2006

An Investigation of the Effects of the Gerogis Framework for Integrating TECHnology(In Tech) Training Program on Teachers' Computer Self-Efficacy and Computer Utilization

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An Investigation of the Effects of the Georgia Framework for Integrating TECHnology (InTech) Training Program on Teachers' Computer Self-Efficacy and Computer Utilization

by

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A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in
Computing Technology in Education

Graduate School of Computer and Information Sciences
Nova Southeastern University

2006

We hereby certify that this dissertation, submitted by Ian P. Johnson, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

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2006

An Abstract of a Dissertation Submitted to Nova Southeastern University in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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May 2006

National technology standards drafted by the International Society for Technology in Education (ISTE) are incorporated into the technology standards required of American public schools. The state board of education in Georgia instituted the Georgia Framework for Integrating TECHnology (InTech), which is a 50-hour training program that prepares teachers to help their students accomplish technology standards and performance objectives.

The goal of this study was to investigate the effects on teachers' computer self-efficacy, technology integration, current instructional practices, personal computer use and factors relating to use or non-use of computers in the curriculum after completing the Georgia Framework for Integrating TECHnology (InTech) training program. A causal comparative research design was employed in this study. The sample consisted of teachers in the Walton County School District in Georgia who had completed the InTech training program. Information was gathered using the Level of Technology Integration (LoTi) instrument and addendum questionnaire, the Computer Self-Efficacy instrument (CUSE), and semi-structured observations and interviews. One hundred and thirty three usable surveys were returned for a return rate of 53%. These were analyzed using correlation, multiple regression, ANOVA, and chi-square statistical methods and content analyses.

The results indicated that the variables, teachers' perception of the quality of InTech training (PQIT) and personal computer use (PCU) contributed significantly to teachers' computer self-efficacy (CSE); however current instructional practice (CIP) was not statistically significant. It was found that there were statistically significant differences in the level of contributions to CSE by the independent variables; however, there were no significant differences among the mean scores on teachers' perception of the quality of InTech training received, CSE, CIP, PCU, and LoTi. There was a relationship between factors relating to use and non-use of computers in the classroom and teachers' CSE.

Acknowledgements

I want to thank the Lord for guiding me through this dissertation process and that he was given the glory, the praise, and the honor.

No words can express the gratitude I feel for Dr. Cohen, my dissertation committee chairperson, for her support, guidance, and encouragement, especially in those difficult times. I also want to thank the members of my dissertation committee, Dr. Abramson and Dr. Terrell for the time they spent devoted to reading and refining my work. Thank you all for the demands placed on your time by agreeing to be on my committee. Your expertise and help were indispensable to the completion of this dissertation.

To my wife, Paulette, and children, Keisha, Duane, and Brian, I want to express my sincere love, thanks, and deep appreciation for all the time, resources, and other commitments that were given up in an effort to see me pursue and finish this major work. I love you all very much.

My thanks go to Dr. Reeves and the UGA Statistics Consulting Center for their assistance with the statistical data used in the study.

To Howard Clayton, a dear friend of the family and statistics professor at Auburn University in Alabama, my sincere thanks for the many times he offered his expertise and advise as I pursued this work.

I also want to thank my friends, Michael and Constance Henry who offered me support and guidance through the years.

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Chapter 1

Introduction

National technology standards drafted by the International Society for Technology in Education (ISTE) are currently being incorporated into the technology standards required of American public schools (Goldsby & Fazal, 2000). This has led schools to seek out effective means of teaching and utilizing technology in the classroom. At the college level, pre-service teachers are required to find, evaluate, and incorporate various aspects of information technology into effective learning activities, thus addressing national and state technology standards that their future students must meet (Goldsby & Fazal, 2000).

To live, learn, and work successfully in an increasingly complex and information-rich society, students and teachers must use technology effectively (ISTE, 2000). The teacher is responsible for establishing the classroom environment and preparing the learning opportunities that facilitate students' use of technology to learn, communicate, and develop knowledge products. According to Casey (2000), "the key to appropriate use of the technology is the teachers' comfort with the hardware and software, their understanding of technology as a method of curriculum delivery, and a change of mind set which will allow them to embrace possibilities that technology brings to the classroom of the future," (p.2).

In the state of Georgia, the state board of education instituted the Georgia Framework for Integrating TECHnology (InTech) which is a 50-hour training program that is used to prepare teachers to help their students accomplish a certain number of standards and performance objectives using technology. Objectives of the program include getting teachers to; (1) critically examine their own instructional practices to determine how technology can play a role in enhancing the teaching and learning process, (2) develop a minimum of four model lessons per teacher using their newly acquired technology skills to meet their curriculum objectives, (3) implement technology-based projects and activities developed during the training program and throughout the school year, and (4) develop a plan to re-deliver the InTech training to the other members of their school faculty (University of Georgia Technology Training Center, 2002).

According to Nickell, Field, and Roach (2001), 13 Department of Education Technology Training Centers (TTC) throughout the state of Georgia are implementing the Georgia InTech training program for teachers. The Georgia InTech program uses the Level of Technology Integration Scale (LoTi) to assess how teachers are currently using technology in their classrooms. Dr. Christopher Moersch of Learning Quest, Inc. developed this survey instrument in 1994 (http://www.loticonnection.com/). The LoTi questionnaire was designed to determine the level of a classroom teacher's technology implementation by generating a profile for the teacher across three specific domains: level of technology implementation (LoTi), personal computer use (PCU), and current instructional practices (CIP) (Moersch, 1999).

Problem Statement

There has been a massive influx of computer-based technologies in education in recent years for instructional and administrative purposes. This infusion of computer-based technologies has the potential to dramatically change teaching methods and impact student learning. Teachers are expected to use these new technologies and to integrate them into the classroom curriculum. For this to occur, teachers need to be proficient in the use of educational technology including the use of computers and other technologies for instruction and student evaluation (Howery, 2001).

One of the primary problems faced by teachers in integrating technology is lack of adequate training (Yildirim, 2000; Casey, 2000). Technology training needs to be viewed as a long-term process. The InTech model requires that over the period of a school year teachers will acquire the skills necessary to integrate technology successfully into the classroom. However, according to Casey (2000), technology training needs to be viewed as a long-term process because “the more time teachers spend with technology and the more comfortable they are, the more able they are to implement instructional changes related to instructional technology” (p.61). With the local school districts setting up InTech training programs, one question that was investigated in this research by the researcher was whether completion of the InTech training program leads to an increase in the use of technology in the classroom at the elementary, middle, and high school levels.

The rapid increase in the call for the integration of technology into the classroom has placed great pressure upon Georgia K-12 teachers. Teachers are already certified to teach in their respective subject areas, but are now required, in addition, to become InTech certified by the end of the school year 2005-2006, and to show how they are actually integrating technology into the classroom. This has led to a massive effort to train teachers through the InTech program on how to be proficient in the use of educational technology and to integrate this technology into their curriculum by the end of the school year 2005-2006 in order to have their teaching certification renewed. In addition, redirect teams, which consists of five InTech trained teachers from the same school, are being used to train other teachers at their schools (University of Georgia Technology Training Center, 2002).

Goal

To investigate whether teachers' completion of the Georgia InTech training program had an impact on the use of technology in the classroom, it was useful to see what effect the training had on teachers' computer self-efficacy and computer utilization. The goal of this study was to investigate the effects on teachers' computer self-efficacy, technology integration, current instructional practices, personal computer use, and factors relating to use or non-use of computers in the curriculum after completing the Georgia Framework for Integrating TECHnology (InTech) training program. This study will add to the field of instructional computing. Also, as Moersch (2001) noted, it will enable stakeholders to channel precious resources toward proven practices that will eventually elevate the level of technology implementation system wide.

Relevance and Significance

Technology is an ever changing and an ever-present reality facing people in all walks of life on a daily basis. New demands are being placed on teachers to integrate technology into their curriculum. According to Casey (2000), these demands have forced educators to integrate instructional technology into their teaching methodologies as well as into the content areas they teach.

Recently, the ISTE drafted several sets of competencies for teacher training, which were accepted by the National Council for Accreditation of Teacher Education (NCATE) (Waugh, Levin, & Buell, 1999). These standards have all been adopted by the Georgia Department of Education and are used in the InTech program. The ISTE teacher technology standards are: (1) Demonstrate a sound understanding of technology operations and concepts, (2) Plan and design effective learning environments and experiences supported by technology, (3) Implement curriculum plans that include methods and strategies for applying technology to maximize student learning, (4) Apply technology to facilitate a variety of effective assessment and evaluation strategies, (5) Use technology to enhance teacher productivity and professional practice, and (6) Understand the social, ethical, legal and human issues surrounding the use of technology in Pre K-12 schools and apply that understanding and practice (http://cnets.iste.org/teachers/t_stands.html).

In an effort to reform and upgrade how technology courses are taught in the teacher education program, Schrum and Dehoney (1998) stated that, “by their graduation, every Alternative Teacher Education Program pre-service student would have had experience using technology for professional development, curricular activities and personal use,”(p.3). Dugas and Adams (2000) conducted an evaluation study of the InTech training program and mentioned that “how much trainees actually did learn, and whether or not this knowledge actually did transfer to their classroom practice”, was not captured by the measures they used but that future evaluations of InTech should add to the “ability to understand more thoroughly the impact of InTech training upon its students,” (p.61). This study investigated the effects on teachers’ computer self-efficacy, technology integration, current instructional practices, personal computer use, and factors relating to use or non-use of computers in the curriculum after completing the Georgia Framework for Integrating TECHnology (InTech) training program at the elementary, middle, and high school levels.

As computers become more commonplace in the classrooms, teachers should become familiar with the possibilities for learning and for support promised by these advances, and help children learn about computers and learn about using computers (Abbot & Faris, 2000). Reichstetter (1999) found that the model that produced the highest combination of predictor variables toward increased frequency of instructional use of computers was the amount of formal training received, teaching area, and specific training components delivered by the trainer during training.

One question considered in this research was: Is there a relationship between the frequency of computer technology use by teachers for instructional purposes and teachers’ perception of the quality of InTech training received? In other words, did the level of technology implementation increase after K-12 teachers completed the InTech training?

Golsby and Fazal (2000) state that K-12 teachers need preparation and support for integrating technology in teaching to fulfill the goals for student learning with technology. Having completed the InTech training, another question this research sought to answer was whether there was a significant change in the teachers’ current instructional practice after receiving the training at the elementary, middle, and high school levels. Current instructional practice (CIP) is the teacher's inclination toward instructional practices that are consistent with learner-based curriculum design (Moersch, 1999). The CIP portion of the LoTi scale was used to measure the teacher's instructional practice.

A study by Christensen (1998) showed that teachers' and students' attitudes towards technology integration at the elementary level were positive after training was received. The report by Dugas and Adams (2000) acknowledged that teachers gave high marks to the Intech training program, however, according to Ertmer (1999) it is important to note that teachers whose visions are directed toward using technology to improve what they already do are likely to achieve a different level of integration than those whose visions include using technology to meet emerging needs and satisfy new goals. This concept was noted in the Dugas and Adams (2000) study where it was mentioned that trainees ranged from feeling "overwhelmed…to feeling bored" (p.61), depending on the technological expertise or non-expertise that they brought with them to the training. This led to the question of whether or not the personal computer use profile for the teachers increased after the Intech training at the elementary, middle and high school levels. Another question that was explored in this study was: What factors listed below appear to be related to the overall computer technology use of teachers at the elementary, middle, and high school levels?

a. Teachers' perception of the quality of InTech training received
b. Teaching Subject
c. Hardware and Software availability

d. Administration Support

e. On-site/Off-site/Online Help Desk Technology Support

According to Atkins and Vasu (2000), by better assessing the types of technology training teachers need, more effective technology staff development programs can be designed. Factors such as level of anxiety toward learning computer technology, quality hands-on practice, and adult learning characteristics related to technology learning (Lee, 1997) are important in any training program. This study examined factors that may be related to the transfer of computer technology training into the teachers' classroom. It is hoped that the results of this study provided insights into the types, frequency, and levels of training needed to equip teachers to use technology in the classroom.

School systems are spending increasing sums of money and time on computer technology planning and training for teachers. However, there is very little feedback on the impact of this spending and technology training on teacher instructional behaviors or student achievement (Deacon, 1999). Reichstetter (1999) noted that the evaluation of teacher technology training might be stopping short of the full picture. Looking at the numbers of teachers trained may not provide information on follow through into classroom application. Knowing if teachers are using computers, with what frequency, and in what ways may benefit the school system regarding the resources being expended (Reichstetter, 1999). It is also hoped that this research provided a better understanding of the conditions necessary for successful implementation of technology into the classroom.

Barriers and Issues

One of the primary barriers to the training of teachers to integrate technology into the curriculum has been the emphasis on basic computer applications and software (Abbott & Faris, 2000), and not on the applications of the technology into the classroom curricula. There are questions as to how much technology is needed for teachers to begin integrating it into their curricula. It has been found in one study (Nisan-Nelson, 2001), that teacher-training programs did not challenge the teachers to think about what was required to integrate technology. In addition, it was found in the same study that the level of integration of technology depended on whether it was seen as an integral part of instruction or just another addendum to it.

The vision of technology integration held by the teacher, the school, and the school district impacts on how successful integration is measured. According to Ertmer (1999), if the vision is on the acquisition of hardware and software, then the technology is the end-goal and that is what will be measured. However, if the vision is focused on opportunities for teaching and learning, then technology is the means for achieving multidisciplinary learning goals. Teachers that link the use of technology to teaching and learning theories do not allow technology to drive what they do, rather, they allow sound principles of teaching and learning to determine what technologies can be used to enhance the teaching and learning activities (Duhaney, 2001). Because many teachers have had little, if any, experience with integrated technology classrooms they have very little to build their own visions of what an integrated classroom should be (Ertmer, 1999).

Although all teachers in Georgia will have to complete the InTech program for re-certification by the end of the school year 2005-2006, there are a number of significant barriers:

- The teacher's inability to adapt the new technology to his or her teaching style (Nisan-Nelson, 2001; Clark, 2000).
- Teachers have to deal with the expectations of the public that they (the teachers) already possess the ability to use instructional technology (Clark, 2000).
- The teachers' perception that these courses are more time consuming than traditional courses (Sullivan, 1999).
- Teachers' perception of the relevancy of various aspects of the technology integration training program to their curricular needs. (D. Manzy, personal communication, October 24, 2001).
- The disparity between the rhetoric of technological reform and the reality of secondary school classrooms (Baines, Deluzain, & Stanley, 1999).

Teachers work under severe time constraints. They are called upon to improve students' scores in national achievement tests, earn a certain amount of staff development units for re-certification and most of the time they have to infringe on their personal time to achieve the professional development that the job calls for. Although most teachers acknowledge the importance and desirability of using technology in their classrooms, time constraints and the barriers mentioned above can block implementation (Ertmer, 1999). According to Ertmer, although some teachers may not face all of these barriers, any one of these barriers alone can significantly impede meaningful classroom use.

Research Questions and Hypotheses

This study focused on the size and direction of the relationship between teachers' perception of the quality of InTech training received, teachers' computer self-efficacy and computer utilization after training at the elementary, middle, and high school levels. The theoretical rationale of this study lies in the three domains described in the LoTi instrument (Moersch, 1999), level of technology implementation, current instructional practice, and personal computer use; and teacher self-efficacy as proposed by Bandura's computer self-efficacy instrument (cited in Chao, 2001).

Research Questions

The following research questions were used to guide this study:

1. What relationship exists between teachers' perception of the quality of their InTech training and teachers' computer self-efficacy based on their level of technology integration at the elementary, middle, or high school levels?
2. What are the relationships between current instructional practice and teachers' computer self-efficacy at the elementary, middle, or high school levels?
3. What relationship exists between personal computer use and teachers' computer self-efficacy at the elementary, middle, or high school levels?
4. What are the levels of contributions to teachers' computer self efficacy by the variables: teachers' perception of the quality of InTech training received, level of technology integration, current instructional practice, and personal computer use?
5. What are the differences among mean scores on teachers' perception of the quality of InTech training received, teachers' computer self-efficacy, current

instructional practice, personal computer use, and LoTi at the elementary, middle, and high school levels?

6. Do any of the factors relating to use or non-use of computers in the classroom positively correlate on teachers' computer self-efficacy at the elementary, middle, or high school levels?

Null Hypotheses

The following hypotheses were proposed as a result of the research questions.

H1: There will be no statistically significant relationship between teachers' perception of the quality of InTech training received and teachers' computer self-efficacy based on the level of technology integration at the elementary, middle, or high school levels.

H2: There will be no statistically significant relationship between current instructional practice and teachers' computer self-efficacy at the elementary, middle, or high school levels.

H3: There will be no statistically significant relationship between personal computer use and teachers' computer self-efficacy at the elementary, middle, or high school levels.

H4: There will be no statistically significant differences in the levels of contributions to teachers' computer self-efficacy by the variables: teachers' perception of the quality of InTech training received, level of technology integration, current instructional practice, and personal computer use.

H5: There will be no significant differences among the mean scores on teachers' perception of the quality of InTech training received, teachers' self-efficacy, current instructional practice, personal computer use, and LoTi at the elementary, middle, and high school levels.

The hypotheses were tested at the .05 level of significance.

Variables

The following variables were used in this study:

Independent Variables

1. Teachers' perception of the quality of InTech Training received (PQIT) as measured by the LoTi addendum questionnaire.
2. Level of Technology Integration (LoTi) measured by the LoTi instrument.
3. Current Instructional Practice (CIP) measured by the LoTi instrument.
4. Personal Computer Use (PCU) measured by the LoTi instrument.

Dependent Variable

1. Teachers' computer self-efficacy (CSE) measured by the CUSE instrument.

Limitations of the Study

There were several limitations to this study.

- The population of the study consisted of public school teachers working in the Walton County School District in Georgia who had completed the InTech Training program.
- The primary and elementary schools were grouped together in the elementary schools category.

- Participation in the study was voluntary which led to a return rate of 53%, which was lower than the researcher anticipated.
- By limiting the study to only InTech trained teachers in the Walton County School District, the results of this study may not be generalized to the public school teachers in other school districts.
- Threats to internal validity as defined by McMillan and Schumacher (2001) were discussed in Chapter 3. The threats were: history, selection, instrumentation, and experimenter effect.
- The surveys were distributed close to the end of the school year and it was not the optimal time to collect data. Teachers were cooperative, but were busy with end-of-year school activities.
- Instrumentation may have been a threat to validity because it involved the use of self-reporting questionnaires and an addendum questionnaire.
- The researcher had no data that could be used to compare the CSE levels and the LoTi levels of teachers in the Walton County School District prior to the surveys conducted in this study.

Definitions and Acronyms

Beliefs. Beliefs are the ideas or core values people are committed to that shape the goals, drive decisions, create discomfort when violated, and stimulate ongoing critique (Lumpe & Chambers, 2001).

Computer self-efficacy (CSE). Computer self-efficacy refers to a judgment of one’s capability to use a computer (Smith, 2001).

Constructivist learning. Constructivist learning emphasizes the learner's contribution to meaning and learning through both individual and social activity. Learners are active in constructing their own knowledge and social interactions are important to knowledge construction (Bruning, Schraw, Norby, Ronning, 2004).

Current instructional practice (CIP). This is the classroom teacher's inclination toward instructional practices consistent with a learner-based curriculum (Moersch, 2001).

