997. Its internal validity was established by way of Cronbach's alpha. For all seven stages, the raw score is equal to the sum total of the numerical value assigned to each response for the five statements in the Likert scale. Mean scores were calculated for each item, which were then converted to percentiles for ease in interpretation.

A statistical analysis was performed on the data in hopes of finding types of professional development and ways of presenting technology through professional development that will improve the self-efficacy of teachers and encourage them to use computers to enhance instruction in the classroom. This study also sought to elucidate why many teachers who have been introduced to computers and have received training in the use of computers are reluctant to use computers in their classroom. An objective of this research was to find methods of training that may be helpful to motivate teachers to effectively use technology. Motivating teachers to use technology in the classroom is a hurdle that trainers have tried to overcome for years. If a teacher cannot see the relevance of technology usage in his/her classroom and cannot be shown how they can use it, then the teacher may not be motivated to attend a training session and technology infusion in the classroom will take longer to complete. The purpose of the study was to evaluate professional development technology training implementation to determine its effectiveness.

Descriptive Data Analysis and Results

Repeated Measures Analysis of Variance (ANOVA)

To examine the effect of professional development on the innovation on seven subscales of SoCQ, 2 (group: treatment vs. control) X 2 (Time: before and after the professional development) repeated measures of analysis of variance (ANOVA) were conducted. Group represented a between-participants variable while time represented a within-participants factor. Table 1 displays the means and standard deviation for Pre and Post Tests of both groups in the 7 subscales of SoCQ. Table 2 summarizes the ANOVA results.

Table 2

Means and Standard Deviations for Pre- and Post-tests for Seven Subscales of SoCQ

	Pre-test	Post-test
Subscale	*M* (SD)	*M* (SD)
Awareness		
Treatment	11.50 (6.962)	12.30 (4.921)
Control	13.42 (5.000)	13.67 (5.324)
Informational		
Treatment	22.75 (4.115)	23.55 (3.170)
Control	21.23 (3.924)	20.48 (4.473)
Personal		
Treatment	22.95 (5.010)	27.30 (5.192)
Control	21.06 (5.152)	21.01 (6.011)

(table continues)

Table 2 (continued)

Subscale	Pre-test *M* (SD)	Post-test *M* (SD)
Management		
Treatment	19.50 (6.160)	21.20 (5.625)
Control	17.13 (6.118)	18.16 (5.481
Consequence		
Treatment	22.90 (4.459)	24.20 (4.708)
Control	19.01 (4.525)	19.18 (5.570)
Collaboration		
Treatment	22.60 (7.111)	24.25 (6.750)
Control	19.08 (4.223)	17.00 (6.166)
Refocusing		
Treatment	19.45 (5.482)	19.95 (4.071)
Control	14.87 (4.512)	16.18 (5.460)

Table 3

Analysis of Variance for Seven Subscales of SoCQ

		Awareness		Informational		Personal	
Source	*df*	*MS*	*F*	*MS*	*F*	*MS*	*F*
Between groups							
Group	1	87.56	2.935	169.71	10.175*	538.895	16.28
Error	101	29.834	--	16.68	--	33.096	--
Within groups							
Time	1	8.935	.329	.023	.001	149.122	5.41*
Group by time	1	2.411	.089	19.285	1.125	155.88	5.651*
Error	101	27.153	--	17.143	--	27.586	--
Total	205						
Between groups							
Group	1	235.92	6.515*	639.33	24.823**	933.95	32.466**
Error	101	36.214	--	25.756	--	28.767	--
Within groups							
Time	1	59.798	1.889	17.382	.725	1.520	.044
Group by time	1	3.681	.116	10.314	.430	12.375	3.241
Error	101	31.654	--	23.969	--	34.668	--
Total	205						
Between groups							
Group		1		562.085	19.862**		
Error		101		28.300	--		

(table continues)

Table 3 (continued)

Source	*df*	Refocusing *MS*	*F*
Within groups			
Time	1	26.495	1.250
Group by time	1	5.330	.251
Error	101	21.202	--
Total	205		