CUSE. Computer self-efficacy instrument developed by Cassidy and Eachus (2002).

ETTC. Educational Technology Training Center.

InTech. InTech is the technology training program in Georgia that is designed to facilitate teacher integration of technology into the classroom.

ISTE. International Society for Technology Education

Level of technology implementation (LoTi). LoTi is the seven technology implementation levels teachers can demonstrate, ranging from Nonuse (level 0) to Refinement (Level 6). (Moersch, 2001).

LoTi. Level of Technology Integration

NCATE. National Council for Accreditation of Teacher Education

NCLB. No Child Left Behind Act

NETS. National Educational Technology Standards

NSSE. National Study of School Evaluation.

RESA. Regional Educational Service Agency.

RETA. Regional Educational Technology Assistance program.

Perception of the quality of InTech training received (PQIT). PQIT is how important the teachers believed the quality of the InTech training to be in helping them to integrate technology into their curriculum.

Personal computer use (PCU). PCU is the classroom teacher's comfort and proficiency levels with using computers (Moersch, 2001).

Self-efficacy. For the purposes of this study, self-efficacy is an individual's judgment of his or her capabilities to organize and execute courses of action required to attain designated types of performances (Bandura, 1986 as cited in Pintrich and Schunk, 2002).

Technology integration. Technology integration involves the practice of using new and emerging technology in ways that are both curriculum-based and future-oriented to create meaningful learning experiences and to increase technology literacy.

USDoE. United States Department of Education

Summary

National technology standards drafted by ISTE are currently being incorporated into the technology standards required of American public schools (Goldsby & Fazal, 2000). In the state of Georgia, teachers who are already certified to teach in their respective subject areas are now required, in addition, to become InTech certified by the end of the school year 2005-2006, and to show how they are actually integrating technology into the classroom. This study sought to investigate the effects on teachers' computer self-efficacy and computer utilization after completing the InTech training program.

This chapter addressed the problems associated with integrating technology into classroom instruction as was stated in the problem statement and the goal of the study. The goal of this study was to investigate the effects on teachers' computer self-efficacy, technology integration, current instructional practices, personal computer use and factors relating to use or non-use of computers in the curriculum after completing the Georgia Framework for Integrating TECHnology (InTech) training program. A discussion on the relevance and significance of the study was presented. The research questions used to guide this study along with the hypotheses and variables in the study were introduced. Barriers and issues related to the study were discussed and the limitations of the study were also discussed. Finally, the terms relevant to understanding this research study were defined.

Chapter 2

Review of Literature

Introduction

This chapter provides a discussion on literature that impacted and provided a foundation for this study. The concepts covered are: a historical perspective of the evolution of computer technologies, theoretical framework, educational changes, national and state technology standards, staff development training programs, self-efficacy, teacher computer self-efficacy, human-computer interaction, integrating technology into teaching, and perceived barriers to implementation. The summary served to bring together the areas discussed in the review of literature.

Historical Perspective

In the 1960s and 1970s instructional computing took place on large mainframe computers, was only at large universities, and was mostly text-based (Alessi & Trollip, 2001). In 1978, the Apple 11 microcomputer was the first computer available for use in schools but became obsolete with the introduction of the IBM personal computer in 1981 and the Apple Macintosh computer in 1984.

Valdez, McNabb, Foertsch, Anderson, Hawkes, and Raack (2000) reported three phases in the evolution of technology in education. The three phases were: print automation, expansion of learning opportunities, and data-driven virtual learning. In the print automation stage, most teachers sent students to the computer lab for drill and practice or electronic tutorials that were based on behavioral learning principles of the time. In the second stage, the focus on technology use shifted to the quality of learning using learner-centered approaches. The third stage espoused the use of the vast resources found on the Internet (virtual learning) and the multimedia presentation capabilities of very powerful computers to address data-driven issues and opportunities. Each phase was an advancement of previous stages and the changes in educational approaches used to integrate the technologies into the curriculum.

"The use of electronic media in education followed the invention of printing, the acceptance of written materials as adjuncts to oral instruction, and the establishment of public schools" (Boschmans, 2003, p.40). The instructional technology field (used interchangeably with educational technology) emerged from the audiovisual technology field where it is defined as a "systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and nonhuman resources to bring about more effective instruction" (Reiser, 1987 as cited in Boschmans, p.43). Another definition, however, stated that educational technology is the approach to achieving the ends of education and instructional technology as the use of such technological processes for teaching and learning (Ely, 2000 as cited in Boschmans, p.43). Education has always been slow in incorporating tools used in the business world and whereas the business community was moving ahead in its use of a variety of new technologies, the educational environment was lagging far behind. The use of a variety of technologies is a powerful component in accomplishing current educational visions and educational technology seeks to find approaches to effectively integrate technologies into education.

There have been a number of initiatives aimed at infusing technology and technology standards into the schools. Some of these include the NETS technology standards which were developed by ISTE and adopted by NCATE, technology funding from the federal government, and the subsequent rise in demand for technologically sophisticated teachers (Beyerbach, Walsh, & Vannatta, 2001).

The field of instructional computing is still young and evolving. The educational change brought about is still in a state of flux and measuring the impact of technology use on student achievement is fraught with difficulties (Ringstaff & Kelley, 2002). Efforts are now being made to have programs put into place that measure the effectiveness of technology integration and the educational change that is expected as more and more technology is integrated into the curriculum.

Theoretical Framework

Educational theories have undergone great change from the behavioral theories that dominated the first half of the 20^{th} century to the cognitive theories that followed and now the constructivist theories that have been around for the last ten years (Alessi & Trollip, 2001). One theory that has implication for the integration of technology in teaching and learning is the constructivist theory. The constructivist approach generally argues that learners build personal understanding and that appropriate learning activities and a good learning environment can facilitate this constructive process (Grabe & Grabe, 2001). Boschmans (2003) discussed the four principles of constructivism in her study on technology integration in mathematics for prospective teachers:

1. Learning is a search for meaning. Therefore, learning must start with the issues around which students are actively trying to construct meaning.
2. Meaning requires understanding wholes as well as parts and parts must be understood in the context of wholes. Therefore, the learning process focuses on primary concepts, not isolated facts.
3. In order to teach well, one must understand the mental models that students use to perceive the world and the assumptions they make to support those models.
4. The purpose of learning is for an individual to construct his or her own meaning, not just memorize the “right” answers and regurgitate someone else’s meaning.

Zahorik (1995) identified five basic elements of constructivist teaching practices that are important to the learning process. They are: (1) activating prior knowledge, (2) acquiring knowledge, (3) understanding knowledge, (4) using knowledge, and (5) reflecting on knowledge. With the constructivist approach, the teacher helps the learners to construct their own meaning from the experiences they have by providing those experiences and guiding the meaning-making process (Duhaney, 2001). Shegog (1997) noted that Piaget espoused that learning is more likely to occur if one discovers knowledge instead of being taught by someone else. In this approach, students are active participants in developing their own knowledge and skills (Shegog). Problem-solving environments share the basic constructivist assumption that students become intrinsically motivated to seek information and solve problems (Halpin, 1999).

“How technology, especially computers, is used or integrated is of critical concern to teacher educators, educational reformers, and other educators who subscribe to the benefits of student-centered learning environments” (Kurz-McDowell & Hannafin, 2004, p.98). Teacher education programs seek to prepare effective teachers who are able to facilitate learning for all students. Evans (2002) noted that teacher effectiveness has become a standard for teacher preparation, a basis for staff development, and a guideline for teacher evaluation. Effective teachers are artistic, serve as guides for learning, involve students actively in learning, have knowledge of pedagogy, teaching strategies, and models of instruction, and can manage the classroom environment (Evans). The effective teacher has characteristics that support the constructivist view of learning in guiding student learning and actively involving them in the learning process. The constructivist view of learning is noted by Kurz-McDowell and Hannafin who pointed out that "preparing pre-service teachers to integrate technology in ways that support the constructivist viewpoint has been another goal of teacher preparation programs" (p.98). Martin, Hupert, Gonzales, and Admon (2003) notes that successful reorientation of teachers from direct instruction to constructivist teaching methods that incorporate technology must alter teachers' epistemologies.

The more advanced uses of technology support the constructivist view of learning in which the teacher is a facilitator of learning rather than the classroom's only source of knowledge (Ringstaff & Kelley, 2002). Marcovitz, Hamza, and Farrow (cited in Kurz-McDowell & Hannafin, 2004) conducted a study that showed teachers choosing and integrating technology in a constructivist manner in third and fourth-grade elementary classrooms. It was noted that some of the responsibility for learning gradually shifted to the students and indicated that technology could support a naturally occurring shift in approach to learning and in the roles of teacher and student. Involving teachers in the constructivist learning environment would enable teachers to become confident and computer literate in a self-directed learning environment as they actively participate and the learning becomes adaptive.

Educational Change

Computer implementation in schools is a national, state, and local educational goal (Scheffler & Logan, 1999). This was acknowledged in 1997 when, then President Clinton, in his State of the Union Address noted, “In our school, every classroom in America must be connected to the information superhighway, with computers and good software, and well-trained teachers…” It is interesting to note that early models of educational change implied that if teachers had access to enough equipment and training, classroom integration would follow (Ertmer, 1999). However, according to Shegog (1997) even though widespread use of technological advances have altered society including educational institutions, educational institutions have not yet fully embraced these technologies at the level needed to adequately prepare students for the future.

The restructuring of schools for this new technological society means that students must have appropriate access and knowledge of the tools used in the business world and educators must provide a coordinated curriculum designed with a commitment to adequately educate the students (The Milken Exchange, 2003). Virtually every state now has standards in place that outline what all students should know and be able to do in core subject areas. These standards represent an important step toward the ability to assess or evaluate key competencies. Information technologies such as computers are helping to “remove some of the constraints that have limited assessment practice in the past and technologies are expanding the types of constructs that can be tapped through assessment" (Chudowsky & Pellegrino, 2003).

There is a call for educational accountability in the schools. According to Chudowsky and Pellegrino (2003) policy makers, educators, and the public are looking to large-scale assessments to gauge student learning, hold education systems accountable, signal worthy goals for student and teachers to work toward, and provide useful feedback for instructional decision making. Chudowsky and Pellegrino also noted that changes in educational technology have vastly improved data collection methods, creating assessments that give more useful and valid indicators of the learning that is going on.

Technology can be used to support the integration of instruction and assessment. According to Chudowsky and Pellegrino (2003), technology could be used to create a complex stream of data about how students think and reason while engaged in important learning activities. Information from this data stream could then be extracted for classroom and external assessment needs. In integrating technology into the curriculum, teachers should include technological means of assessment as part of the curriculum. Teachers should, however, not be expected to design all of their own assessment tools. Sophisticated cognitive theories and measurement models can be embedded in easy-to-use instruction and assessment materials for classroom use (Chudowsky & Pellegrino).

Assessment practice is shifting towards performance assessments based on student learning outcomes in technology supported instruction. According to Moersch (2002), high-stakes testing in schools throughout the country is moving toward performance measures that assess not only content understanding, but higher-order thinking.

National and State Technology Standards

According to Roblyer (2003) the standards movement was born of necessity. There was not only a need to ensure minimum competency but also excellence in education. To ensure equitable educational opportunities and high levels of achievement for all students, Congress passed the Goals 2000: Educate America Act in 1989. Another act signed into law was the No Child Left Behind Act (NCLB), of which the technology component, Title 11, Part D "Enhancing Education Through Technology," made significant changes in the use of technology in education. Setting national technology standards provide guidance on the integration of technology into the curriculum.

In 1991, ISTE released a set of guidelines and established the technology standards for all teachers. This was adopted by NCATE and utilized in the accreditation process (Vannatta, 2000). In 1994 NCATE and ISTE set forth accreditation guidelines that were implemented in the fall of 1995 and required teacher candidates to complete a sequence of courses/experiences to develop an understanding of the impact of technological and societal changes on schools and to use technology in instruction and assessment as well as for professional productivity. The National Educational Technology Standards (NETS) Project includes standards for students, teachers, and administrators. The NETS Project was grounded in the principle that setting standards for educational uses of technology would facilitate school improvement (Roblyer, 2003). As noted by Roblyer, "as of April 2003, 45 states in the United States have either adopted or used in some way at least one set of NETS in their state technology plans, certification, licensure, curriculum plans, assessment plans, or other official state documents" (p.10).

In Georgia, the InTech training program uses the NETS standards to train teachers in ways to integrate technology into the curriculum.

The National Study of School Evaluation (NSSE) also developed technology standards (known as Indicators of Quality) for information systems in K-12 schools. NSSE represents the six regional accrediting associations for schools and colleges: Middle States, New England, North Central, Southwest, Southern, and Western Association of Colleges and Schools. Included in the indicators of quality for technology are the integration of technology applications in teaching strategies and learning activities and professional development in information technology (Scheffler & Logan, 1999).

In 2002, the U.S. Education Department released the No Child Left Behind (NCLB) law which required states to submit an application to the U.S. Education Department (ED) that addresses the fifteen technology requirements cited in the law (Lohr, 2003). The NCLB has led to the federalization of education, the standardization of curriculum, assessment, and accountability, the systemization of education from local autonomy to a state-based, federally supported arrangement that overseas school accountability, and increased privatization of curriculum and assessment along with parental choice (Bloomfield & Cooper, 2003). Some of the requirements included how a state will improve student achievement through the effective use of technology, how students and teachers will have increased access to technology, and how the state will ensure that teachers and principals are technologically literate (Lohr). Proponents of the NCLB Act note that it will boost student achievement and bring accountability to states' and districts' use of federal funds. Funds from this law would be allocated by the states to school districts in the following amounts: 50% would be allocated to school districts that qualify for Title 1 money and 50% would be awarded through a state-determined competitive process (Lohr). The NCLB moved the U.S. toward a national standard in education based on state-determined standards and tests along with a set of processes and consequences that are federally mandated (Bloomfield & Cooper, 2003). This has led states to define standards for what students and teachers should know and be able to do regarding technology.

Today's teachers are expected to not only equip students with the basic knowledge and skills of an educated person, prepare students for work, create responsible citizens, and help them develop personal interests that brings meaning to life (Grabe & Grabe, 2001), but now they are also expected to equip them with the technological skills needed in today's society. If these standards are to have an impact, reliable assessments must be developed and implemented (The Milken Exchange, 2003).

Staff Development Training Programs

The provision for adequate training in effectively integrating technology into classroom instruction is a major concern for school districts throughout the United States as schools implement the national technology standards. With the increasing dollars being allocated for technology and the corresponding training for implementing its use, there is a need for school districts to assess how effective the training really is in enabling teachers to integrate the technology into the curriculum. It was found that there were few research studies focusing on the evaluation of technology use in education (Herman as cited in Hugo, 2000). Barron, Kemker, Harmes and Kalaydjian (2003) noted that as a result of the significant investments being made in hardware, software, and infrastructure, there is a need for evidence regarding the instructional integration of technology in K-12 classrooms.

There are many practicing teachers who have had some exposure to computers but have not worked with a number of other technologies such as video production, videodiscs, and electronic smartboards (Grabe & Grabe, 2001). There is also a lot of uncertainty faced by teachers now that they are called upon to be computer literate and to integrate technology into their curriculum. A number of colleges and schools of education are making progress in integrating technology in their teacher education programs; however, there are still a vast number of teachers who have been in the profession long before computing technologies became a buzz word (Duhaney, 2001). These teachers need to be trained in effectively using and integrating the newer computing technologies into their classroom instruction to support pedagogy and learning.

Research shows that training and computer experience increase computer use (Albion, 2001; Scheffler & Logan, 1999). However, traditional technology-training programs do not help teachers acquire the skills needed to use technology in ways that facilitate fundamental, qualitative changes in the nature of teaching and learning (Ertmer, 1999). There is a need to investigate the most effective approach for integrating computer training into teacher education (Halpin, 1999) and to determine the best way to incorporate the theory and the practice. Halpin reported that it is important to integrate the use of computer applications into the courses taught so teachers experience exactly how technology can be an integral part of the daily operations of the classroom.

However, Hugo (2000) commented that only 15% of technology dollars typically are allotted for training teachers in the use of hardware and software.

Providing teachers with technology staff development programs that closely link to their area of expertise is essential for teacher growth and continued integration of the technology into the classroom. One model, the engaged learning model, was used in a technology professional development program supported by the Technology Innovation Challenge Grant from the USDoE in the Midwest. Engaged learning is a comprehensive model of instruction that refers to a student-centered classroom environment where questions are complex, student activities are collaborative and project based, roles and tasks are designed to promote generative learning, and assessment is performance based (Lumpe & Chambers, 2001).

Another staff development model that offers professional development opportunities in integrating technology into academic content to educators across the state is the Regional Educational Technology Assistance (RETA) program in New Mexico (Martin, Hupert, Gonzales, & Admon, 2003). The RETA model focused on how to use technology in context within a constructivist learning environment and believed that (1) teachers need adequate time to assimilate the phases of the change process, (2) teachers and staff members need to work collaboratively, and (3) educators need to create challenging, developmentally appropriate curricula. The program sought to address the multiple and unique needs of teachers in New Mexico where the population is geographically isolated and teachers have limited access to development opportunities. Participants in the RETA program tend to increase their use of various types of hardware and software over time and expose their students to a wider range of technology. The evaluation study results also indicated that participants in the study altered how they teach using more facilitation methods.

It is also important to note that schools should provide on-going staff development in technology and to address personal attributes of teachers when designing staff development in technology (Shegog, 1997). Jaber and Moore (1999) noted that the teachers preferred a continuous type of computer training which was defined as training conducted on an ongoing basis throughout the year. Beyerbach, Walsh, and Vannata (2001) noted that professional development needs to center on creating sustained learning communities where participants have an active voice in determining goals and activities of the project. The state of Georgia, through its InTech training program is working to eliminate barriers for teachers and to collaborate with some colleges of education to focus on technology-enhanced learning (Lumpkin & Clay, 2001). The InTech training program provides for the development of curriculum materials as the training progresses. Teachers have to develop lesson plans as they go through the training and are a collaborative resource for cohorts undergoing the training.

In a study conducted by McCannon and Crews (2000) with elementary school teachers in Georgia, it was found that 97% of the participants had been offered staff development courses in technology. Ninety-one percent of the participants actually participated in those courses. It was noted by Atkins and Vasu (2000) that schools could plan more effective technology staff development by better assessing the types of technology training needed by teachers. Martin et al. (2003) noted that “professional development must address the beliefs held by educators and the methods in which they incorporate those beliefs into their teaching, as well as deliver effective new methods of integration technology and curricula" (p.54).

Self-Efficacy

Teachers' beliefs and self-efficacy are critical to the mastery of skills and are an important feature of program planning that should be carefully considered in professional development activities. According to Loucks-Horsley, Hewson, Love, and Stiles (1998), beliefs are the ideas or core values to which people are committed. Bandura (1997) defined self-efficacy as a self-judgment of one's ability to perform a task within a specific domain. This is different from locus of control which is concerned with beliefs about the outcome of such actions or tasks (Cassidy & Eachus, 2002). According to Cassidy and Eachus, self-efficacy levels have been shown to be related to choice of task, motivational level and effort, and perseverance with the task, thus it is considered to be situation specific. A teacher may exhibit high levels of self-efficacy in a specific domain but exhibit low levels of self-efficacy in another domain.