$^{*}p < .05$ $^{**}p < .001$

Data indicated no significant interaction effect of time and group on awareness ($F_{1,101} = .089$, $p > .05$), informational ($F_{1,101} = 1.125$, $p > .05$), management ($F_{1,101} = .116$, $p > .05$), consequence ($F_{1,101} = .430$, $p > .05$), collaboration ($F_{1,101} = 3.241$, $p > .05$), or refocusing scales ($F_{1,101} = 19.862$, $p > .05$). However, it indicated significant interaction effect on the personal scale ($F_{1,101} = 5.651$, $p < .05$). Upon this interaction, two one-way repeated measures of analysis of variance (ANOVA) at the simple effect level were performed to examine the mean differences between the treatment group and the control group. The analysis results indicated a statistically significant increase ($F_{1,19} = 11.513$, $p < .05$) from 22.95 to 27.30 for the treatment group mean scores on personal subscale, whereas it indicated no statistically significant increase or decrease for the control group ($F_{1,82} = .003$, $p > .05$). There was also a main effect of group for informational, management, consequence, collaboration, and refocusing subscales. The main effect of group on informational scale ($F_{1,101} = 10.175$, $p < .05$) indicated that overall, the treatment group outperformed the control group. On the management scale, overall, the treatment group outperformed the control group ($F_{1,101} = 6.515$, $p < .05$), as well as on the consequence scale ($F_{1,101} = 24.823$, $p < .05$), and on the refocusing scale ($F_{1,101} = 1.250$, $p < .05$).

To assess internal consistency among items, reliability analysis was conducted for each subscale in Pre and Post-tests. SoCQ was scored on a 5-point Likert scale ranging from 1 to 5. The results were examined in seven different subscales: awareness, informational, personal, management, consequence, collaboration, and refocusing, which consist of 5 items each. The alpha coefficients ranged from .4065 to .7120 on pre-test and from .4273 to .8300 on Post-test. Table 3 displays the alpha coefficients for each subscale of SoCQ on Pre-test and Post-test.

Table 4

Alpha Coefficients for Each Subscale in Pre- and Post-Test

Item	α	
	Pre-test	Post-test
Awareness	.5653	.5078
Informational	.4065	.4273
Personal	.6477	.7880
Management	.7120	.6119
Consequence	.4975	.6695
Collaboration	.6935	.8300
Refocusing	.4905	.5878

The item-total correlation coefficients of Pre-test and Post-test are shown in Appendix C.

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This study explored the importance of the integration of technology into educational classrooms and why teachers are reluctant to embrace this integration. The amount of computer use, attitudes toward computer use, and factors associated with use or attitude toward computer use were studied. The focus of the study was developed from the observation that regardless of school administration effects to introduce computers into the classroom, many teachers were hesitant to use computers in their classrooms. Many teachers who have been introduced to computers, who have been encouraged to use them, and who have been trained in their use are not using the computers. Classrooms are equipped with computers, but teachers are not using these computers for significant instructive and educational advantage.

Null Hypotheses

Hypothesis 1 - The intense technology training workshop does not influence teachers' perceptions on technology integration into the classroom.

The intense technology training did influence the teachers' perceptions on technology integration. Data indicates that, for the treatment group, responses showed an increase from the pre-test to the post-test in all seven stages. The increase was not as great an increase as the researcher expected, but there was an increase indicated.

Hypothesis 2 - There will be no significant difference in the stages between the teachers who participated in the intense technology training workshop and those who did not.

The data indicated that there was a statistically significant difference in the awareness stage between the teachers who participated in the intense technology workshop and those teachers who did not participate. The treatment group performed lower than the control group. This may be accredited to the fact that the treatment group was made up of 20 teachers who voluntarily agreed to attend the intense technology training workshop because they wanted to improve technology skills and their self-efficacy about using technology in the classroom. These teachers may have been the least technology literate and therefore had the least awareness of technology integration and its importance in the classroom, but valued technology's importance in the classroom. The post-tests show their awareness increased after attending the intense technology training workshop, suggesting the workshop helped the ones who attended. The control group also made a slight increase in their awareness, between pre-test and post-test, but it was not statistically significant. This finding reinforces Woodbridge (2003) who reported educators need to be aware of and understand technology integration more completely and view technology as an instructional tool for delivering subject matter in the classroom.