Teacher Computer Self-Efficacy

The human computer interface is becoming increasingly intuitive, but for the inexperienced user still poses formidable problems (Cassidy & Eachus, 2002). According to Cassidy and Eachus, the inability of individuals to tap into the power of the computer's potential may be real (as in the case of not having the skills to use the computer) or may be a "belief which results in incapacity and poor motivation as in the case of self-efficacy expectations" (p.134).

Smith (2001) noted that computer self-efficacy refers to a judgment of one's capability to use a computer and perceived efficacy beliefs about performance are based on judgment of capability, perceived task difficulty, individual effort, the amount of external assistance, and cognitive organization of experiences. Training and educational practices can significantly influence a person's sense of efficacy.

To be effective users of computer technologies and be models for students' computer use, teachers must have positive computer attitudes and feel self-efficacious in using them (Milbrath & Kinzie, 2000). According to Milbrath et al., many teachers have doubts about computer technology and their own ability because computer technology was not part of their learning experiences. In the longitudinal panel study conducted by Milbrath et al., it was found that over time, perceived self-efficacy with all six selected computer technologies increased significantly. It was found that "course exposure to and frequent use of computer technology may exert a more direct impact on the development of self-efficacy than on overall change in attitudes" (p. 385-6).

Experience with computers can affect the levels of computer self-efficacy. Smith (2001) also states that experience with computer technologies, through a course or continuous use, is a vital examination factor in the study of computer self-efficacy. However, it must be stated that "it was not necessarily the type of training that was the most important factor in use of technology, rather it was the individual teacher's perception of knowledge, or self-perceived knowledge, that was the strongest predictor of use" (Henry, 1993 as cited in Hugo, 2000, p. 15).

Compeau and Higgins (cited in Cassidy & Eachus, 2002), found that individuals with high self-efficacy used computers more, enjoyed using them more, and experienced less computer related anxiety. Cassidy and Eachus also noted that computer self-efficacy beliefs also affected whether individuals chose to use computers irrespective of their beliefs about the value of doing so. Having a high self-efficacy will positively affect performance and good performance will enhance one's self-efficacy in turn. In the study conducted by Smith (2001), "correlational analyses revealed that the strongest relationship existed between mastery experiences and affective states" and that "computer technology skills are only acquired through repetitious practice that builds self-efficacy beliefs and reduces computer anxiety" (p.35).

Teachers are a catalyst for educational reform. However, discomfort with the equipment or pedagogical techniques reduce the likelihood of teacher use (Hugo, 2000). According to Atkins and Vasu (2000), a teacher's computer confidence level is strongly related to personal knowledge and use of technology in teaching. They found that as teachers become more knowledgeable about technology integration; their concerns tend to move from lower levels to higher levels of integration. Shegog (1997) also noted that computer experience was the best predictor of attitude. This underscores the fact that teachers and their concerns should be at the center of the educational change process.

Finally, Dexter, Anderson, and Becker (1999) noted that teachers' range along a continuum of instructional styles from instruction to construction and that the catalyst for change is internal and is based on reflection on teaching practice, goals, and efficacy.

Human-Computer Interaction (HCI)

HCI is a multi-disciplinary field involving computer science, psychology, engineering, ergonomics, sociology, anthropology, philosophy, and design and is concerned with the design, evaluation, and implementation of interactive computing systems for human use (Berg, 2000). According to Berg, changes in educational technology have shown a pattern of exaggerated promise at the introduction of new technology which is typically followed by disappointment. This same sense of great promise is now being hailed with the introduction of the personal computer in education. The focus of HCI is on the user as the field seeks to gain a better understanding of the interactions between the user and the computer.

Computers are viewed as tools or instruments for storing and manipulating data, however, in the field of human-computer interaction it is seen as a medium. Berg notes that the understanding of computers as a medium may be a key to re-envisioning educational software. With the current focus on integrating technology into the curriculum and teaching with technology, this field brings an important viewpoint into the discussion with the wealth of software that is being developed for education. Berg (2000) pointed out that constructivist notions of learning being activity, exploration, and creation are well suited to the computer environment. Shneiderman (as cited in Berg) notes that speed of performance, a time to learn, rate of errors, subjective satisfaction, and retention over time are five human factors that should be considered in the development of educational software.

Usability, a major area of study that overlaps with HCI, and which refers to the degree to which a computer system is effectively used by its users, is also complementary to the learner-centered educational approach. Computer environments offer the users' rich learning experiences and a variety of collaborative opportunities, thus improved collaborative software could facilitate easier management of teams of learners. Berg points out that "it is clear from the HCI literature review that education can learn a great deal from human factors, usability, and interface design approaches to software design" (p.364). In seeking to gain a better understanding of the interactions between the user and the computer, the field of HCI is working to overcome some of the barriers teachers face in integrating technology into the classrooms as the interface becomes more user-friendly.

Integrating Technology into Teaching

The percentage of public schools connected to the Internet increased from 35% in 1994 to 95% in 1999 (Bennett, 2001). Nationally in 2001, there were just over four students for every instructional school computer, and the number went from 7.9 students in 2000 to 6.8 in 2001 for the number of students per Internet-connected computer in schools (Skinner, 2002). For the state of Georgia, students per instructional computers were 4.3 in 2001 and 7.5 for Internet-connected computers (Education Week on the Web, 2002). These figures show that computers are becoming more commonplace in educational institutions. However, in 1998 only 20 percent of teachers reported that they felt prepared to integrate educational technology into their teaching methods (Bennett, 2001). "With computers and advanced telecommunications technology revolutionizing nearly every aspect of life and work, the question is not whether states and local districts should incorporate technology into teaching and learning but how they should do it" (Houghton, 1997, p.8 as cited in Scheffler & Logan, 1999).

Knowing the computer competencies needed by teachers is a key factor in creating technology integrated classrooms. "For widespread classroom change to occur, teachers must accept computers as models of new processes for interpretation and abstraction of meaning and as models for investigating and knowing our complex world" (Scheffler et al.). It is important to note that the focus is no longer on teaching about computers but on teachers using computers. There has been a shift in essential teacher competencies from operating and explaining hardware and software toward integrating computer technology into the curriculum (Scheffler et al.). Beyerbach, Walsh, and Vannatta (2001) also supported this shift in thinking when their study indicated that pre-service teachers changed their views of technology infusion from thinking that they would teach and learn about technology to thinking they would use technology to support student learning. According to the study done by Scheffler et al., it was found that the most important competency groups were integration of computers into the curriculum and using computers within instruction. The study also found that the use of the Internet for research and the use of e-mail were important competencies.

There is now a need to examine how integrated the technology is with the curriculum. The Department of Education is planning a three year, $15 million study to gauge the effectiveness of using technology to improve learning (Totter, 2002). The purpose of the study will be to examine "the conditions and practices under which educational technology is effective in increasing student academic achievement, as well as the ability of teachers to integrate technology effectively into curricula and instruction." (Totter).

Clark (2000) noted in his study that teachers feel that technology is an integral part of their classrooms and also that classrooms need more technology. The more computer experience a teacher has, the greater the indication that the teacher will feel comfortable and have a positive attitude towards technology (Nisan-Nelson, 2001; Shegog, 1997). The amount of computer knowledge the teacher possesses determines the level of computer integration that takes place in the classroom (McCannon & Crews, 2000; Atkins & Vasu, 2000).

If the teacher is unable to adapt the new technology to his or her teaching style, then effective integration into the instruction will not occur (Nisan-Nelson, 2001). There is a need to have definitive plans to aid the teacher to incorporate technology into classroom activities. The integration of computers into the curriculum should not be left to chance, but rather well developed plans, which will be used to its fullest in teaching and learning situations (Ediger, as cited in MacDonald, 2003). Emerging from any technology integration training with a positive attitude towards the technology will lead to an increase in its use in the classroom (MacDonald, 2003).

Pierson (2001) noted that exemplary teachers are needed who know how to effectively use all the tools at their disposal for the learning benefit of students. She defined experts as people who are distinguished by a lifelong pursuit of complex problems for the purpose of enhancing personal learning. Exemplary technology-using teachers (the experts) not only spend a good deal of personal time working with computers but also had more extensive computer training and teaching experience, high levels of innovativeness, and confidence. She also stated that unless a teacher views technology use as an integral part of the learning process, it will remain a peripheral ancillary to his or her teaching. Exemplary technology-using teachers make conscious decisions to alter established curriculum as they rely on their professional judgment to guide student choice in learning activities.

Technology is also empowering teachers as instructional designers, authors, and presenters. As noted by Simpson (2000), the use of new technologies of instructional delivery, such as web-based and video instruction, will bring ownership of intellectual property to light in schools. Teachers are expected to use these new technologies and to integrate them into the classroom curriculum. For this to occur, teachers need to be proficient in the use of educational technology including the use of computers and other technologies for instruction and student evaluation (Howery, 2001).

The vision of technology integration held by the teacher, the school, and the school district impacts on how successful integration is measured. A vision of technology integration that empowers, rather than constrains, teachers as active participants in the teaching and learning process will positively impact the level of technology integration that occurs in the curriculum. Teachers that link the use of technology to teaching and learning theories do not allow technology to drive what they do, rather, they allow sound principles of teaching and learning to determine what technologies can be used to enhance the teaching and learning activities (Duhaney, 2001).

Curriculum design needs to blend technology concepts into academic subjects. According to Smith (2001), “a curriculum that emphasizes the guided instructive model, instead of the lecture format, will help students develop higher levels of computer self-efficacy. Guided instructive models promote critical thinking, transferability of applicable knowledge, and contribute to lifelong learning” (p.37). In integrating technology into classroom instruction, diverse teaching methods should be implemented that provide not only mastery experiences, but also furnish models and supportive verbal persuasion with regular assessment of students’ feelings.

Schechter (2000) notes that technology's benefits for teaching is generally positive and listed benefits given by the Office of Technology Assessment, some of which were (1) increased emphasis on individualized instruction, (2) more time engaged by teachers advising students, (3) increased interest in teaching, (4) increased collaboration and planning with colleagues, (5) rethinking and revision of curriculum and instructional strategies, and (6) increased communication among stakeholders. Schechter also notes certain conditions are necessary for successful integration of computer technology and increases in constructivist instructional practice. The conditions included "adequate and current hardware and software, formal computer coursework, professional development workshops, and technical support" (p.91).

Perceived Barriers to Implementation

As stated before, the vision of technology integration held by the teacher, the school, and the school district impacts on how successful integration is measured. In a study by Ertmer, Addison, Lane, Ross, and Woods (1999), the authors posited that it was important to look at teachers' beliefs and practices (first-order barriers) in addition to external factors (second-order barriers). Ertmer et al. noted that technology integration had been focused on first-order barriers because they could be pinpointed and remedied easily and if these barriers were overcome, then teachers would integrate the technology into their curriculum. Teachers' beliefs about the role of technology in the classroom may either reduce or magnify the effects of first-order barriers. Therefore, in addressing barriers to implementation, both first-order and second-order barriers must be addressed simultaneously. Dexter, Anderson, and Becker (1999) noted that teachers' predisposition to change is a factor that speed up or slows down the inevitable reaction that occurs when technology is presented as a catalyst in educational reform.

Teachers' planning and classroom practices are strongly related to their beliefs and these beliefs influence the integration of technology into their classrooms. According to Albion (2001) a teacher's belief, or lack thereof, in their personal capacity to teach effectively with computers may be a critical factor in determining patterns of classroom computer use. The teachers' self-efficacy, their confidence in their ability to perform specific tasks, plays a vital role in the level of technology integration that occurs in the curriculum.

Albion noted that perceived barriers to increased use of computers include limited access to resources, lack of time for planning, and inadequate training. Albion also noted that fewer than 25 percent of newly graduating teachers considered themselves adequately to thoroughly prepared for using computers in instruction. Veteran teachers, who may not have had computer training as part of their courses, may find computers to be an intrusion into their established practice.

Personal skills in computer use are a likely but not sufficient condition for integrating the technology into classroom instruction. Albion noted that integrating new technologies into teaching requires that, in addition to knowing how to harness the technology for personal use, teachers need to be able to adapt their classroom practices. A school-wide emphasis toward constructivist practices can influence the level and effectiveness of technology integration that takes place. Beyerbach, Walsh, and Vannatta (2001) noted that some teachers feel that they have no choice and had to integrate the technology into their curriculum. This perceived lack of control can adversely affect the integration of technology into the classroom.

Teachers must have adequate time to acquire and transfer technological knowledge and skills into classroom instruction as an integral part of the curricula and not as an addendum. According to Vanfossen (2001), 85% of all teachers had less than nine clock hours in computer training. Many teachers saw lack of training and even more importantly, lack of training that focused on the pedagogy and curriculum as barriers to implementation (Vanfossen, 2001; Cuban, Kirkpatrick, & Peck, 2001; Albion, 2001). Time also effects participation in workshops and other staff development opportunities. In a study done by Martin, Hupert, Gonzales, and Admon (2003) it was found that workshop attrition was one of the obstacles to staff development programs. The Regional Educational Technology Assistance (RETA) staff development model was evaluated and over the course of a year, it was noted that the program loses approximately 20% of workshop participants for a number of reasons. They found that the attrition rate was higher when school and district administrators selected teachers for the workshop rather than when teachers attended because they had a vested interest in participating in the program. Therefore, the RETA program changed its method of recruiting teachers and began targeting teachers directly for the various workshops. The RETA program also began offering online workshops to address the time factor and workshop attrition rates.

There is a problem in finding technology infused curriculum materials that can be used in the classroom. MacDonald (2003) noted that “teachers are strapped for time and with so many demands on their time, most find it hard to invest extra time in developing educational software programs” (p. 53). Georgia has adopted curricula standards that emphasized the integration of technology into the curriculum. However, there are still a low percentage of teachers who consistently and in a meaningful way, effectively integrate technology into their curriculum. As mentioned in Bennett (2001), in 1998, only 20 percent of the teachers in Georgia felt prepared to integrate technology into the classroom. Obviously, pedagogical innovations need to start at the design level to involve curriculum writers, practitioners, teachers, and students in the process of awareness raising, programming, and classroom implementation (Zhong & Shen, 2002).

The national trend toward greater teacher accountability and the curriculum pressures applied by the adoption of state-mandated standardized tests is a significant barrier to technology integration (Kurz-McDowell & Hannafin, 2004). These state-mandated tests often emphasize recall instead of the development of higher-order thinking skills and so teachers may feel pressured to devote most of their planning and instruction time to teaching for the test and this in turn significantly affects the level of technology integration that takes place in the curriculum.

Flexibility is a key component to providing teachers with technology training. In Georgia, there are a variety of ways in which teachers can gain the technology certification requirement that all teachers must have to remain certified to teach in Georgia by the year 2006. Teachers can satisfy the technology certification option through one of five ways: (1) take courses at a technology center within the school district; (2) through a technology specialist at the school on a weekly basis; (3) take courses at an educational testing center such as the Regional Educational Service Agency (RESA), a university, or Educational Technology Training Center (ETTC); (4) develop an electronic portfolio as a test-option; or (5) take the online test-out option.

Summary

Chapter two reviewed the relevant literature on a historical perspective of the evolution of computer technologies, theoretical framework, educational changes, national and state technology standards, staff development training programs, self-efficacy, teacher computer self-efficacy, human-computer interaction, integrating technology into teaching, and barriers to implementation. The research showed that there has been an evolution in the use of computers in education. Computers are no longer large mainframes but smaller machines that fit on a desk and are portable (Alessi & Trollip, 2001) and computer use has moved from drill and practice through learner-centered to data-driven learning (Valdez et al. 2000).

Educational theories such as the behaviorist and constructivist theories are fundamental to the pedagogical approach the teacher uses in integrating technology in teaching and learning and the degree to which the integration is teacher-centered or student-centered. Computer implementation in schools is a national, state, and local educational goal, however, access to equipment and training does not necessarily mean that there is a corresponding cataclysmic change in the way education is structured. With the public outcry for improving schools and student achievement, the NETS Project was grounded in the principle that setting standards for educational uses of technology would facilitate school improvement (Roblyer, 2003). There are now national and state technology standards used to measure teacher technology implementation levels and student technology usage. Using these technology standards to measure technology integration in schools will further increase the use of technology in more meaningful ways in the curricula.

Training and computer experience increase computer use (Albion, 2001; Scheffler & Logan, 1999) and it is important to integrate the use of computer applications into the courses taught so teachers experience exactly how technology can be an integral part of the daily operations of the classroom (Halpin, 1999). Beyerbach, Walsh, and Vannata (2001) noted that professional development needs to center on creating sustained learning communities where participants have an active voice in determining goals and activities of the project. As a result of the significant investments being made in hardware, software, and infrastructure, there is a need for evidence regarding the instructional integration of technology in K-12 classrooms (Barron, Kemker, Harmes & Kalaydjian, 2003).

Having a high self-efficacy will positively affect performance and good performance will enhance one’s self-efficacy in turn. The research showed that training and computer experience increase computer use. It also showed that training that is specific to the teacher’s subject area is more beneficial than generic training and will improve self-efficacy. To be effective users of computer technologies and be models for students’ computer use, teachers must have positive computer attitudes and feel self-efficacious in using them (Milbrath & Kinzie, 2000).

Computers are revolutionizing nearly every aspect of life and work, are more commonplace in educational institutions, and states and local districts need to incorporate technology into teaching and learning. The field of human-computer interaction seeks to better understand the interactions between the computer and the user and so is important in the development of the software for the educational community. Teacher competencies have shifted from operating and explaining hardware and software toward integrating computer technology into the curriculum (Scheffler & Logan, 1999). Emerging from any technology integration training with a positive attitude towards the technology will lead to an increase in its use in the classroom (MacDonald, 2003).

Regardless of the training received, teachers still encountered barriers in integrating technology into the curriculum. The teacher's beliefs and practices (first-order barriers) as well as external factors (second-order barriers) that impede implementation must be addressed in any training that takes place. Finding technology infused curriculum materials that can be used in the classroom, limited access to resources, lack of time for planning, and inadequate training were some of the perceived barriers to implementation. Research also showed that teachers must have adequate time to acquire and transfer technological knowledge and skills into classroom instruction.

Chapter 3

Methodology

This chapter describes the research design and methodologies used in this dissertation. The chapter is organized in the following sections: (1) overview of research design, (2) purpose of the study, (3) research questions and hypotheses, (4) research design and methodology, (5) population, (6) instrumentation, (7) procedures, (8) data analysis, (9) presentation of results, (10) resource requirements, (11) limitations, and (12) summary.

Overview of Research Design

This study employed a causal-comparative research design (also called *ex post facto*) (Ravid, 2000) to examine teachers' computer self-efficacy (CSE), current instructional practice (CIP), level of technology integration (LoTi), personal computer use (PCU), and factors related to use or non-use of computers in their curriculum after training. Information was gathered using the LoTi instrument (Moersch, 1999), the Computer Self-Efficacy (CUSE) Instrument (Cassidy & Eachus, 2002), observations, and interviews. Data was analyzed using appropriate statistical techniques.

Purpose of the Study

The theoretical rationale of this study lies in the three domains described in the LoTi instrument (Moersch, 1999); level of technology implementation, current instructional practice, and personal computer use; and teacher self-efficacy as proposed by Bandura's computer self-efficacy instrument (cited in Chao, 2001). The goal of this study was to investigate the effects on teachers' computer self-efficacy (CSE), technology integration (LoTi), current instructional practices (CIP), personal computer use (PCU) and factors relating to use or non-use of computers in the curriculum after completing the Georgia Framework for Integrating TECHnology (InTech) training program. This study sought to provide practical recommendations for principals and the coordinator for testing and research in the Walton County Public School District in developing effective training programs and ways to improve teachers' computer utilization. In addition, this study examined the relationship between teachers' computer self-efficacy toward computer utilization and teachers' perception of the quality of InTech training received, level of technology integration, current instructional practice, personal computer use, and factors affecting use or non-use of computers in the classroom after training.

Research Questions and Hypotheses

The following research questions were used to guide this study:

1. What relationship exists between teachers' perception of the quality of their InTech training and teachers' computer self-efficacy based on their level of technology integration at the elementary, middle, or high school levels?

2. What are the relationships between current instructional practice and teachers' computer self-efficacy at the elementary, middle, or high school levels?
3. What relationships exist between personal computer use and teachers' computer self-efficacy at the elementary, middle, or high school levels?
4. What are the levels of contributions to teachers computer self-efficacy by the variables: teachers' perception of the quality of InTech training received, level of technology integration, current instructional practice, and personal computer use?
5. What are the differences among mean scores on teachers' perception of the quality of InTech training received, teachers' computer self-efficacy, current instructional practice, personal computer use, and LoTi at the elementary, middle and high school levels?
6. Do any of the factors relating to use or non-use of computers in the classroom positively correlate on teachers' computer self-efficacy at the elementary, middle, or high school levels?

Null Hypotheses

The following hypotheses were proposed as a result of the research questions.

H1: There will be no statistically significant relationship between teachers' perception of the quality of InTech training received and teachers' computer self-efficacy based on the level of technology integration at the elementary, middle, or high school levels.

H2: There will be no statistically significant relationship between current instructional practice and teachers' computer self-efficacy at the elementary, middle, or high school levels.

H3: There will be no statistically significant relationship between personal computer use and teachers' computer self-efficacy at the elementary, middle, or high school levels.

H4: There will be no statistically significant differences in the levels of contributions to teachers' computer self-efficacy by the variables: teachers' perception of the quality of InTech training received, level of technology integration, current instructional practice, and personal computer use.

H5: There will be no significant differences among the mean scores on teachers' perception of the quality of InTech training received, teachers' self-efficacy, current instructional practice, personal computer use, and LoTi at the elementary, middle and high school levels.

The 6th research question was not analyzed as a hypothesis.

Variables

Independent Variables

1. Teachers' perception of the quality of InTech Training received (PQIT) as measured by the LoTi addendum questionnaire.
2. Level of Technology Integration (LoTi) measured by the LoTi instrument.
3. Current Instructional Practice (CIP) measured by the LoTi instrument.
4. Personal Computer Use (PCU) measured by the LoTi instrument.

Dependent Variable

1. Teachers' computer self-efficacy (CSE) measured by the CUSE instrument.

Research Design and Methodology

The research design employed in this study was causal-comparative research design (also called *ex post facto*). In causal-comparative design studies the researcher does not have control over independent variables. According to McMillan and Schumacher (2001) “the most common reasons that true experimental designs cannot be employed are that random assignment of subjects to experimental and control groups is impossible and that a control or comparison group is unavailable, inconvenient, or too expensive” (p. 342). Ravid (2000) propounded that in causal comparative studies, “the independent variable is not manipulated due to two main reasons: Either it has occurred prior to the start of the study, or it is a variable that cannot be manipulated” (p. 6). In this study, the InTech training has already occurred and cannot be manipulated and the training is directly related to one of the independent variables, perception of the quality of InTech training received.

The methodology used was a combination of descriptive quantitative research techniques. Quantitative research focuses on explaining cause-and effect relationships (Ravid, 2000), seeks to establish relationships, and explain causes of changes in measured social facts (McMillan & Schumacher, 2001; Leedy & Ormrod, 2001). According to Fraenkel and Wallen (2000), quantitative data are obtained when the variable being studied is measured along a scale that indicates how much of the variable is present. Techniques for conducting descriptive quantitative research include surveys, structured interviews, and structured observations (McMillan & Schumacher, 2001).

This study examined the relationships between the independent variables: PQIT, LoTi, CIP, and PCU; and the dependent variable, teachers’ CSE and also examined the correlations between elementary, middle, and high schools according to teachers' CSE. Correlational studies help us to understand the pattern of relationships among identified variables (Floyd, 1999). Correlation may be defined as the relationship or association between two or more variables and the strength or degree of correlation is indicated by a correlation coefficient (Ravid, 2000). Correlation studies provide a way to understand the variance of a variable (Floyd, 1999). According to Ravid (2000) "the most common way to use correlation in the field of education is to administer two measures to the same group of people and then correlate their scores on one measure with their scores on the other measure" (p. 143).

A purposeful sample of follow-up semi-structured interviews and observations was conducted after the completion of the LoTi and CUSE surveys. Purposeful samples "are chosen because they are likely to be knowledgeable and informative about the phenomena the researcher is investigating" (McMillan & Schumacher, 2001, p. 401). The data was triangulated. According to Leedy and Ormrod (2001) triangulation of the multiple sources of data can lead to a better analysis or interpretation of a particular hypothesis, theory, or situation.

Surveys are used to learn about people's attitudes, beliefs, values, demographics, behavior, opinions, habits, desires, ideas, and other types of information (McMillan & Schumacher, 2001). Surveys are versatile as they can be used to investigate almost any problem or question, efficient because credible information can be collected at a relatively low cost, and they also permit generalizations to the population (McMillan & Schumacher). The surveys used in this research study provided information on the participants’ LoTi, CIP, PCU, PQIT, and teachers’ CSE, thus enabling the researcher to make inferences about the characteristics of the population in the study.

Interviews involve direct contact with individuals in the research study and provide a more flexible and adaptive environment. Interview questions usually take one of four forms: structured, semi-structured, unstructured (McMillan & Schumacher, 2001) or retrospective (Fraenkel and Wallen, 2000). Patton (cited in Fraenkel and Wallen, 2000) identified six basic types of questions that contribute to gaining valuable information for the research study. They are: (1) background or demographic questions, (2) knowledge questions, (3) experience or behavior questions, (4) opinion or values questions, (5) feelings questions, and (6) sensory questions. Regardless of the type of question, the responses are coded, tabulated, and summarized numerically.

Purposeful sampling was conducted to determine the six participants to be interviewed for this study. Fraenkel and Wallen (2000) noted that “based on previous knowledge of a population and the specific purpose of the research, investigators use personal judgment to select a sample” (p. 112). The participants in the interviews were selected based on their level of technology use as identified on the LoTi survey. Two were selected from level 0 or level 1 (Non-Use and Awareness), two from level 3, level 4a, or level 4b (Infusion, Integration-Mechanical, and Integration-Routine), and two from level 5 or Level 6 (Expansion and Refinement). This selection method allowed the researcher to choose interview participants that best represented their groups’ self efficacy and use of technology. The interviews conducted in this study provided additional data used to make inferences about the characteristics of the population in the study.

Observations provide another means for data-gathering. According to Fraenkel and Wallen (2000) researchers select a sample of observations they feel will yield the best understanding of whatever they wish to study. A structured observation allows the researcher to directly observe some phenomenon and then systematically record the resulting observations. In a structured observation, specific categories of behavior are predetermined and then systematically recorded during the observation. In the case of this study, purposeful sampling was conducted to determine the six participants to be observed from a population of 251, as the researcher believes that this number will yield valid results. The observations done served to validate the data from the survey and the interviews on the participants' use of and comfort level with computer technology.

Validity refers to the degree to which scientific explanations of phenomena match the realities of the world in that the inferences made from the data collected are appropriate, meaningful, and useful (McMillan & Schumacher, 2001; Fraenkel & Wallen, 2000). The use of previously developed surveys that have been validated in other studies provided evidence of content-related validation. The use of different data gathering procedures allowed the researcher to be more confident in interpreting the data and provided evidence of construct-related validation.

Population

A population is an entire group of persons or elements that have at least one characteristic in common (Ravid, 2000; Fraenkel & Wallen, 2000) or, as noted in Hinton (2001), have the complete set of things that the researcher is interested in. Fraenkel and Wallen noted that the size of the sample should be as large as the researcher can obtain with a reasonable expenditure of time and energy and that for descriptive studies there should be a minimum number of 100 subjects.

Walton County is a fertile agricultural county that has a number of small towns. The county seat is located in the small town of Monroe which is known as one of Georgia's most civic minded and cultured small towns. Some of the schools in the Walton County School District are located in these small towns and others are located in more rural areas of the county.

There are 13 schools that comprise the Walton County School District and during the 2003-2004 school year the student enrollment was 10,722. According to the 2004 Georgia County Guide, (http://www.agecon.uga.edu/%7Ecountyguide/) there were 854 teachers in Walton County. The 2004 Georgia County Guide showed that Walton County had a total population of 69,381 with a median household income of $46,123. A number of school teachers in the Walton County Public School District travel from nearby counties to work in the school district. The 2004 Georgia County Guide noted that the ratio of teachers to students in Walton County is 14:1. The average years of teaching experiences for teachers in the Walton County school district were 11.18 years and 50% of the teachers have advanced degrees in education. Teachers from the Walton County School District did not take the LoTi survey instrument before participating in the InTech training program although in other school districts in Georgia teachers were required to take the LoTi survey instrument before taking the InTech training. A random sampling of this population was conducted to arrive at the six participants for the observations and the six participants for the interviews.

The target population for this research study was the elementary, middle, and high school teachers in the Walton County Public School District in Georgia who have already completed their InTech certification requirement. A listing of teachers in the Walton County School District who have completed the InTech training program was obtained from the Instructional Technology Director and was the population used in this research. This listing showed that 252 teachers have completed the InTech training and now have the technology certification required by the state. Therefore, the population for this study was the 252 InTech certified teachers in Walton County. Fraenkel and Wallen (2000) noted that the minimum sample size should be 100 for descriptive studies, 50 for correlation studies, and 30 for experimental and causal-comparative studies. In addition, Fraenkel and Wallen stated that “the extent to which the results of a study can be generalized determines the external validity of the study” (p.119). Therefore a minimum return of 100 samples from the target population would be enough to determine the validity of this study. Responses were analyzed according to elementary, middle, and high school teachers.

Instrumentation

In order to accomplish the stated goal the following instruments and data gathering procedures were used; (1) two surveys: the LoTi instrument and addendum questionnaire, and the CUSE instrument, (2) semi-structured interviews, and (3) structured observations. A number of strategies were employed to ensure the reliability and validity of the results of the study. Reliability refers to the consistency of the results of the measurement instruments used to collect data (Fraenkel & Wallen, 2000;

McMillan & Schumacher, 2001). The internal consistency reliabilities of the LoTi and the CUSE instruments were measured using the Cronbach alpha. Cronbach's alpha is measured on a scale from 0 to +1.0. Fraenkel and Wallen have suggested that for research purposes the generally accepted standard for reliability estimates should be at least .70 and preferably higher.

The LoTi instrument (see Appendix A) was developed by Christopher Moersch in 1994 (Moersch, 1999; (http://www.loticonnection.com/) and was a 50-item paper or online questionnaire that sought to determine classroom teachers' current level of technology implementation (LoTi), personal computer use (PCU), and current instructional practices (CIP). There were five questions for each of the eight levels of technology implementation. The levels of technology table in Appendix B outlines the eight levels of technology implementation purported by Moersch's LoTi instrument.

There were five questions for the level of personal computer use, and five questions for the level of current instructional practice. The stages of instructional practice table in Appendix C gives a brief description of the levels of current instructional practice as purported by Moersch (2002). The LoTi scale generates a profile for the teacher across the three levels mentioned in the stages of instructional practice seen in Appendix C**.**

The LoTi scale was tested for reliability, internal consistency, and validity with several different samples, which showed that it accurately measures teacher's level of technology integration in the classroom, personal computer use, and current instructional practices (http://www.loticonnection.com/).

The Computer Self-Efficacy (CUSE) instrument used in this study (see Appendix D) was developed by Cassidy and Eachus (2002). This is a self-reporting instrument and was used to determine teachers' attitudes and beliefs about their ability to use a computer. The instrument contains two parts. Part 1 elicits basic information on the participants' background and their experience with computers. Part 2 of the survey focuses on the participants' attitudes toward computers using a six-point Likert scale to measure their responses.

The CUSE was found to have high levels of internal reliability (Chao, 2001) and Cassidy and Eachus (2002) reported that the study provided strong support for the reliability and validity of the instrument. Cassidy and Eachus noted that the internal consistency of the 30-item scale, measured by Cronbach's alpha was high (alpha=.97) and that construct validity was significant. To enhance reliability, all participants were given the same directions and time frame to complete the surveys (McMillan & Schumacher, 2001) and the researcher conducted the interviews and observations.

Procedures

To evaluate the effect on teachers' computer self-efficacy and computer utilization after completing the InTech training program, the research focused on teacher computer self-efficacy, the levels of technology integration, current instructional practice, personal computer use, and teachers' perception of the quality of InTech training. This research study was conducted in the Walton County School District in the state of Georgia. Dr. Roger Crim, Coordinator for Testing and Research, approved the study and along with Harvey Franklin, Assistant Superintendent for Curriculum and Instruction, provided assistance in conducting the study.

The following procedures were used to gather the data for this study: The researcher personally distributed the survey packets to the principals at a district-wide principals' meeting. The principals' packet included a principal's cover letter (see Appendix E), a consent form to distribute and collect the teacher surveys (see Appendix F), the teacher survey packets, and a large self-addressed return envelope in which teacher responses were placed. The number of teacher survey packets in each principal's packet varied according to the number of teachers at the school who have completed the InTech training and had the names of the teachers on the teacher packet. The principals were instructed to designate the school's administrative secretary to distribute the teacher survey packets to all the teachers who have completed the InTech training program on their school site and then to collect the teacher response envelopes.

The teacher survey packets included a cover letter (see Appendix G), the interview and observation consent form (see Appendix H), the LoTi survey instrument, (see Appendix A), the CUSE instrument (see Appendix D), and a self-addressed return envelope. (See Appendix I for the Structured Observation Guide list and Appendix J for the Structured Interview Questions.) The teacher survey packets were distributed by the principals on the day following the district-wide principals' meeting in the 2004-2005 school year.

The surveys were collected within two weeks of distribution from the teachers by the schools' administrative secretaries. The packets were delivered to the researcher at the researcher's school through the district-wide mail system. The researcher emailed the six teachers to be interviewed and observed after the completed surveys were collected from the schools and the LoTi results were analyzed to evaluate the teachers' level of technology implementation. A date and time for the interviews and observations was arranged. The researcher was the person conducting the interviews and observations. The interviews were recorded on tape as well as using handwritten notes. Due to participant scheduling difficulties, only five of the six interviews were completed. The 30-minute observations and interviews were done within a month of receipt of the surveys by the researcher and were conducted at the school sites where the teachers are employed.

Data Analysis

This study contains four independent variables and one dependent variable. A variable is an event, category, behavior, or attribute that expresses a construct and has different values, depending on how it is used in a study (McMillan & Schumacher, 2001). The variable that is the outcome measure or is a consequence of predictions is known as the dependent variable because its value depends on and varies with the value of the independent variable (McMillan & Schumacher, 2001; Ravid, 2000). The variable that is used as the predictor or intervention is known as the independent variable and is used to investigate the effect on dependent variables (McMillan et al.).

One independent variable in this study was teachers' perception of the quality of InTech training received (PQIT), which was measured by the LoTi addendum questionnaire. The second independent variable was the level of technology integration (LoTi) which was assessed by level of technology integration questions on the LoTi instrument. The third independent variable was current instructional practice (CIP) which was measured by the current instructional practice questions on the LoTi instrument. The fourth and final independent variable was personal computer use (PCU) which was measured by the personal computer use questions on the LoTi instrument. Teachers' computer self-efficacy (CSE) was the dependent variable in this study and was measured by the Computer Self-Efficacy instrument (CUSE) developed by Cassidy and Eachus.

Survey instruments that were returned were processed prior to any statistical analysis and each teacher survey was assigned a unique case number. Descriptive statistics including mean scores and standard deviations were used to analyze the data. Analyses using *z*-scores and multiple regression were used to determine differences in teacher computer self-efficacy and technology integration after completing the InTech training program. A *z*-score is a standard score frequently used in educational research (Resch & Hall, 2002; Frankel & Wallen, 2000; Ravid, 2000). Standard scores allow the researcher to compare scores from different tests by converting these scores into the same scale thus allowing for comparisons to be made. The *z*-score tells how many standard deviation units a given score is above or below the mean for that group.

Regression is a technique used to assess the contribution of one or more independent variables to one dependent variable. Multiple regression enables researchers to determine a correlation between a criterion variable and the best combination of two or more predictor variables (Fraenkel & Wallen, 2000).

Multiple regression analyses were used to test the following null hypotheses:

Hypothesis 1. There will be no statistically significant relationship between teachers' perception of the quality of their InTech training and teachers' computer self-efficacy based on their level of technology integration at the elementary, middle, or high school levels.

Hypothesis 2. There will be no statistically significant relationship between current instructional practice and teachers' computer self-efficacy at the elementary, middle, or high school levels.

Hypothesis 3. There will be no statistically significant relationship between personal computer use and teachers' computer self-efficacy at the elementary, middle, or high school levels.

Hypothesis 4. There will be no statistically significant differences in the levels of contributions to teachers' computer self-efficacy by the variables: teachers' perception of the quality of InTech training received, level of technology integration, current instructional practice, and personal computer use.

A one-way ANOVA statistical test was used to examine the 5th null hypothesis:

Hypothesis 5. There will be no significant differences among the mean scores of teachers' perception of the quality of the InTech training program received, teachers' computer self-efficacy, current instructional practice, personal computer use, and LoTi at the elementary, middle, and high school levels.

Qualitative content analysis was done on the data gathered from the interviews and observations to answer research question six. Content analysis is a technique used to study human behavior in an indirect way through an analysis of their communications (Fraenkel & Wallen, 2000). It is a systematic process of selecting, categorizing, comparing, synthesizing, and interpreting in order to explain a phenomenon (McMillan & Schumacher, 2001). To ensure that the data from the interviews and observations was examined objectively and systematically, a semi-structured interview and an observation guide list were utilized. Semi-structured interviews are made up of questions developed in advance along with prepared probes designed to obtain additional, clarifying information (Morse & Richards, 2002; Leedy & Ormrod, 2001). The research study was focused on technology integration into the curriculum and to assist the researcher in objectively targeting this occurrence, an observation rating scale (guide list) was used to facilitate the evaluation of the behavior when it transpired (Leedy & Ormrod). Data was classified into data sets using a pre-determined coding scheme. The research questions and hypotheses guided the *a priori* coding scheme that was used to analyze the data from the interviews and the observations.

Presentation of Results

The goal was to investigate the effects on teachers' computer self-efficacy, technology integration, current instructional practices, personal computer use and factors relating to use or non-use of computers in the curriculum after completing the Georgia Framework for Integrating TECHnology (InTech) training program. Following the data collection and analysis, a report was prepared. A description was done of the characteristics of the participants in the study in terms of the grade level at which they teach, subject, gender, and years of teaching experience.

The results from the LoTi survey instrument and addendum questionnaire, the CUSE instrument, teacher interviews, and observations were used to determine the answers to the null hypotheses and the research questions. Tables were used to show the results from the quantifiable data collected.