The data indicated there was a difference in the levels of concern in the informational stage between the teachers who participated in the intense technology workshop and those teachers who did not participate. The treatment group's responses ranged higher (23.55) on the scale showing more concern for having more information about the innovation than the control group (20.48), but the difference was not statistically significant. The data also indicates that the informational stage showed a slight decrease from the pre-test scores of the control group to the post-test scores of the control group. This suggests that without intense technology training the participants in the control group felt they had not been given enough information about technology integration throughout the year to change their thoughts about how technology could enhance instruction in the classroom. This finding supports the findings of Hsiung (2001) and Coffland (2000). Both researchers reported the lack of technology integration in the classroom is related to teachers not being informed about technology integration and therefore, not truly understanding the concept of integration. Teachers, therefore, will likely be unable to successfully integrate technology.

The data indicated that there was a statistically significant difference in the levels of concern for the personal stage between the teachers who participated in the intense technology workshop and those teachers who did not participate. The responses on the pre-test for the treatment group (22.95) were not statistically significantly higher than the control group (21.06) pre-test. The significant difference appeared in the post-test responses; treatment (27.30), control (21.01). There was an indication of significant interaction effect on the personal stage for the treatment group. The significant increase (22.95 to 27.30) is seen from the pre-test scores of the treatment group to the post-test scores of the treatment group indicating that the intense technology training made a difference in how the treatment group felt, personally, about technology integration in the classroom after the training. This higher level of concern from the treatment group reflects the possibility of anxiety from the teachers about their self-efficacy in implementing technology. This anxiety or uneasiness supports the findings of Anderson, Iannotti, and Angeles (2000) who reported on several factors that affect teacher attitudes toward technology. They found that a lack of computer experience has been identified as a factor in a teacher's reluctance toward technology and a teacher's negative attitudes toward computer-based instruction. They also noted that with the lack of experience and negative attitudes which caused teachers to become reluctant to use technology also caused computer anxiety. Computer anxiety came from teachers feeling unfamiliar with the context of the material, worrying about the hardware working, and being uncertain about the behavior of the learners. There was no significant increase or decrease for the control group.

The data indicated no statistically significant difference in the levels of concern in the management stage between the treatment group and the control group. Both groups' levels of concern increased from the pre-test to the post-test scores, but the levels of concern were not significantly different. The levels of concern were low for both groups indicating their concerns may fall into other areas. The school system allows teachers planning time and flexibility in teaching instruction, and this may have influenced their concern leels. Slough and Chamblee (2000) and Dexter (2004) found if teachers were given the chance to help make decisions about using technology in the curriculum and more time to plan for technology use, perhaps concerns about the management of technology in the classroom would decrease.

The data indicated there was a statistically significant difference in the consequence stage between the teachers who participated in the intense technology workshop and those teachers who did not participate. The responses on the pre-test for the treatment group (22.90) were not significantly higher than the control group (19.01) pre-test. The difference appeared in the post-test responses; treatment (24.20), control (19.18). After the intervention of the technology training, the treatment group's level of concern increased to show a statistically significant difference from the control group. It is inferred that because the teachers went through the intense training, the concerns for students increased when the teachers were shown how beneficial the technology integration could be for students and how it could enhance student learning. The low scores in the consequence stage from the control group reflects little to no concern regarding impact on students. Teachers need to be made aware of the "2000 Report on the Effectiveness of Technology in Schools" (SIIA, 2000) which states how technology has increased student achievement, enhanced student self-concept and attitudes about learning, and improved interaction involving educators and students in the learning process. School administrators need to show an interest that technology is important and that it benefits the students for teachers to believe it is important to improve their skills and self-efficacy in technology.