The interviews and observation data were used to determine the answer to research question six. The teacher interviews were used to provide specific information on the frequency of teacher use of technology in the classroom and for personal use as well as finding out how comfortable they felt in using the technologies. The observations were used as a corroboration of the teachers' computer self-efficacy in the implementation of technology in classroom instruction.

Resources

The following resources were required to conduct this study:

- IRB permission from Nova Southeastern University (See Appendix K)
- Walton County School District's approval to conduct the study (Appendix L)
- Approval from teachers who have gone through the InTech program
- Use of school facilities
- The ISTE Technology Standards for teachers and for students
- The LoTi Survey Instrument.
- The CUSE Instrument
- The University of Georgia Statistical Consulting Center

Validity

Internal validity is the extent to which the research design has control over extraneous variables (McMillan & Schumacher, 2001). Certain events can threaten the internal validity of a research design. Some events may pose a threat to internal validity are given:

1. History. The population for the study took the InTech training program at different times over a number of years. The differing times that the population took the training may constitute a history threat associated with the independent variable InTech training. The length of time between the InTech training and this research study could also be a history threat.

2. Selection. In addition to the surveys, a sample of the population in this study was observed and interviewed. This sample was purposefully selected to lessen any threats to the internal validity of the study.

3. Instrumentation. Instrumentation refers to the way changes in the instruments or persons used to collect data might affect the results (McMillan & Schumacher, 2001). The researcher was the observer and interviewer in this research. This lessened the results from any subjectivity that different observers or interviewers may add to the research.

4. Experimenter Effect. This refers to deliberate and unintentional influences that the researcher has on the subjects (McMillan & Schumacher, 2001). To lessen this effect on the study, the sample population used for the observations and interviews were purposefully selected.

Finally, due to the fact that the teachers knew they are in a study participants, they may have report higher values on the surveys; however, no external pressure was placed on them by the researcher or the school district. It must be noted that surveys involving self-assessment and self-reporting by teachers may, to some extent, lead to biased results since teachers may over-estimate their integration and/or use of computer (Smeets & Mooij, 2001). By using surveys, observations, and interviews and then triangulating the data, it is hoped that any pressure that was felt was offset by using a variety of techniques to collect and to analyze the data.

Summary

In this chapter, the methodology used in this research study was described. The chapter was organized in the following sections: (1) overview of research design, (2) purpose of the study, (3) research questions and hypotheses, (4) research design and methodology, (5) population, (6) instrumentation, (7) procedures, (8) data analysis, (9) presentation of results, (10) resource requirements, (11) limitations, and (12) summary.

The chapter started with an introduction to the purpose and research design. The six research questions and five hypotheses were discussed followed by a presentation of the four independent variables and one dependent variable. A detailed discussion on the *ex post facto* research design and methodology was presented. The population for the study was described along with a detailed discussion of the instrumentation. The procedures followed in conducting the research were presented and then the data analysis for the study was then articulated. A discussion on how the results were presented was given. This was followed by the resources section that included a timeline showing dates when permissions and approvals for the resources were acquired. Finally, four limitation issues were discussed.

Chapter 4

Results

The chapter includes four sections. The first section provides background information about the study. In this section, the goal of the study is restated. The second section discusses the screening of the data. The third section discusses the results of all quantitative statistical analyses and qualitative descriptions performed in the study along with the findings. The statistical analyses included descriptive statistical analyses and inferential statistical analyses of the data in the study. The qualitative descriptions and analyses discuss the themes that emerged from the interviews and observations that supported the research questions and hypotheses. The fourth section summarizes the results of the study.

Background

The goal of this study was to investigate the effects on teachers' computer self-efficacy, technology integration, current instructional practices, personal computer use, and factors relating to use or non-use of computers in the curriculum after completing the Georgia Framework for Integrating TECHnology (InTech) training program. The study focused on the size and direction of the relationship between teachers' perception of the quality of InTech training received, teachers' computer self-efficacy and computer utilization after training at the elementary, middle, and high school levels. The independent variables in the study were teachers' perception of the quality of InTech Training received (PQIT); level of technology integration (LoTi); current instructional practice (CIP); and personal computer use (PCU). The dependent variable was teachers' computer self-efficacy (CSE).

The population for the study consisted of InTech trained teachers in the 13 public schools in the Walton County School District in Georgia. These teachers were employed in the Walton County School District during the 2004-2005 school year. The findings may be helpful to administrators and teachers in the school district where the study was conducted to determine the role computer self-efficacy and training plays in teachers' integrating technology into the curriculum.

Data Screening Procedures

The original list obtained from the Instructional Technology Director contained the names of 252 InTech trained teachers. Of the 252 survey packets that were delivered, 156 (62%) were returned. Eighteen of the returned survey packets were from teachers who chose not to participate in the study. Five of the returned survey packets came in four months after the deadline date for packages to be returned and were not included in the data. This dropped the total survey returns from 156 to 133 usable surveys for a return rate of 53%.

All data were checked for accuracy of entry, missing data, skewness, and kurtosis using the functions provided by the Statistical Package for the Social Sciences (SPSS) 13.0 descriptive statistics. Data editing was performed to check the accuracy of data entry on the CUSE survey and the addendum to the LoTi Questionnaire. A printout was made of the data to check for large numbers, missing entries, and whether the pattern of the data looked correct (Hinton, 2001). Missing entries found on the CUSE data were checked with the original surveys to decide if they were mistakes on data entry or if the teacher participants omitted a response. The teacher responses were located on the original surveys and the missing entries were corrected. The LoTi questionnaire is a proprietary instrument and the data were analyzed and the scores sent to the researcher by the proprietors for the instrument.

The distribution of the data was checked for skewness using results from the descriptive statistics tables. Skewness is a measure of the asymmetry of a distribution where the normal distribution is symmetric, and has a skewness value of zero (Norusis, 2005). A distribution with a significant positive skewness is skewed to the right and a distribution with a significant negative skewness is skewed to the left. According to Norusis, a skewness value more than twice its standard error is taken to indicate a departure from symmetry therefore, the skewness values of the distribution were determined to be within acceptable ranges.

The distribution of the data was also checked for kurtosis using results from the descriptive statistics tables. Kurtosis is a measure of the extent to which observations cluster around a central point and where the value of zero indicates a normal distribution of the data (Norusis, 2005). According to Norusis, positive kurtosis indicates that the observations cluster more and have longer tails than those in the normal distribution and negative kurtosis indicates the observations cluster less and have shorter tails. The kurtosis values were determined to be within acceptable ranges.

Data Analysis

This section details the results from the three data collection methods used in this research including: a) two surveys and an addendum questionnaire, b) semi-structured interviews, and c) classroom observations. Quantitative statistical analyses from the two surveys and addendum questionnaire were addressed first. This section begins with descriptive statistical analyses followed by inferential statistical analyses. Qualitative analyses from the supportive evidence from the interviews and classroom observations are presented next.

Quantitative Statistical Analyses

Descriptive Statistics

Descriptive statistics help to summarize the overall trends or tendencies in the data, provide an understanding of how varied the scores might be, provide insight into where one score stands in comparison with others (Creswell, 2005), and is the most fundamental way to summarize data (McMillan & Schumacher, 2001). Descriptive statistics provide a general profile of the sample population and is essential to fully understand the implication of the resulting numbers. Tables are used to present the measures of central tendency and the measures of variability for the dependent and independent variables.

Table 1 displays descriptive statistics for each of the variables in the study. It gives a summary of the number of cases with valid values for each of the variables. As indicated by the last row (Valid N), all 133 cases have complete information for all the variables used in the analysis.

Table 1. Descriptive Statistics for the Variables

	N	Minimum	Maximum	Mean	Std. Deviation
CIP	133	0	7	3.62	1.501
CSE	133	74	179	136.34	25.703
LoTi	133	0	5	1.62	1.622
PCU	133	1	7	4.26	1.230
PQIT	133	6	25	16.35	4.818
Valid N (listwise)	133				

Table 2 displays the descriptive statistics computed for the variable, PQIT. The data gathered indicated that the mean score was 16.35 out of a total possible score of 25 with a standard deviation of 4.818. The median score was 16.00. The participants' scores were from 6 to 25 giving a range of 19. The variance was 23.213. The minimum possible score that a teacher could make was 0 but the minimum score that teachers made in the survey was 6. The maximum possible score was 25 and results of the survey indicated that teachers achieved the maximum score.

Table 2. Descriptive Statistics for PQIT

N	Valid	133
	Missing	0
Mean		16.35
Median		16.00
Std. Deviation		4.818
Variance		23.213
Skewness		-.143
Std. Error of Skewness		.210
Kurtosis		-.634
Std. Error of Kurtosis		.417
Range		19
Minimum		6
Maximum		25

Table 3 displays data that indicates that 98 of the 133 participants (73.7%) scored at 19 and below (76% and below) on their PQIT. Three participants (2.3%) scored 20 (80%), eight participants (6.0%) scored at 21 (84%), ten participants (7.5%) scored at 22 (88%), six participants (4.5%) scored at 23 (92%), one participant (.8%) scored at 24 (96%), and seven of the participants (5.3%) scored at the highest level of 25 (100%).

Table 3. Frequency Table for PQIT

Scores		Frequency	Cumulative Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6	3	3	2.3	2.3	2.3
	7	3	6	2.3	2.3	4.5
	8	2	8	1.5	1.5	6.0
	9	4	12	3.0	3.0	9.0
	10	6	18	4.5	4.5	13.5
	11	5	23	3.8	3.8	17.3
	12	8	31	6.0	6.0	23.3
	13	4	35	3.0	3.0	26.3
	14	11	46	8.3	8.3	34.6
	15	8	54	6.0	6.0	40.6
	16	13	67	9.8	9.8	50.4
	17	12	79	9.0	9.0	59.4
	18	12	91	9.0	9.0	68.4
	19	7	98	5.3	5.3	73.7
	20	3	101	2.3	2.3	75.9
	21	8	109	6.0	6.0	82.0
	22	10	119	7.5	7.5	89.5
	23	6	125	4.5	4.5	94.0
	24	1	126	.8	.8	94.7
	25	7	133	5.3	5.3	100.0
	Total	133		100.0	100.0	

There are eight levels of LoTi as identified by Moersch (2002). These levels range from Nonuse (Level 0) to Refinement (Level 6). Table 4 displays the descriptive statistics computed for the variable, LoTi. The data gathered indicated that the mean score was 1.62 out of a total possible score of 5 with a standard deviation of 1.622. The median score was 1.0. The participants’ scores were from 0 to 5 giving a range of 5. The variance was 2.632. The minimum score that teachers made in the survey was 0 and the maximum score was 5.

Table 4. Descriptive Statistics for Scores on the LoTi

N	Valid	133
	Missing	0
Mean		1.62
Median		1.00
Std. Deviation		1.622
Variance		2.632
Skewness		.674
Std. Error of Skewness		.210
Kurtosis		-.850
Std. Error of Kurtosis		.417
Range		5
Minimum		0
Maximum		5

Table 5. Frequency Table for LoTi Category Levels

	Category	Level	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Nonuse	0	45	33.8	33.8	33.8
	Awareness	1	34	25.6	25.6	59.4
	Exploration	2	13	9.8	9.8	69.2
	Infusion	3	17	12.8	12.8	82.0
	Integration - Mechanical	4a	16	12.0	12.0	94.0
	Integration - Routine	4b	8	6.0	6.0	100.0
	Expansion	5	0	0	0	100.0
	Refinement	6	0	0	0	100.0
	Total		133	100.0	100.0	

Table 5 displays data that indicates that 45 of the 133 respondents (33.8%) were at the Level 0 (Nonuse) of technology implementation. Thirty four of the participants were at Level 1 (Awareness). That represents 25.6% of the participants. Thirteen of the participants (9.8%) were at Level 2 (Exploration), 17 of the participants (12.8%) were at Level 3 (Infusion), 16 of the participants (12%) were at Level 4a (Integration-

Mechanical), and 8 of the participants (6%) were at Level 4b (Integration-Routine). None of the participants achieved Levels 5 (Expansion) and 6 (Refinement).

Table 6 displays the descriptive statistics computed for the independent variable, current instructional practice (CIP). The data gathered indicated that the mean score was 3.62 out of a total possible score of 7 with a standard deviation of 1.501. The median score was 4.0. The participants' scores were from 0 to 7 giving a range of 7. The variance was 2.253. The minimum score that teachers made in the survey was 0 and the maximum score was 7.

Table 6. Descriptive Statistics for CIP

N	Valid	133
	Missing	0
Mean		3.62
Median		4.00
Std. Deviation		1.501
Variance		2.253
Skewness		-.235
Std. Error of Skewness		.210
Kurtosis		-.369
Std. Error of Kurtosis		.417
Range		7
Minimum		0
Maximum		7

As identified by Moersch (2002); the CIP scores range from "Not True of Me Now" (levels 0, 1, and 2) to "Very True of Me Now" (levels 6 and 7). Table 7 shows data that indicates that 11 teachers (8%) scored in the range "Very True of Me Now" (levels 6, and 7), 92 teachers (69%) scored in the range "Somewhat True of Me Now" (levels 3, 4, and 5), and 30 teachers (23%) scored in the range "Not True of Me Now" (levels 0, 1, and 2).

Table 7. Frequency Table for CIP

	Category	Level	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not True of Me Now	0	3	2.3	2.3	2.3
	Not True of Me Now	1	9	6.8	6.8	9.0
	Not True of Me Now	2	18	13.5	13.5	22.6
	Somewhat True of Me Now	3	31	23.3	23.3	45.9
	Somewhat True of Me Now	4	30	22.6	22.6	68.4
	Somewhat True of Me Now	5	31	23.3	23.3	91.7
	Very True of Me Now	6	9	6.8	6.8	98.5
	Very True of Me Now	7	2	1.5	1.5	100.0
	Total		133	100.0	100.0	

Table 8. Descriptive Statistics for PCU

N	Valid	133
	Missing	0
Mean		4.26
Median		4.00
Std. Deviation		1.230
Variance		1.514
Skewness		-.269
Std. Error of Skewness		.210
Kurtosis		-.322
Std. Error of Kurtosis		.417
Range		6
Minimum		1
Maximum		7

Table 8 displays the descriptive statistics computed for the independent variable, personal computer use (PCU). The data gathered indicate that from a range of 1 – 7 the mean score was 4.26 out of a total possible score of 7 with a standard deviation of 1.23.

The median score was 4.0. The participants' scores were from 1 to 7 giving a range of 6 and the variance was 1.514. The minimum score that teachers made in the survey was 1 and the maximum score was 7.

As identified by Moersch (2002); the PCU scores range from "Not True of Me Now" (levels 0, 1, and 2) to "Very True of Me Now" (levels 6 and 7). Table 9 shows data that indicates that 98 teachers (74%) scored in the range "Somewhat True of Me Now" (levels 3, 4, and 5), 21 teachers (15%) scored in the range "Very True of Me Now" (levels 6 and 7), and 14 teachers (11%) scored in the range "Not True of Me Now" (0, 1, and 2).

Table 9. Frequency Table for PCU

	Category	Level	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not True of Me Now	0	0	0	0	0
	Not True of Me Now	1	1	.8	.8	.8
	Not True of Me Now	2	13	9.8	9.8	10.5
	Somewhat True of Me Now	3	17	12.8	12.8	23.3
	Somewhat True of Me Now	4	44	33.1	33.1	56.4
	Somewhat True of Me Now	5	37	27.8	27.8	84.2
	Very True of Me Now	6	19	14.3	14.3	98.5
	Very True of Me Now	7	2	1.5	1.5	100.0
	Total		133	100.0	100.0	

Data gathered from the Computer User Self-Efficacy Scale (Cassidy & Eachus, 2002) was used to compute the descriptive statistics for the dependent variable, teachers' computer self-efficacy (CSE). On a six point Likert-type scale with 1= Strongly Disagree to 6 = Strongly Agree, teachers were asked to respond to a 30-item survey concerning their attitudes toward using computers. Table 10 displays the descriptive statistics computed for the dependent variable “computer self-efficacy”. The data gathered indicated that the mean score was 136.34 with a standard deviation of 25.703. The median score was 143 and the range of scores was 105. The minimum possible score that a teacher could make was 30 but the minimum score that teachers made in the survey was 74. The maximum possible score was 180 and results of the survey indicated that teachers gained a maximum score of 179.

Table 10. Descriptive Statistics for Teachers’ CSE

N	Valid	133
	Missing	0
Mean		136.34
Median		143.00
Std. Deviation		25.703
Variance		660.650
Skewness		-.484
Std. Error of Skewness		.210
Kurtosis		-.532
Std. Error of Kurtosis		.417
Range		105
Minimum		74
Maximum		179

According to Cassidy and Eachus (2002) high total scale scores mean that participants are more positive about their CSE beliefs. The frequency scores for CSE from the CUSE instrument are displayed in Appendix O. The data indicates that 24 teachers (18%) scored at or below the neutral computer self-efficacy level of 110 (set by the researcher), 109 teachers (82%) scored at 111 or above. Eighty-two percent of teachers in this study have high computer self-efficacy beliefs. Of that percentage, 76 teachers (57%) scored above the mean score of 136.34.

Table 11 compares the mean and standard deviation of the variables in the study by school levels. The data gathered indicated that the CSE mean score of 140.96 (with a standard deviation of 25.057) for teachers at the middle schools was higher than the mean score of 140.04 (with a standard deviation of 24.899) at the high schools and 133.93 (with a standard deviation of 26.104) at the elementary schools. The mean scores for CIP (3.91 with a standard deviation of 1.443) and PCU (4.52 with a standard deviation of 1.201) were highest at the middle school level. The mean scores for PQIT (17.31 with a standard deviation of 3.845) and the level of technology integration (1.69 with a standard deviation of 1.594) were highest at the high school level. Eighty-four teachers (63.2%) were from the elementary schools, 23 teachers (17.3%) were from the middle schools, and 26 teachers (19.5%) were from the high schools.

Table 11. Comparative Means and Standard Deviations of the Variables by Schools

School Level		CSE	CIP	PCU	PQIT	LoTi
Elementary School	Mean	133.93	3.51	4.17	15.83	1.65
	N	84	84	84	84	84
	Std. Deviation	26.104	1.602	1.316	5.117	1.690
Middle School	Mean	140.96	3.91	4.52	17.13	1.39
	N	23	23	23	23	23
	Std. Deviation	25.057	1.443	1.201	4.576	1.438
High School	Mean	140.04	3.69	4.35	17.31	1.69
	N	26	26	26	26	26
	Std. Deviation	24.899	1.192	.936	3.845	1.594
Total	Mean	136.34	3.62	4.26	16.35	1.62
	N	133	133	133	133	133
	Std. Deviation	25.703	1.501	1.230	4.818	1.622

Inferential Statistics

Inferential statistics allows the researcher to analyze data from a sample in order to draw conclusions or make inferences about an unknown population (Creswell, 2005;

Leedy & Ormrod, 2005). This section contains the results of the statistical analyses (multiple regression and one-way ANOVA) that were used to provide a basis for the acceptance or rejection of the hypotheses presented in this study. The independent variables in the study that were used in the analysis were teachers' perception of the quality of InTech training received (PQIT), level of technology integration (LoTi), current instructional practice (CIP), and personal computer use (PCU). The dependent variable in the study was teachers' computer self-efficacy (CSE). In this section results of the hypotheses and answers to the research questions are presented.

The correlation among the independent variables in the study was examined. "Very large correlations among independent variables can cause computational problems as well as increase the difficulty of interpreting your results." (Norusis, 2005. p. 244). Reichstetter (1999) noted that a low to modest correlation coefficient is acceptable in educational research. *Z*-score is a standard score that enables the researcher to compare scores from different scales (Creswell, 2000). *Z*-scores were used for the statistics testing in order to enable comparison of scores from one instrument to scores from another instrument. In reporting the research, hypothesis testing and effect size were included (Creswell, 2005). Test results are stated using the Pearson correlation method of analysis. The significance level used for all statistical analyses was .05.

Table 12 shows the correlation coefficients for all the variables in the study. LoTi at .406 and PCU at .531 are moderately correlated with CIP. LoTi and PCU are moderately correlated with each other at .358. PCU indicates a correlation to CSE at .268 and PQIT shows a moderate correlation to CSE at .319. PQIT shows a low correlation with the other independent variables (.147 with LoTi, .142 with CIP, and .129 with PCU).

Table 12. Correlation Coefficients Matrix for all the Variables

		CIP	LoTi	PCU	PQIT	CSE
CIP	Pearson Correlation	1	.406(**)	.531(**)	.142	.043
	Sig. (2-tailed)		.000	.000	.103	.623
	N	133	133	133	133	133
LoTi	Pearson Correlation	.406(**)	1	.358(**)	.147	.109
	Sig. (2-tailed)	.000		.000	.091	.210
	N	133	133	133	133	133
PCU	Pearson Correlation	.531(**)	.358(**)	1	.129	.268(**)
	Sig. (2-tailed)	.000	.000		.139	.002
	N	133	133	133	133	133
PQIT	Pearson Correlation	.142	.147	.129	1	.319(**)
	Sig. (2-tailed)	.103	.091	.139		.000
	N	133	133	133	133	133
CSE	Pearson Correlation	.043	.109	.268(**)	.319(**)	1
	Sig. (2-tailed)	.623	.210	.002	.000	
	N	133	133	133	133	133

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

Hypothesis Testing

In order to determine the correlation between the variables, multiple regression analyses were conducted. According to Norusis (2005) “if you have a nominal or ordinal independent variable with more than two categories, you must create a set of independent variables to represent the variable” (p. 254). To examine the relationships across school levels, dummy variables were created for the middle and high schools with the elementary schools used as the reference category.

Research Question 1

What relationship exists between teachers’ perception of the quality of their InTech training and teachers’ computer self-efficacy based on their level of technology integration at the elementary, middle, or high school levels? To investigate if there is a relationship between teachers’ perception of the quality of their InTech training and teachers' computer self-efficacy based on their level of technology integration at the elementary, middle, or high school levels, the first null hypothesis was analyzed.

Null Hypothesis 1

H1: There will be no statistically significant relationship between teachers' perception of the quality of InTech training received and teachers' computer self-efficacy based on the level of technology integration at the elementary, middle, or high school levels.

Table 13 displays the results of the stepwise multiple linear regression analysis. The value of the coefficient of multiple correlation, R, was .319 with an associated R^2 of .102. According to Norusis (2005, p. 529), "a value of 1 tells you that the dependent variable can be perfectly predicted from the independent variables. A value close to 0 tells you that the independent variables are not linearly related to the dependent variable." When the regression model was conducted it excluded the variable LoTi because the results show it to be insignificant. The school levels were also excluded from the model because no statistical significance was observed at the elementary, middle, or high schools. The R^2 value of .102 indicates that 10% of the observed variability in the percentage of CSE is attributable to differences in PQIT.

Table 13. Model Summary of PQIT on CSE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.319[a]	.102	.095	24.454

a. Predictors: (Constant), PQIT

Table 14 reports the unstandardized and standardized regression coefficients, and the significance tests. PQIT has a *p* value of .000 which means that for any given level of LoTi and schools, there is a positive correlation between CSE and PQIT. It can be seen that for every one unit increase in PQIT score there is a corresponding CSE increase by 1.701. With a *p* value that is less than the .05 significance level, PQIT is statistically significant and there was sufficient evidence to reject the null hypothesis.

Table 14. PQIT on CSE at the Various School Levels Based on LoTi Levels[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	108.532	7.526		14.421	.000
	PQIT	1.701	.442	.319	3.851	.000

a. Dependent Variable: CSE

Research Question 2

What are the relationships between current instructional practice and teachers' computer self-efficacy at the elementary, middle, or high school levels? To investigate if there is a relationship between current instructional practice and teachers' computer self-efficacy at the elementary, middle, or high school levels, the second null hypothesis was analyzed.

Null Hypothesis 2

H2: There will be no statistically significant relationship between current instructional practice and teachers' computer self-efficacy at the elementary, middle, or high school levels.

Table 15 displays the results of the multiple linear regression analysis. The value of the coefficient of multiple correlation, R, was .043 with an associated R^2 of .002. The R^2 value of .002 indicates that less than 1% of the observed variability in the percentage of CSE is attributable to differences in CIP.

Table 15. Model Summary of CIP on CSE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.043[a]	.002	-.006	25.777

a. Predictors: (Constant), CIP

Table 16 reports the unstandardized and standardized regression coefficients, and the significance tests. With a *p* value of .623 which is more than the .05 significance level, CIP is not statistically significant in predicting teachers' CSE. The significance value for CIP provided sufficient evidence to fail to reject the null hypothesis.

Table 16. CIP on CSE[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	133.672	5.849		22.853	.000
	CIP	.737	1.495	.043	.493	.623

a. Dependent Variable: CSE

Research Question 3

What relationships exist between personal computer use and teachers' computer self-efficacy at the elementary, middle, or high school levels? To investigate if there is a relationship between personal computer use and teachers' computer self-efficacy at the elementary, middle, or high school levels, the third null hypothesis is analyzed.

Null Hypothesis 3

H3: There will be no statistically significant relationship between personal computer use and teachers' computer self-efficacy at the elementary, middle, or high school levels.

Table 17 displays the results of the multiple linear regression analysis. The value of the coefficient of multiple correlation, R, was .268 with an associated R^2 of .072. The

R^2 value of .072 indicates that approximately 7% of the observed variability in the percentage of CSE is attributable to differences in PCU.

Table 17. Model Summary of PCU on CSE

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.268[a]	.072	.065	24.858

a. Predictors: (Constant), PCU

Table 18 reports the unstandardized and standardized regression coefficients, and the significance tests. With a *p* value of .002 which is less than the .05 significance level, PCU is statistically significant in predicting teachers' CSE for any given school level. The data indicates that for every one unit increase in teachers' PCU; their CSE is expected to increase by 5.6. The significance value for PCU provided sufficient evidence to reject null hypothesis three.

Table 18. PCU on CSE[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	112.479	7.801		14.418	.000
	PCU	5.597	1.759	.268	3.182	.002

a. Dependent Variable: CSE

Research Question 4

What are the levels of contributions to teachers' CSE by the variables: teachers' perception of the quality of InTech training received, level of technology integration, current instructional practice, and personal computer use? To investigate the levels of contributions between the independent variables and the dependent variable, the fourth null hypothesis is analyzed.

Null Hypothesis 4

H4: There will be no statistically significant differences in the levels of contributions to teachers' computer self-efficacy by the variables: teachers' perception of the quality of InTech training received, level of technology integration, current instructional practice, and personal computer use.

Table 19 reports the unstandardized and standardized regression coefficients, and the significance tests. When looking at the level of contributions to CSE, PCU (.314) explained the most variance followed by PQIT (.300). A one standard deviation increase in PCU will lead to a .314 standard deviation increase in CSE. With *p* values that are less than the .05 significance level, PCU and PQIT are statistically significant in predicting teachers' CSE. A one standard deviation increase in CIP will lead to a .176 standard deviation decrease in CSE. With *p* values that are more than the .05 significance level, LoTi and CIP do not significantly attribute to any change in CSE.

Table 19. Levels of Contributions Between the Independent Variables and the Dependent Variable[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	92.507	9.794		9.445	.000
	PQIT	1.600	.435	.300	3.674	.000
	LoTi	.385	1.422	.024	.270	.787
	CIP	-3.016	1.689	-.176	-1.785	.077
	PCU	6.561	2.016	.314	3.254	.001

a. Dependent Variable: CSE

Table 20 displays the results of the pair-wise comparison of regression beta coefficients with the confidence levels set at 95%. There is a 95% confidence level that the contributions to CSE are between .074 and .478 when looking at the pairs, PQIT and LoTi. In looking at the pairs, LoTi and CIP, there is a 95% confidence level that either

LoTi or CIP is contributing to CSE by -.401 or by .801 so it is not significant. The *p* values of PQIT and PCU and the contributions for the pairs, PQIT-LoTi and PQIT-CIP, provided sufficient evidence to reject null hypothesis four that there will be no significant difference in the levels of contributions between the independent variables and the dependent variable.

Table 20. Pair-Wise Comparison of Regression Beta Coefficients

	b1	b2	Covariance Correlation	Difference	Lower CL (95%)	Upper CL (95%)
LoTi - CIP	0.024	-0.176	-0.265	0.200	-0.401	0.801
PCU - CIP	0.314	-0.176	-0.448	0.490	-0.526	1.506
PQIT - CIP	0.300	-0.176	-0.061	0.476	0.338	0.614
PCU - LoTi	0.314	0.024	-0.180	0.290	-0.118	0.698
PQIT - LoTi	0.300	0.024	-0.089	0.276	0.074	0.478
PCU - PQIT	0.314	0.300	-0.047	0.014	-0.093	0.121

Research Question 5

What are the differences among mean scores on teachers' perception of the quality of InTech training received, teachers' computer self-efficacy, current instructional practice, personal computer use, and LoTi at the elementary, middle and high school levels? To investigate if there are differences, the fifth null hypothesis is analyzed.

Null Hypothesis 5

H5: There will be no significant differences among the mean scores on teachers' perception of the quality of InTech training received, teachers' computer self-efficacy, current instructional practice, personal computer use, and LoTi at the elementary, middle, and high school levels.

A one-way ANOVA statistical test was conducted to investigate the differences. Table 21 shows the estimates of variability to investigate the fifth null hypothesis that there are no significant differences between the mean scores on teachers' PQIT, teachers' CSE, CIP, PCU, and LoTi at the elementary, middle, and high school levels. The *F* ratio was used to reject or fail to reject the null hypothesis. The *F* ratio is the ratio of two estimates of the population variance: the between-groups and the within-groups mean squares (Norusis, 2005). With the exception of LoTi, the *F* ratio is close to or above 1. CIP is .683 with a significance level of .507, CSE is 1.010 with a significance level of .367, LoTi is .270 with a significance level of .764, PCU .823 with a significance level of .441, and PQIT is 1.30 with a significance level of .275. With the *F* ratio and significance levels observed, there was insufficient evidence to reject the null hypothesis.

Table 21. Analysis of Variance

		Sum of Squares	df	Mean Square	F	Sig.
CIP	Between Groups	3.091	2	1.545	.683	.507
	Within Groups	294.353	130	2.264		
	Total	297.444	132			
CSE	Between Groups	1334.285	2	667.142	1.010	.367
	Within Groups	85871.489	130	660.550		
	Total	87205.774	132			
LoTi	Between Groups	1.439	2	.719	.270	.764
	Within Groups	346.005	130	2.662		
	Total	347.444	132			
PCU	Between Groups	2.499	2	1.250	.823	.441
	Within Groups	197.290	130	1.518		
	Total	199.789	132			
PQIT	Between Groups	60.276	2	30.138	1.304	.275
	Within Groups	3003.814	130	23.106		
	Total	3064.090	132			

Qualitative Analyses

Data from the interviews and observations were triangulated to provide answers to research question six that examined whether factors relating to use or non-use of computers had an impact on teachers' CSE. The factors that were explored in this study included training, subject, equipment, support, comfort level, and classroom climate. During the interviews teachers were asked about the InTech training received and during the observations evidence of technology use or non-use were noted by the researcher. The themes that emerged from the interview were: training with subcategories beneficial and not beneficial; equipment with the subcategories hardware and software; administrative support; technical support; school resources; and subject area. The observation themes were classroom climate, technology use, equipment, software, and comfort level.

The text files developed from the interviews and observations were imported into the MAXqda2 software program for analysis. The code matrix browser feature of the MAXqda2 program was used to get the code frequencies.

Research Question 6

Do any of the factors relating to use or non-use of computers in the classroom positively correlate on teachers' computer self-efficacy at the elementary, middle, or high school levels?

Table 22 displays the code frequencies from the interviews. The themes were: training with subcategories beneficial and not beneficial; equipment with the subcategories hardware and software; support with the subcategories technical support and school resources; and subject area. Training showed a frequency code of seven for beneficial and seven for not beneficial. Equipment (with its subcategories) was the most frequently occurring code (equipment 9, hardware 16, and software 15) in the interviews.

Table 22. Frequency Codes from the Interviews

Codes	Interview 1	Interview 2	Interview 3	Interview 4	Interview 5	Total
Training	0	3	0	2	3	8
Training/ Beneficial	2	1	2	1	1	7
Training/ Not Beneficial	1	1	0	3	2	7
Subject	1	0	1	1	2	5
Equipment	3	4	2	0	0	9
Equipment/ Hardware	2	6	3	2	3	16
Equipment/ Software	2	9	2	0	2	15
Support	1	3	0	1	3	8
Support/ Tech Support	1	2	0	1	0	4
Support/ School Resources	0	2	2	1	2	7

Table 23 displays frequency codes from the observations. The themes were classroom climate, technology use, equipment, software, and comfort level. To summarize the number of times a code was observed, a total column was added to the table. There was a positive classroom climate observed ranging from “satisfactory” (3) to “accomplished very well” (4). The teachers’ comfort level with the equipment ranged from “not observed” (1) to “accomplished very well” (4). There was not much technology equipment observed in the classrooms with four of the six observations resulting in a “not observed” (1) level. Software observed was at the “not observed” (1) level with four of the six teachers observed. Three of the teachers were at the “not observed level” (1) of technology use, two were at the “satisfactory level” (3) and one was at the “accomplished level” (4).

Table 23. Frequency Codes from the Observations

Codes	O1	O2	O3	O4	O5	O6	Total
Class Climate	4	4	4	3	3	4	22
Comfort Level	4	1	4	1	2	1	13
Equipment	4	1	3	1	1	1	11
Software	4	1	3	1	1	1	11
Tech Use	4	1	3	1	3	1	13

Coding Note: The number following each code represents the following: 1 = Not observed; 2 = More emphasis; 3 = Satisfactory; and 4 = Accomplished very well.

It was noted that about 50% (coded frequency of seven on Table 22) of the teachers interviewed thought the training was beneficial and the other 50% (also coded frequency of seven on Table 22) did not think training was beneficial. The observations showed that only a few teachers were actually integrating the technology into their classroom activities (three were at the “not observed” level, two were at the “satisfactory” level, and one was at the “accomplished” level of technology use as displayed in Table 23).

Summary of Results

This study utilized four independent variables and one dependent variable. The four independent variables were PQIT, LoTi, CIP, and PCU. The dependent variable was teachers’ CSE. This chapter presented findings for each of the five null hypotheses and the six research questions in this study. A statistical analysis of the quantitative data was presented and the qualitative data was discussed.

Eighty-two percent of the teachers scored 111 on the computer user self-efficacy scale which indicated that they have high CSE beliefs. On analyzing the hypotheses, it was found that school levels were not significant in affecting variances in CSE. On analyzing the first null hypothesis that there will be no statistically significant relationship between PQIT and teachers' CSE based on the LoTi levels at the elementary, middle, or high school levels, it was found that even though PQIT was statistically significant in variances in CSE, LoTi and the school levels were not significant in variances in CSE. Null hypothesis one was therefore rejected.

The second null hypothesis was analyzed and it was found that neither CIP nor school level were statistically significant in variances in CSE. Therefore, there was insufficient evidence to fail to reject null hypothesis two.

An analysis of the third null hypothesis found that PCU, with a *p* value of .002, was statistically significant in predicting teacher's CSE. Therefore, null hypothesis three was rejected.

The fourth null hypothesis was analyzed and it was found that there were significant differences in the levels of contributions between the independent variables and the dependent variable. The *p* values and pair-wise comparisons of regression beta coefficients provided sufficient evidence to reject null hypothesis four.

The fifth null hypothesis stated that there will be no significant differences among the mean scores on PQIT, CSE, CIP, PCU, and LoTi at the elementary, middle, and high school levels. With the *F* ratio and significance levels observed, there was insufficient evidence to reject the null hypothesis.

The sixth research question on whether any of the factors relating to use or non-use of computers in the classroom positively correlate on teachers' computer self-efficacy at the elementary, middle, or high school levels was analyzed. The analysis of the qualitative data for the interviews found that hardware, software availability and support (administrative and technology services) had an impact on teachers' CSE (Table 22).

With the high frequency levels recorded in the “not observed” level for comfort level, equipment, software, and tech use as displayed in Table 23, the decision was made that factors relating to use or non-use of computers in the classroom does have an impact on CSE.

Chapter 5

Conclusions, Implications, Recommendations, and Summary

This chapter includes four sections. The first section discusses the conclusions of the study based on the results of the quantitative and qualitative analyses performed in this research. The extent to which the findings supported or rejected the null hypotheses and the research questions is discussed and the strengths, weaknesses, and limitations of the study are delineated. In the second section, the implication of teachers' computer self-efficacy on technology integration in education, contributions of this study to the field of education, and implications for future research are discussed. The third section presents recommendations for further research in the areas of teacher computer self-efficacy and technology integration and finally, a summary of the research study is presented.

Conclusions

Participants in this study were from a population of 252 teachers who had taken and completed the InTech training program in the 13 public schools in the Walton County School District in Georgia. These teachers were employed in the Walton County School District during the 2004-2005 school year. All 252 teachers were given survey packets from their principals and encouraged to participate. Follow-up emails were sent to the principals to encourage them to follow-through in gathering the teacher survey packets. One hundred and thirty-three teachers returned their completed packets and participated in the study for a return rate of 53%. Teachers were also invited to be observed and interviewed. Twelve teachers were selected based on the results of their LoTi surveys and of that number, six teachers were observed and five teachers were interviewed. The sixth teacher to be interviewed cancelled the initially scheduled interview time and was unable to reschedule another time for the interview.

It should be noted that the surveys, interviews, and observations were given near the end of the school year. Teachers were involved in end-of-year school activities and a number of teachers who included technology extensively in their curriculum during the course of the school year, were not actively integrating technology into their classroom curriculum during this time. This could have impacted on the results of the classroom observations and the interviews conducted.

The data were analyzed using multiple regression, and analysis of variance utilizing SPSS 13.0 statistical computer software. An alpha level of .05 rejection level was used to test all hypotheses. The MAXqda2 text analysis software was used to analyze data from the interviews and observations.

According to Cassidy and Eachus (2002) high total scale scores on the CUSE survey mean that participants are more positive about their CSE beliefs. A neutral score of 110 was set by the researcher for the CUSE survey. One hundred and nine teachers (82%) scored at 111 or above. This means that the teachers participating in this study have positive CSE beliefs.