The data indicates there is no statistically significant difference in the levels of concerns for the collaborative stage between the treatment group and the control group. The difference is seen in the post-test scores of the two groups. For the treatment group the levels of concern increased from the pre-test to the post-test scores while the control group's levels of concern decreased. It is inferred that the difference between the two scores, treatment (24.25) and control (17.00), occurred because the trained teachers were interested in learning from their colleagues after collaborating with other colleagues in the workshop and seeing the creativity that evolved from several teachers working together. Collaborating with colleagues on the integration of technology brings the innovation into the classroom where a teacher can see how technology can enhance what is already being taught. Teachers can gain new ideas that fit their teaching style when having a colleague model ways technology can be used in the classroom. These findings reflect the ideas of Schrum (1999) who reported that modeling the use of technology in the classroom by a cohort can help teachers find and implement meaningful technology and increase each observer's confidence for generating the same behaviors. The control group reflected little to no concern about collaborating with a colleague. It is inferred that the level of concern is low because the control group, having little to no training, had not been involved in sharing technology integration ideas and did not realize the help collaboration could provide.

The data indicated no statistically significant difference in the levels of concern in the refocusing stage between the treatment group and the control group. Both groups' levels of concern increased from the pre-tests to the post-tests, but the increase was not statistically significantly different. The data did indicate a difference in the pre-test scores in the level of concern for the treatment group (19.45) and the control group (14.87) that was inferred to be wide spread because the treatment group thought the approaches they were taking in the classroom were working, but they wanted the technology integration to be improved so it would be easier to implement into the curricula. The control group had little or no concern for the innovation of technology integration and they were not interested in other approaches that might work better. This indicates that the teachers in the control group were not having their needs met by voluntarily attending technology workshops when convenient.

For there to be a positive impact on students, teachers' needs must be met. It is very important for teachers to receive personal support and training for the integration of technology to take place. Administrators and technology trainers need to demonstrate ways to use technology in the classroom to address teacher's concerns. The lack of transferring technology training into the classroom, through demonstrations or hands-on instruction, has been identified as the weakest link of most educational technology training programs (Hsiung, 2001). For these training initiatives to be transferred from training to the classroom, one would have to facilitate change in the classroom. Traditionally, initiating change in classroom practice has been accomplished through in-service training. Unfortunately this process has had limited success because many in-service programs simply provide knowledge to teachers but do little to help transfer these skills to actual classroom practice (Hsiung, 2001). For many teachers, it is the lack of training, and the lack of implementation after training that keeps teachers from infusing technology into curriculum lessons and activities (Schrum, 1999).

Conclusions

The higher level of concern in the personal stage, where the responses to the questions are about how technology affects the teacher personally, reflects what Cheung, Hattie, and Ng (2001) report as an apprehension about technology, not opposition. The high level of concern in the collaborating stage reflects that teachers are interested in learning from other teachers who use technology in the classroom and being able to see what other teachers are doing with technology. The high level of concern in the consequence stage reflects a concern for the impact technology might have on students (Cheung et al., 2001).

The teachers indicated high levels of concern regarding an interest in collaborating with colleagues, how technology would affect them personally, and expressed interest regarding the impact technology integration would have on students. For technology to be integrated into a classroom curriculum, teachers must first see that a shift from skills-based instruction to technology enhanced project-based instruction is in the best interest for the students. Appropriate teacher support is needed from administration and technology trainers to meet the needs of teachers. This is more important than student support, because teachers that receive the personal support needed have students that use technology more often and effectively (Rakes & Casey, 2002). It is essential that administrators and trainers demonstrate how the use of technology can address each teacher's personal concerns in order to integrate technology throughout instruction (Rakes & Casey, 2002).

This study contributes to the research on teacher efficacy and use of technology by describing the common phenomenon of the push for technology integration without "teacher buy-in". If school systems expect teachers to implement and integrate the use of technology in the classroom, then first, the teachers need to be taught how to enhance their teaching with technology. This study indicates the main focus in technology integration for the administration and trainers of a school system should be to meet the needs of teachers. After the high levels of personal concern have been condensed, then administrators and trainers can begin to address other concerns.