The results of the LoTi survey showed that 69.2% of the teachers in this study were at Level 2 and below. This indicated that the majority of teachers participating in this study had very low levels of technology integration into the curriculum. None of the teachers achieved Levels 5 or 6 (Expansion and Refinement). The CIP levels revealed that 77% of the teachers in this study used instructional practices that were consistent with a learner-based curriculum. The PCU levels indicated that a large percentage (89%) of the teachers also had high personal comfort and proficiency levels with using computers. The cumulative frequency scores on the addendum questionnaire for PQIT revealed that 58.3% of the teachers scored at 15 and above on the addendum questionnaire. This means that more than half the teachers participating in this study have positive attitudes towards their training. It must be noted that those who did not find the training beneficial had already taken technology courses in college and the InTech training seemed remedial to them. Teachers indicated that they already knew most of the information that was being taught in the InTech training program. Teachers perceived support to be very important and they believed they have the support of the administration and the technology support staff. All the teachers have access to a computer at work and to a computer lab for classroom instruction. Equipment, including hardware and software, had a high response rate in the interview frequency codes as teachers appear to have access to technologies that can be integrated into classroom instruction.

Research Questions and Null Hypotheses

Five null hypotheses and six research questions were addressed in the study. The extent to which the findings supported or rejected the hypotheses for the study was examined. The analyses indicated that school levels had no statistical significance at either the elementary, middle, or high school levels.

Research Question 1: What relationship exists between teachers' perception of the quality of their InTech training and teachers' computer self-efficacy based on their level of technology integration at the elementary, middle, or high school levels?

H1: There will be no statistically significant relationship between teachers' perception of the quality of InTech training received and teachers' computer self-efficacy based on the level of technology integration at the elementary, middle, or high school levels.

The results for research question one and null hypothesis one indicated that PQIT contributed significantly to teachers' CSE. The *p* value for PQIT was .000 and combined with the effect size variance (R^2) of 10%, there was sufficient evidence to reject the null hypothesis, therefore, it can be inferred that training had a positive effect on teachers' CSE. The state of Georgia, through its InTech training program is working to eliminate barriers for teachers and to collaborate with some colleges of education to focus on technology-enhanced learning.

Research Question 2: What are the relationships between current instructional practice and teachers' computer self-efficacy at the elementary, middle, or high school levels?

H2: There will be no statistically significant relationship between current instructional practice and teachers' computer self-efficacy at the elementary, middle, or high school levels.

The results for research question two and null hypothesis two indicated that there was no significant relationship between CIP and CSE. The *p* value for CIP was .623 which indicated that it was not significant and combined with the effect size variance (R^2) of less than 1%; there was insufficient evidence to fail to reject the null hypothesis. Therefore, it can be inferred that CIP had no effect on teachers' CSE.

Research Question 3: What relationships exist between personal computer use and teachers' computer self-efficacy at the elementary, middle, or high school levels?

H3: There will be no statistically significant relationship between personal computer use and teachers' computer self-efficacy at the elementary, middle, or high school levels.

The results for research question three and null hypothesis three indicated that PCU contributed significantly to the prediction of CSE. The *p* value for PCU was .002 and combined with the effect size variance (R^2) of 7%, there was sufficient evidence to reject the null hypothesis, therefore, it can be inferred that PCU had a positive effect on teachers' CSE.

Research Question 4: What are the levels of contributions to teachers' CSE by the variables: teachers' perception of the quality of InTech training received, level of technology integration, current instructional practice, and personal computer use?

H4: There will be no statistically significant differences in the levels of contributions to teachers' CSE by the variables: teachers' perception of the quality of InTech training received, level of technology integration, current instructional practice, and personal computer use.

The results for research question four and null hypothesis four indicated that there were statistically significant differences in the levels of contributions to CSE by the independent variables. Statistical analyses conducted (see Table 20) show that CSE increased with increasing values of PQIT (beta=.300), LoTi levels (beta=.024), and PCU (beta=.314). The lowest predictor on CSE was CIP (beta=-.176). PQIT and PCU showed significance values of .000 and .001. Based on the inferential statistical analyses, it can be inferred that the four independent variables have varying or no effect on CSE. The *p* values of PQIT and PCU and the contributions for the pairs, PQIT-LoTi and PQIT-CIP, provided sufficient evidence to reject null hypothesis four.

Research Question 5: What are the differences among mean scores on teachers' perception of the quality of InTech training received, teachers' computer self-efficacy, current instructional practice, personal computer use, and LoTi at the elementary, middle and high school levels?

H5: There will be no significant differences among the mean scores on teachers' perception of the quality of InTech training received, teachers' computer self-efficacy, current instructional practice, personal computer use, and LoTi at the elementary, middle, and high school levels.

The results for research question five and null hypothesis five indicated that there were no differences among the mean scores at the elementary, middle, or high school levels. The *F* ratio was used in the one-way ANOVA statistical analysis conducted (see Table 21) to reject or fail to reject the fifth null hypothesis and the results of that analysis indicated that there were no significant differences among the mean scores on PQIT, CSE, CIP, PCU, and LoTi (the *p* value for all the variables were greater than the .05

significance level set for this research). Based on the *F* ratio and significance levels observed, the researcher failed to reject null hypothesis five.

Research Question 6: Do any of the factors relating to use or non-use of computers in the classroom positively correlate on teachers' computer self-efficacy at the elementary, middle, or high school levels?

The results for research question six indicated that there was a relationship between factors relating to use and non-use of computers in the classroom and teachers' CSE. The interview data showed that training seen as being beneficial, subject matter taught, software, administrative, and school resources were significant in predicting CSE (see Table 22). The observation data showed that climate, comfort level, equipment, software, and technology uses were significant in predicting CSE (see Table 23). All teachers had access to computers at work, and computer labs for whole class lessons where technology integration can take place were available in all the schools. Interviews, observations, and anecdotal notes written on the surveys indicated to the researcher that teachers found time to be a critical factor in their use of technology. Based on the qualitative data gathered, the decision was made that factors relating to use or non-use of computers in the classroom does have an impact on CSE.

Implications

As mentioned in Chapter 1, Casey (2000) stated that "the key to appropriate use of the technology is the teachers' comfort with the hardware and software, their understanding of technology as a method of curriculum delivery, and a change of mind set which will allow them to embrace possibilities that technology brings to the classroom of the future," (p.2). The researcher in this study was motivated by a desire to know whether or not teachers who had completed the InTech training had high CSE and were consistently integrating technology into the curriculum.

Self-efficacy is an individual's judgment of his or her capabilities to organize and execute courses of action required to attain designated types of performances (Bandura, 1986 as cited in Pintrich and Schunk, 2002). Results indicated that teachers' CSE was high; however, the feelings of the teachers were ambivalent towards the benefits of the InTech training they received. Results show that, even though teachers' CSE was high, they were not consistently integrating technology into their curriculum as seen in the low LoTi levels.

One of the stipulations in the No Child Left Behind (NCLB) law is for teachers to be technology proficient. Implications resulting from the findings in this study were that teachers felt comfortable using a computer, as indicated by their CSE scores, yet their level of technology implementation was low. Another implication from this study is that the highest percentages of teachers (33.8%) were at the "Nonuse" level (Level 0) of technology integration and the other teachers that used the technology, primarily used it in preparing to teach, for administrative purposes, and for personal use rather than for actual classroom instruction. It can be inferred that as teachers progress through the levels of technology implementation that they also progress through the stages of instructional practice (see Appendix C) as they employ more student-oriented and constructivist instructional practices.

The InTech training provided the teachers who had little technology skills (indicated by the LoTi levels) the opportunity to learn about technology in a nonthreatening environment (cohort groups at the building or district level). For teachers who are more knowledgeable about technology, it was a refresher course that was easy enough to allow them to take the test-out option in order to meet the Georgia requirements for InTech certification before the summer of 2006. Another implication arising from the results of this study indicated that time and place of the technology training was not always convenient with the teachers' schedules. This indicated the need to diversify the delivery of training through multimedia and Internet technologies and the development and support of online e-learning environments.

Teachers acknowledged that they had support from their school administrators and from district personnel in the academic areas, but technology support was limited because of the tremendous focus on standardized test scores. Some teachers indicated that the limited support was restrictive in that they were unable to explore software they believed to be useful in their curriculum because of the school district's technology policies. A number of teachers indicated by directly writing on the surveys that if they had more time to devote to learning the technology, easier access to computer labs, on-site technology specialists that had the clear role of teacher-assistant, and complete freedom to install legal software that the teacher determined was useful for raising students' level of achievement, then they believed they would integrate the technology routinely and effortlessly into their curriculum.

Contributions to the Field of Education

It is hoped that the results from this study will be added to the body of knowledge being gathered on what it takes to have high levels of technology integration within school districts. Going through a technology training program and having high CSE is a big step towards technology integration, but this study showed that it takes more than those two variables to have success in implementing technology integration across a school district. Staff development training offered by school districts need to change the way training is delivered to teachers in order for them to maximize technology integration in the curriculum. The goal is to have high levels of technology integration in the curriculum which positively impacts teacher productivity and student achievement levels. Teachers who are open to change and are willing to accept challenges will be instrumental in demonstrating innovative ways of integrating technology into the curriculum of the future classroom. However, lack of teacher-acquired computer technology resources, technology specialists that assist teachers, and various delivery technology training methods would be a major barrier even for these teachers.

In contributing to the field of education, this study found that teacher's perception of the quality of technology training received contributed significantly to their feeling of computer self-efficacy, even though they may or may not have been integrating technology at any of the school levels. The study also found that current instructional practices at any school level did not have any effect on the teacher's computer self-efficacy. However, personal computer use contributed significantly in predicting the teacher's computer self-efficacy, regardless of the school levels. This was further corroborated, when it was found in the study that teacher's perception of the quality of training and their personal computer use had a stronger relationship to computer self-efficacy than their current instructional practice or their integration of technology into the curriculum. Another contribution in the field of education that can be seen in the study is that, even when teacher's scores for PQIT, CSE, CIP, LoTI, and PCU were combined across school levels, there appeared to be no significant relationship found between the variables. It appears that teachers were having the same experiences and challenges in technology integration, regardless of the school level or variables used in the study.

It was found that classroom climate, using technology in a comfortable manner, having technology equipment and software in the classroom, and being able to use it, had an impact on their computer self-efficacy. Finally, the study found that teachers' saw the technology training as beneficial, and that the subject they taught, the acquisition of software, administrative support and technology resources at the school building, had an impact on their computer self-efficacy.

Implications for Future Research

The time factor is an important element in any research. This researcher found that it would have been better to have conducted the surveys earlier in the year rather than near the end of the school year. This research used paper-based surveys; however, the use of online surveys would have been more convenient for the teachers and the researcher, thus allowing for more participation in the research.

Recommendations for Further Research

This study examined teachers' computer self-efficacy and computer utilization after completing the InTech training program. Based on the findings of this study, the following recommendations are made:

1. This study should be replicated at a school district similar to the one in which this research was done to confirm the results.
2. This study should be replicated at several school districts with different demographics within the state of Georgia.
3. This study focused on how technology implementation was affected by computer self-efficacy and computer utilization after the InTech training. Further research could explore technology implementation, computer self-efficacy, and computer utilization for all teachers in one school district to find out what factors contribute more heavily towards technology implementation.
4. Further research could be conducted to investigate the differences in self-efficacy and computer utilization based on the type of training received.
5. This study looked at teachers at the elementary, middle, and high school level. Further research could be conducted to find out what characteristics teachers possess at each level that make them more willing to integrate technology.

Summary

National technology standards drafted by the International Society for Technology in Education (ISTE) are being incorporated into the technology standards required of American public schools (Goldsby & Fazal, 2000). In addition, the technology component, Title 11, Part D "Enhancing Education Through Technology," of the No Child Left Behind Act (NCLB), made significant changes in the use of technology in education. The state board of education in Georgia instituted the Georgia Framework for Integrating TECHnology (InTech), which is a 50-hour training program that prepares teachers to help their students accomplish technology standards and performance objectives. Objectives of the program included getting teachers to; (1) critically examine their own instructional practices to determine how technology can play a role in enhancing the teaching and learning process, (2) develop a minimum of four model lessons per teacher using their newly acquired technology skills to meet their curriculum objectives, (3) implement technology-based projects and activities developed during the training program and throughout the school year, and (4) develop a plan to re-deliver the InTech training to the other members of their school faculty (University of Georgia Technology Training Center, 2002).

To investigate whether teachers' completion of the Georgia InTech training program had an impact on the use of technology in the classroom, it was useful to see what effect the training had on teachers' CSE and computer utilization. This led to the rationale for conducting this study. The goal of this study was to investigate the effects on teachers' CSE, LoTi, CIP, PCU, and factors relating to use or non-use of computers in the curriculum after completing the Georgia Framework for Integrating TECHnology (InTech) training program.

The target population for this research study was the elementary, middle, and high school teachers in the 13 public schools in the Walton County Public School District in Georgia who had already completed their InTech certification requirement and were employed in the 2004-2005 school year. The following instruments and data gathering procedures were used in this study; (1) two surveys: the LoTi instrument and addendum questionnaire, and the CUSE Instrument, (2) semi-structured interviews, and (3) semi-structured observations. From the total body of teachers in the Walton County Public

School District, 252 were identified as having completed the InTech training program. Of the 252 teachers, 133 teachers returned usable surveys for a response rate of 53%.

This study employed a causal-comparative research design (also called *ex post facto*) to examine teachers' CSE, LoTi, CIP, PCU, and factors related to use or non-use of computers in their curriculum. The methodology used in this study was a combination of descriptive research techniques. Descriptive statistics including mean scores and standard deviations were used to analyze the data. The data was analyzed using *z*-scores, multiple regression, and one-way ANOVA utilizing SPSS 13.0 statistical computer software. An alpha level of .05 rejection level was used to test all hypotheses. Qualitative content analysis utilizing the MAXqda2 text analysis software was done on the data gathered from the interviews and observations.

The four independent variables in the study were; (1) Teachers' perception of the quality of InTech Training (PQIT) received as measured by the LoTi addendum questionnaire, (2) Level of Technology Integration (LoTi) measured by the LoTi instrument, (3) Current Instructional Practice (CIP) measured by the LoTi instrument, and (4) Personal Computer Use (PCU) measured by the LoTi instrument. The dependent variable in the study was Teachers' computer self-efficacy (CSE) measured by the CUSE instrument.

Six research questions and five null hypotheses were tested. The findings of this study indicated the need to provide continuous technology training to teachers. The training, however, need to be geared towards technology integration that is specific to the teacher's curricular area and delivery optimized through multimedia and Internet technologies to take into account time, place, and quality of content. All the teachers have access to a computer at work and to a computer lab for classroom instruction. Equipment, including hardware and software, had a high response rate in the interview frequency codes as teachers appear to have access to technologies that can be integrated into classroom instruction. Teachers perceived themselves to have high CSE; however, this did not translate into them integrating more technology in the classroom curriculum. The teachers' low LoTi levels inferred that they do not have high beliefs in their capabilities to organize and execute courses of action required to integrate technology fully into their curriculum. Teachers perceived support to be very important and they believe they have the support of the administration and the technology support staff.

Appendix A

Level of Technology Implementation Questionnaire

Version 4.0

Inservice Teacher

The following information has been requested as part of an ongoing effort to increase the Level of Technology Implementation in schools nationwide. Individual information will remain anonymous, while the aggregate information will provide various comparisons for your school, school district, regional service agency, and/or state within the LoTi Technology Use Profile. Please fill out as much of the information as possible.

The LoTi Questionnaire (LoTiQ) takes about 20-25 minutes to complete. The purpose of this questionnaire is to determine your Level of Technology Implementation (LoTi) based on your current position (i.e., pre-service teacher, inservice teacher, building administrator, instructional specialist, media specialist, higher education faculty) as well as your perceptions regarding your Personal Computer Use (PCU), and Current Instructional Practices (CIP).

THIS IS NOT A TEST!

Completing the questionnaire will enable your educational institution to make better choices regarding staff development and future technology purchases. The questionnaire statements were developed from typical responses of educators who ranged from non-user to sophisticated users of computers. Questionnaire statements will represent different uses of computers that you currently experience or support, in varying degrees of intensity, and should be recorded appropriately on the scale. Please respond to the statements in terms of your present uses or support of computers in the classroom. For statements that are Not Applicable to you, please select a "0" response on the scale.

*Indicates that this information is required to correctly process your data.

Name of State*:

____

Name of School District*:

____

Name of School*:

____

Subject/Specialty: ___________________ **Grade Level:** _______________

Participant ID#*: ___________________

Do you have computer access at school?*

☐**Yes**

☐**No**

Computer access means that students and teachers can use computers within the school building for instructional purposes; including computers in your classroom, computer labs, computers on carts, general access computers in the Library or something similar.

LoTi Questionnaire

Read each response and assign a score based on the following scale:

0 1 2 3 4 5 6 7

N/A Not true of me now Somewhat true of me now Very true of me now

1 Score __________
I design projects that require students to analyze information, think creatively, make predictions, and/or draw conclusions using electronic resources such as multi-purpose calculators, hand-held computers, the classroom computer(s), or computer peripherals (e.g., digital video cameras, probes, MIDI devices).

2 Score __________
I use our classroom computer(s) primarily to present information to students using presentation software (e.g., PowerPoint) or interactive white boards because it helps students better understand the content that I teach.

3 Score __________
I currently use instructional units acquired from colleagues, curriculum resource catalogs, or the internet that integrate the use of computers with higher order thinking skills and student-directed learning (e.g., students generate questions, define tasks, set goals, self-assess learning).

4 Score __________
Students in my classroom design either web-based or multimedia presentations to showcase their research (e.g., information gathering) on topics that I assign in class.

5 Score __________
I have experienced past success with designing and implementing web-based projects that emphasize complex thinking skill strategies such as problem-solving, creative problem solving, investigation, scientific inquiry, or decision-making.

6 Score __________
My students collaborate with me in setting both group and individual academic goals that provide opportunities for them to direct their own learning within my classroom curriculum.

7 Score __________
I have stretched the limits of instructional computing in my classroom using the most current and complete technology infrastructure (e.g., small student/computer ratio, high-speed internet access, updated computer software, teleconferencing capability).

8 Score __________
Students in my classroom use the available technology resources (e.g., websites, multimedia applications, spreadsheets, MIDI devices) to complete projects that focus on critical content and higher order thinking skills (e.g., analysis, synthesis, evaluation).

9 Score _____
I use computers primarily to support my classroom management tasks such as taking attendance, posting assignments to a web page, using a gradebook program, and/or commu-nicating with parents via email.

10 Score __________
In my classroom, students use multiple software applications/hardware peripherals (e.g., internet browsers, productivity tools, multimedia applications, digital video cameras, MIDI

devices) as well as resources beyond the school building (e.g., partnerships with business professionals, other schools) to solve problems of interest to them.

LoTi Questionnaire

Read each response and assign a score based on the following scale:

0	1	2	3	4	5	6	7
N/A	*Not true of me now*		*Somewhat true of me now*			*Very true of me now*	

11 Score __________
In my classroom, students use computers primarily to improve their basic skills or understand better what I am teaching them with the aid of supplemental instructional resources (e.g., CD's, internet, integrated learning systems-ILS, tutorial programs).

12 Score __________
Technical problems prevent me and/or my students from using the classroom computers during the instructional day.

13 Score __________
I access the computer daily to browse the internet, send/ receive email, and/or use different productivity and multimedia tools (e.g., word processor, spreadsheet, database, presentation software).

14 Score __________
I empower my students to discover innovative ways to use our school's vast technology infrastructure to make a real difference in their lives, in their school, or in their community.

15 Score __________
I am proficient with and knowledgeable about the technology resources (e.g., hardware, software programs, peripherals) appropriate for my grade level or content area.