Results indicate the most important factor in creating technology-related professional development models for the integration of technology is providing training in technology integration. Teachers need to understand the innovation of technology integration and be trained in how to integrate technology into their classroom, not just learn how to use computers and computer programs. There is more to developing technology-related staff development models than having a 40-hour intense technology training workshop. The intense technology training workshop did not make any statistically significant differences in the levels of concern for the treatment group except in the personal stage. Teachers need more training than what the workshop provided and teachers need to be shown how technology can be used in the classroom. Although the topic was provided in the workshop, it was not to the extent the teachers must have needed. The more training and experience teachers have integrating technology into the curriculum, the sooner they accept and optimally use technology (Rakes & Casey, 2002). There remains a need for the development of teachers' knowledge and skills through additionally meaningful professional development programs.

Recommendations

Based on the findings for this study, the following recommendations are made:

1. Consideration should be given to determining if the teacher concerns regarding technology implementation draw a parallel to the computer experience levels of the teachers. The questionnaire should provide questions about how the computer is used in the classroom, how much the computer is used, how many hours of training the

teacher has had, and if the computer in the classroom is, for the most part, for teacher or student use.

2. Teachers should be given the opportunity to make suggestions and help plan the technology training for their school system. Administrators and trainers should provide surveys or questionnaires from teachers with questions that will help in the planning of their technology training.

3. Technology integration models should be developed for school systems to use when training their teachers. The educational leaders of Alabama should play a fundamental part in helping prepare teachers to integrate technology into the classroom. The Alabama Department of Education should provide technology training to new and veteran teachers who teach in Alabama school systems.

4. Universities should design more programs for pre-service teachers to prepare them for the integration of technology into the classroom before they graduate from college. School systems, and particularly impoverished districts, may not be equipped for training teachers to integrate technology, and it is important for new teachers to have the technology training before they begin teaching.

5. A follow-up study should be conducted in a year to verify advancement toward integrating technology into the classrooms in this school system.

6. This study should be replicated in other school systems in order to determine teacher self-efficacy of technology integration in the classroom.

7. Future research should determine if administrators and trainers hoping to positively impact student learning through the use of instructional technology have

provided a clear demonstration of how to use instructional technology tools can address the personal concerns of the teachers.

8. The use of a concerns-based training model rather than a skill-based training model could be used for addressing attitudes and feelings that may inhibit teacher use of technology.

Limitations

The study was conducted with the following limitations acknowledged:

1. The representation of the sample was limited by the voluntary participation of teachers in the school system.

2. The accuracy of the data collected relies on the honesty of the subjects' responses and their accuracy and completeness on the Stages of Concern Questionnaire.

3. The data collected was limited to one urban school system.

4. The study surveyed only K-12 teachers.

5. The analysis of teachers' concerns was limited to their concerns toward instructional technology as assessed by the Stages of Concern Questionnaire.

Instrumentation Validity

The Stages of Concern Questionnaire was used in this study. The instrument was originally validated in 1979 and has been validated numerous times since its creation as it has been in many studies over the past 20 years. Cronbach's alpha was used to establish the instrument's internal validity, with a sample (n=830) of teachers involved in team teaching and professors concerned about the innovation. A sub sample (n=132) participated in a test-retest of the instrument over a two-week period. Alpha coefficients ranged from .64 to .83, and the test-retest correlations ranged from .65 to .84, indicating the internal consistency and stability for each of the seven stages (Hall, George, & Rutherford, 1998)

Summary

Although the integration of technology has been proven to be effective in helping student achievement in classrooms, educators need to appreciate and understand the benefits of technology integration more completely to make the integration successful (Woodbridge, 2003). Hazzan (2000) stated two major categories of teachers' perceptions about technology integration are experience with integration and knowledge about integration. These perceptions have been created by the barriers of access to computers, lack of knowledge about technology, lack of in-service support, lack of a definition for technology integration, teacher self-efficacy, school expectations and lack of time to learn (Brickner, 1995). One additional challenge to technology integration is a lack of motivation on the part of the teachers to integrate technology. To effectively integrate technology, teachers must be motivated to do so.

A lack of technology training was a further reason why only a small percentage of the teachers in the nation use computers in their classes (U. S. Department of Education, 2000). Research findings agreed technology training should reject the idea of the one-day workshops in a central location, away from the actual teaching environment; workshops should explore issues beyond technical training; workshops must be supported by a network of either colleagues or mentors; and teachers' perspectives are important for a successful adoption of the innovation (Hsiung, 2001).

The intense technology workshop provided in this study for the treatment group did not generate the results the researcher was hoping for. The workshop followed the aforementioned criteria, but the results showed that the intense technology workshop did not significantly increase or decrease the concerns of the teachers for technology integration. The importance of the integration of technology needs to be studied yet again to try and find an answer to what type of technology training workshops and techniques are paramount for encouraging teachers to use technology in the classroom and integrating technology into the class curriculum.

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APPENDICES

APPENDIX A

AUBURN UNIVERSITY IRB APPROVAL LETTER

APPENDIX A

Auburn University

Auburn University, Alabama 36849

Office of Human Subjects Research
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October 4, 2004

MEMORANDUM TO: Carol Gaither
Educational Foundation Leadership Technology

PROTOCOL TITLE: "Developing Teacher's Self-Efficacy for Technology Integration Through Professional Development"

IRE FILE: 04-146 EX 0410
APPROVAL DATE: October 1, 2004
EXPIRATION DATE: September 30, 2005

The referenced protocol was approved "Exempt" from further review under 45 CFR 46.101(b)(2) by IRB procedure on October 1, 2004. You should retain this letter in your files, along with a copy of the revised protocol and other pertinent information concerning your study. If you should anticipate a change in any of the procedures authorized in protocol #04-146 EX 0410, you must request and receive IRB approval prior to implementation of any revision. Please reference the above IRB File in any correspondence regarding this project.

If you will be unable to file a Final Report on your project before September 30, 2005, you must submit a request for an extension of approval to the IRE no later than September 15, 2005. If your IRE authorization expires and/or you have not received written notice that a request for an extension has been approved prior to September 30, 2005 you must suspend the project immediately and contact the Office of Human Subjects Research for assistance.

A Final-Report will be required to close your IRB project file.

If you have any questions concerning this Board action, please contact the Office of Human Subjects Research at 844-5966.

Sincerely,

E. N. (Chip) Burson, Executive Director
Office of Human Subjects Research

cc: Dr. William Spencer
Dr. Susan Bannon

APPENDIX B

STAGES OF CONCERN QUESTIONNAIRE

APPENDIX B

Stages of Concern Questionnaire

In order to identify these data, please give us the last four digits of your Social Security number:

__________ __________ __________ __________

Please respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with technology integration. We do not hold to any one definition of this integration, so please think of it in terms of your own potential perceptions of what it involves. Remember to respond to each item in terms of your present concerns about your involvement or potential involvement with the new innovation of technology integration.

Thank you for taking the time to complete this task.

0	1	2	3	4	5	6
Irrelevant	Not true of me now		Somewhat true of me now			Very True

1	I am concerned about students' attitudes toward this innovation.	0	1	2	3	4	5	6
2	I now know of some other approaches that might work better.	0	1	2	3	4	5	6
3	I don't even know what the innovation is.	0	1	2	3	4	5	6
4	I am concerned about not having enough time to organize myself each day.	0	1	2	3	4	5	6
5	I would like to help other faculty in their use of the innovation.	0	1	2	3	4	5	6
6	I have a very limited knowledge about the innovation.	0	1	2	3	4	5	6
7	I would like to know the effect of reorganization on my professional status.	0	1	2	3	4	5	6
8	I am concerned about conflict between my interests and my responsibilities.	0	1	2	3	4	5	6
9	I am concerned about revising my use of the innovation.	0	1	2	3	4	5	6
10	I would like to develop working relationship's with both our faculty and outside faculty using this innovation.	0	1	2	3	4	5	6
11	I am concerned about how the innovation affects students	0	1	2	3	4	5	6

12	I am not concerned about this innovation.	0	1	2	3	4	5	6
13	I would like to know who will make the decisions in the new system of integration.	0	1	2	3	4	5	6
14	I would like to discuss the possibility of using the innovation.	0	1	2	3	4	5	6
15	I would like to know what resources are available if we decide to adopt this innovation.	0	1	2	3	4	5	6
16	I am concerned about my inability to manage all that the innovation requires.	0	1	2	3	4	5	6
17	I would like to know how my teaching or administration is supposed to change.	0	1	2	3	4	5	6
18	I would like to familiarize other departments or persons with the progress of this new approach.	0	1	2	3	4	5	6
19	I am concerned about evaluating my impact on students.	0	1	2	3	4	5	6
20	I would like to revise the innovation's instructional approach.	0	1	2	3	4	5	6
21	I am completely occupied with other things.	0	1	2	3	4	5	6
22	I would like to modify our use of the innovation based on the experiences of our students.	0	1	2	3	4	5	6
23	Although I don’t know about this innovation, I am concerned about things in this area.	0	1	2	3	4	5	6
24	I would like to excite my students about their part in this approach.	0	1	2	3	4	5	6
25	I am concerned about time spent working with non-academic problems related to this innovation.	0	1	2	3	4	5	6
26	I would like to know what the use of the innovation will require in the immediate future.	0	1	2	3	4	5	6
27	I would like to coordinate my effort with others to maximize the innovation's effects.	0	1	2	3	4	5	6
28	I would like to have more information on time and energy commitments required by this Innovation.	0	1	2	3	4	5	6
29	I would like to know what other faculty are doing in this area.	0	1	2	3	4	5	6
30	At this time I am not interested in learning about about this innovation.	0	1	2	3	4	5	6
31	I would like to learn how to supplement, enhance, or replace this innovation.	0	1	2	3	4	5	6
32	I would like to use feedback from students to change the program.	0	1	2	3	4	5	6
33	I would like to know how my role will change when I am using the innovation.	0	1	2	3	4	5	6

34	Coordination of tasks and people is taking too much of my time.	0	1	2	3	4	5	6
35	I would like to know how this innovation is better than what we have now.	0	1	2	3	4	5	6

APPENDIX C

ITEM-TOTAL CORRELATION COEFFICIENTS OF

PRE-TEST AND POST-TEST

Table 5

The Item-Total Correlation Coefficients of Pre-Test and Post-Test

Subscale	Item-total correlation	
	Pre-test	Post-test
Awareness		
Item 3	.2502	.2877
Item 12	.3535	.2382
Item 21	.3489	.2161
Item 23	.2097	.3233
Item 30	.4802	.3338
Informational		
Item 6	.1716	-.0028
Item 14	.0384	.1560
Item 15	.2840	.3850
Item 26	.2831	.3643
Item 35	.2906	.3218
Personal		
Item 7	.3305	.6135
Item 13	.2947	.5915
Item 17	.6116	.6580
Item 28	.3305	.5386
Item 33	.4889	.4688
Management		
Item 4	.4140	.3751
Item 8	.4728	.3609
Item 16	.5088	.3881
Item 25	.5535	.3626
Item 34	.4185	.3502

(table continues)

Table 5 (continued)

Subscale	Item-total correlation	
	Pre-test	Post-test
Consequence		
Item 1	.3425	.3246
Item 11	.4496	.4616
Item 19	.3361	.3934
Item 24	.1811	.6134
Item 32	.0477	.3844
Collaboration		
Item 5	.3559	.6341
Item 10	.5168	.6858
Item 18	.4863	.7635
Item 27	.6217	.6613
Item 29	.3253	.4340
Refocusing		
Item 2	.2177	.3070
Item 9	.1251	.2027
Item 20	.3758	.4921
Item 22	.2814	.2794
Item 31	.3702	.4841