16 Score __________
Locating good software programs, websites, or CD's to supplement my curriculum and reinforce specific content is a priority of mine at this time.

17 Score __________
Getting more comfortable with using computers during my instructional day is my goal for this school year.

18 Score __________
I have the background to assist others in the use of a variety of software applications (e.g., Excel, Inspiration, PowerPoint), the internet (web browsers, web page construction and design), and peripherals (e.g., digital video cameras, probes, MIDI devices).

19 Score __________
The current student-to-computer ratio in my classroom(s) is not sufficient for me to use computer(s) during my instructional day.

20 Score __________
I consistently provide alternative assessment opportunities (e.g., performance-based assessment, peer reviews, self-reflection) that encourage students to "showcase" their content understanding in nontraditional ways.

21 Score __________
In my classroom, students use the internet for (1) collaboration with others, (2) publishing, (3) communication, and (4) research to solve issues and problems of personal interest to them that address specific content areas.

LoTi Questionnaire

Read each response and assign a score based on the following scale:

0	*1*	*2*	*3*	*4*	*5*	*6*	*7*
N/A	*Not true of me now*		*Somewhat true of me now*			*Very true of me now*	

22 Score __________
Students in my classroom participate in online collaborative projects (not including email exchanges) with other entities (e.g., schools, businesses, organizations) to find solutions, make decisions, or seek a resolution to an issue of importance to them.

23 Score __________
Given my current curriculum demands and class size, it is much easier and more practical for students to learn about and use computers and related technologies outside of my classroom (e.g., computer lab).

24 Score __________
I use my classroom computer(s) primarily to locate and print out lesson plans appropriate to my grade level or content area.

25 Score __________
Using the classroom computers is not a priority for me this school year.

26 Score __________
I do not have to call someone (e.g., computer technician, network manager) to figure out a problem with my computer or a software application; I have the confidence and expertise to "fix" it myself.
27 Score __________
I prefer using previously-developed curriculum materials (e.g., instructional kits, existing web-based projects) that
(1) emphasize complex thinking skill strategies (e.g., creative problem-solving, decision-making, investigation),
(2) promote the use of computers, and (3) provide opportunities for students to direct their own learning.

28 Score __________
My students' creative thinking and problem-solving opportunities are supported by our school's extensive technology infrastructure (e.g., high-speed internet access, unlimited access to computers, updated computer software, multimedia and video production stations).

29 Score __________
My personal professional development involves investigating and implementing the newest innovations in instructional design and computer technology that takes full advantage of my school's extensive technology infrastructure (e.g., immediate access to the newest software applications, multimedia and video production stations, teleconferencing equipment).

30 Score __________
I favor previously-developed curriculum materials (e.g., instructional kits, existing web-based projects) that emphasize students using technology to solve "real" problems or issues of

importance to them rather than building my own instructional units from scratch.

31 Score __________
I have an immediate need and interest in contacting other teachers, "qualified" consultants, and/or related professionals who can assist me in my ongoing effort to design and manage student-directed learning experiences using the available computers.

LoTi Questionnaire

Read each response and assign a score based on the following scale:

0 1 2 3 4 5 6 7

N/A Not true of me now Somewhat true of me now Very true of me now

32 Score __________
Students' use of information and inquiry skills to solve problems of personal relevance guides the types of instructional materials used in and out of my classroom.

33 Score __________
I take into consideration my students' background, prior experiences, and desire to solve relevant problems of interest to them when planning instructional activities that utilize our available technology.

34 Score __________
I am able to design my own student-centered instructional materials that take advantage of our existing computers to engage students in their own learning (e.g., students generate questions, define tasks, set goals, self-assess learning).

35 Score __________
I alter my instructional use of the classroom computer(s) based upon (1) the newest software and web-based innovations and (2) the most current research on teaching and learning (e.g., differentiated instruction, problem-based learning, multiple intelligences).

36 Score __________
Students applying what they have learned in the classroom to a real world situation (e.g., student-generated recycling program, student-generated business, student-generated play/musical) is a vital part of my instructional approach to using the classroom computer(s).

37 Score __________
I need more training on using technology with relevant and challenging learning experiences for my students rather than how to use specific software applications to support my current lesson plans.

38 Score __________
An ongoing goal of mine is for students to learn how to create their own web page or multimedia presentation that shows what they have been learning in class.

39 Score __________
The types of professional development offered through our school, district, and/or professional organizations does not satisfy my need for bigger, more engaging experiences for my students that take advantage of both my "technology" expertise and personal interest in developing student-centered curriculum materials.

40 Score __________

My students use the classroom computer(s) for research purposes that require them to investigate an issue/problem, think creatively, take a position, make decisions, and/ or seek out a solution.

41 Score __________
Having students apply what they have learned in my classroom to the world they live in is a cornerstone to my approach to instruction and assessment.

LoTi Questionnaire

Read each response and assign a score based on the following scale:

0	*1*	*2*	*3*	*4*	*5*	*6*	*7*
N/A	*Not true of me now*		*Somewhat true of me now*			*Very true of me now*	

42 Score __________
The curriculum demands at our school such as implementing standards and increasing student test scores have diverted my attention away from using the computers in my classroom.
43 Score __________
I have the background and confidence to show others how to merge technology with relevant and challenging learning experiences that emphasize higher order thinking skills and provide problem-solving opportunities for students.

44 Score __________
Though I currently use a student-centered approach when creating instructional units, it is still difficult for me to design these units on my own to take full advantage of our classroom computers.

45 Score __________
My immediate professional development need is to learn how my students can use my classroom computer(s) to achieve specific outcomes aligned to district or state standards.

46 Score __________
It is easy for me to identify software applications, peripherals, and web-based resources that support and expand student's critical and creative thinking skills, and promote self-directed problem solving.

47 Score __________
My students have immediate access to all forms of the most current technology infrastructure available (e.g., easy access to newest computers, latest software applications, small student/computer ratio, video or teleconferencing kiosks) that they use to pursue problem-solving opportunities surrounding issues of personal and/or social importance.

48 Score __________
I need access to more resources and/or training to start using computers as part of my instructional day.

49 Score __________
I frequently explore new types of software applications, web-based tools, and peripherals as they become available.

50 Score __________

Students' questions and previous experiences heavily influence the content that I teach as well as how I design learning activities for my student.

Addendum Questionnaire

Please read the following five questions and then circle the number that most closely matches your concerns about each item. Please refer to the scale below to select your best answer.

0	**1**	**2**	**3**	**4**	**5**
Not true		**Somewhat true**		**Very true**	

InTech Training						
1. The training has made me excited about using technology.	0	1	2	3	4	5
2. I am not fearful of using technology.	0	1	2	3	4	5
3. I now have a number of ways to integrate technology into my teaching.	0	1	2	3	4	5
4. My personal use of technology has increased since I've taken the training.	0	1	2	3	4	5
5. I have used various technologies more frequently in my classroom as a result of the training.	0	1	2	3	4	5

Appendix B

Levels of Technology Implementation Table

Level	Category	Description
0	Nonuse	A perceived lack of access to technology-based tools (e.g., computers) or a lack of time to pursue electronic technology implementation. Existing technology is predominately text based (e.g., ditto sheets, chalkboard, and overhead projector).
1	Awareness	Technology-based tools are (1) one step removed from the classroom teacher (e.g., placed in integrated learning system labs, special computer-based pull-out programs, computer literacy classes, central word processing labs); (2) used almost exclusively by the classroom teacher for classroom or curriculum management tasks, such as taking attendance, using gradebook programs, accessing e-mail, retrieving lesson plans from a curriculum management system; and/or (3) used to embellish or enhance teacher-directed lessons or lectures (e.g., multimedia presentations).
2	Exploration	Technology-based tools supplement the existing instructional program (e.g., tutorials, educational games, basic skill applications) or complement selected multimedia or Web projects (e.g., Internet research papers, informational multimedia presentations) at the knowledge/comprehension level. The electronic technology is employed in extension activities, enrichment exercises, Internet searches, or multimedia presentations and generally reinforces lower cognitive skill development relating to the content under investigation.
3	Infusion	Technology-based tools including databases, spreadsheet and graphing packages, multimedia and desktop publishing applications, and the Internet complement selected instructional events (such as a field investigation using spreadsheets or graphs to analyze results from local water quality samples) or multimedia or Web projects at the analysis, synthesis, and/or evaluation levels. Although the learning activity may not be perceived as authentic by the student, the emphasis is, nonetheless, placed on higher levels of cognitive processing and on in-depth treatment of the content using a variety of thinking skill strategies, such as problem solving, decision making, reflective thinking, experimentation, and scientific inquiry.
4A	Integration (Mechanical)	Technology-based tools are integrated in a mechanical manner that provides a rich context for students'

		understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials, on outside resources such as assistance from colleagues, or on interventions such as professional development workshops that aid teachers in the daily execution of their operational curriculum. Technology is perceived as a tool to identify and sole authentic problems as perceived by the students relating to an overall theme or concept. Emphasis is placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.
4B	Integration (Routine)	Technology-based tools are integrated in a routing manner that provides a rich context for students' understanding of the pertinent concepts, themes, and processes. At this level, teachers can with little or no outside assistance readily design and implement learning experiences that empower students to identify and solve authentic problems relating to an overall theme or concept using the available technology. Emphasis is placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.
5	Expansion	Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from other schools, business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle using the Internet), research institutions, and universities to expand student experiences directed at problem solving, issues resolution, and student activism surrounding a major theme or concept. The complexity and sophistication of the technology-based tools used are commensurate with (1) the diversity, inventiveness, and spontaneity of the teacher's experiential approach to teaching and (2) the students' level of complex thinking and in-depth understanding of the content.
6	Refinement	Technology is perceived as a process, product (e.g., invention, patent, new software design), and/or tool for students to find solutions related to an identified "real-world" problem or issue of significance to them. At this level, there is no longer a division between instruction and technology use in the classroom. Technology provides a seamless medium for information queries, problem solving, and product development. Students have ready access to and a complete understanding of a vast array of

		technology-based tools to accomplish any particular task at school. The instructional curriculum is entirely learner based. The content emerges based on the needs of the learner according to his or her interests or aspirations and is supported by unlimited access to the most current computer applications and infrastructure available.

Note: From: Beyond Hardware: Using Existing Technology to Promote Higher-Level Thinking, by Christopher Moersch, p. 47-49. Copyright 2002 ISTE.

Appendix C

Stages of Instructional Practice

Category	Level	Description
Learning Materials	1	Organized by the content; heavy reliance on textbook and sequential instructional materials
	2	Emphasis on science kits; hands-on activities (e.g. AIMS, FOSS.)
	3	Determined by the problem areas under study; extensive and diversified resources
Learning Activities	1	Traditional verbal activities; problem-solving activities
	2	Emphasis on student's active role; problem-solving activities with little or no context; verification labs with science kits and related hands-on experiences
	3	Emphasis on student activism and issue investigations and resolutions; authentic hands-on inquiry related to a problem under investigation; focus on experiential learning
Teaching Strategy	1	Expository approach
	2	Facilitator; resource person
	3	Co-learner/facilitator
Technology	1	Drill-and-practice computer programs (e.g., traditional integrated learning systems): computer games; little connection between technology use and overall theme or topic
	2	Technology integrated into isolated hands-on experiences (e.g., tabulating and graphing data to analyze a survey or experiment): information searches using telecommunications
	3	Expanded view of technology as a process, product, and tool to retrieve information, solve problems, and communicate results (e.g., using spreadsheets, graphs, probes, databases, CD-ROM simulation, telecommunications)
Evaluation	1	Traditional evaluation practices including multiple choice, short answer, and true or false questions
	2	Multiple assessment strategies including performance tasks and open-ended and problem-based questions
	3	Multiple assessment strategies integrated authentically throughout unit and linked to the problem, theme, or topic; use of portfolios, open-ended questions, self-analysis, and peer review

Note: From: Beyond Hardware: Using Existing Technology to Promote Higher-Level Thinking, by Christopher Moersch, p. 50-51. Copyright 2002 ISTE.

Appendix D

Computer Self-Efficacy Instrument

No. _________

Before answering the questions, please circle your teaching area:

1. English 2. Mathematics 3. Science 4. Physical Education 5. Social Studies
6. Foreign Languages 7. Career & Technology Education 8. JROTC
9. Elementary 10. Other___________

Attitudes Towards Computer

The purpose of the questionnaire is to examine the benefits and difficulties people experience when using computers.
The questionnaire is divided into two parts. In Part 1 you are asked to provide some basic background information about yourself and your experience of computers, if any. Part 2 aims to elicit more detailed information by asking you to indicate the extent to which you agree or disagree with a number of statements provided.

Part 1

Your age ________

Your sex
☐ Male
☐ Female

Experience with computers
☐ none
☐ very limited
☐ some experience
☐ quite a lot
☐ extensive

Please indicate the computer packages (software) you have used
☐ Word processing packages
☐ Spreadsheets
☐ Databases
☐ Presentation package (eg. Harvard Graphics, CorelDraw, PowerPoint)
☐ Statistic packages
☐ Desktop publishing
☐ Multimedia
☐ Other (specify)

Do you own a computer?
☐ Yes
☐ No

Do you have access to a computer when you are **not** at work?
☐ Yes
☐ No

Have you ever attended a computer training course?
☐ Yes
☐ No

Part 2

Below you will find a number of statements concerning how you might feel about computers. Please indicate the strength of your agreement/disagreement with the statements using the six point scale shown below where 1=strong disagreement and 6=strong agreement with a particular statement.

Strongly Disagree 1 2 3 4 5 6 Strongly Agree

You can indicate how you feel by choosing a number between 1 and 6. Check on the blank which most closely represent ho much you agree or disagree with the statement. There are no 'correct' responses; it is your own views that are important.

It will take you only a few minutes to complete the thirty statements that make up the questionnaire, but it is important that you respond to each statement. Please check on the most appropriate blank as far as you are concerned.

Q1. Most difficulties I encounter when using computers, I can usually deal with.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q2. I find working with computers very easy.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q3. I am very unsure of my abilities to use computers.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q4. I seem to have difficulties with most of the packages I have tried to use.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q5. Computers frighten me.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q6. I enjoy working with computers.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q7. I find computers get in the way of learning.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q8. Web-based computer packages don't cause many problems for me.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q9. Computers make me much more productive.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q10. I often have difficulties when trying to learn how to use a new computer package.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q11. Most of the computer packages I have had experience with, have been easy to use.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q12. I am very confident in my abilities to use computers.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q13. I find it difficult to get computers to do what I want them to.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q14. At times I find working with computers very confusing.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q15. I would rather that we did not have to learn how to use computers.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Well done, you have completed half the questionnaire, please keep going…….

Q16. I usually find it easy to learn how to use a new software package.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q17. I seem to waste a lot of time struggling with computers.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q18. Using computers makes learning more interesting.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q19. I always seem to have problems when trying to use computers.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q20. Some computer packages definitely make learning easier.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q21. Computer jargon baffles me.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q22. Computers are far too complicated for me.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q23. Using computers is something I rarely enjoy.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q24. Computers are good aids to learning.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q25. Sometimes, when using a computer, things seem to happen and I don't know why.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q26. As far as computers go, I don't consider myself to be very competent.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q27. Computers help me to save a lot of time.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q28. I find working with computers very frustrating.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q29. I consider myself a skilled computer user.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

Q30. When using computers I worry that I might press the wrong button and damage it.

Strongly Disagree __1; __2; __3; __4; __5; __6; Strongly Agree

◆ _____ No, I do not want to participate in this study.

You have now completed the questionnaire; thank you for your time.
We'll assure the anonymity, and no respondent will be identified

********Once again, many thanks for helping with this research********

Appendix E

Letter to Principals

Ian Johnson
750 Gaines School Rd., I-155
Athens, GA 30605

April 12, 2005

Dear Principals:

I have been a teacher for 21 years and three of those years have been spent in Walton County School District where I currently teach at an elementary school. I hope to complete my doctoral program at Nova Southeastern University within the next year.

I am currently involved in studying the process of technology implementation in the classroom. It is widely argued in the current professional and popular educational literature that computer technology offers great promise as an instructional tool, and it is the focus of my study.

I am asking for your assistance in allowing me to distribute in your schools on Wednesday, April 13, 2005, a survey packet for classroom teachers who have completed the InTech training. The survey has been approved by the Institutional Review Board at Nova Southeastern University and by Dr. Roger Crim, Coordinator for Testing and Research in Walton County Schools. Teachers will be asked to fill out two questionnaires: a 50 item questionnaire that seeks to measure current instructional practice, level of technology implementation, and personal computer use; a five question addendum questionnaire on the InTech training received; and a 30 item questionnaire on the benefits and difficulties of using a computer.

In addition, six teachers will be selected to take part in one observation and six others for an interview. No teacher, classroom, or school will be identifiable. All responses will be kept strictly confidential and participation in this survey is strictly voluntary.

Please ask the teachers to return the completed surveys to your secretary by Wednesday, April 27, 2005. I will come by on Friday, April 29, 2005 and collect the teacher packets. Thank you for your help. I will report the findings to you once this study has been completed.

Sincerely,

Ian Johnson
Doctoral Student
Computer and Technology in Education Dept.
Nova Southeastern University
ianjohns@nova.edu

Appendix F

Principal's Consent Form

Consent to Distribute Surveys and Facilitate Research

April 13, 2005

School____

Principal ____

Number of Classroom Teachers ____

I agree to have Ian Johnson's surveys regarding his dissertation *An Investigation of the Effects on Teacher's Computer Self-Efficacy and Computer Utilization after completing the Georgia Framework for Integrating TECHnology (InTech) Training Program* distributed in my school.

The school's administrative secretary will collect the packets from the participating teachers on Wednesday, April 27, 2005 and return them to Ian Johnson.

Principal's Signature ______________________________ Date ______________

Please keep one copy for your records and I will come by on Friday, April 29, 2005 to pick up the other form. Thank you.

Appendix G

Letter to Teachers

Ian Johnson
750 Gaines School Rd., I-155
Athens, GA 30605

April 13, 2005

Dear Teachers:

I have been a teacher for 21 years and three of those years have been spent in Walton County School District where I currently teach at an elementary school. I hope to complete my doctoral program in Computing Technology in Education at Nova Southeastern University within the next year.

I am researching the impact of the InTech training program on teacher self-efficacy, and computer utilization. I have obtained approval from the school district to contact you concerning your participation in a short survey on your level of technology integration, computer use and personal computer use.

As you will notice, the surveys do not ask for your name. There is a number on the questionnaires for purposes of data processing only. The surveys are designed to ensure your confidentiality and take about 40 minutes to complete. You are also asked to choose to participate in one observation and one interview at your convenience.

Please return the completed surveys to your school's administrative secretary by Wednesday, April 27, 2005. Thank you for your help. I will report the findings to you once this study has been completed.

Sincerely,

Ian Johnson
Doctoral Student
Computer and Technology in Education Dept.
Nova Southeastern University
ianjohns@nova.edu

Appendix H

Teacher Consent Form to be Interviewed and/or Observed

If you are willing to participate in a 30-minute interview and or observation with me regarding your use of technology after the InTech training, please enter the following information below. Your name will **NOT** be used in my final report. The information you provide is very important in gaining a complete understanding of the integration of technology in the classroom and could provide valuable insights for future changes in this field.

Please circle your choice.

Interview: Yes No **Observation**: Yes No

Name: ______________________________________

Phone Number: ______________________________

Convenient Times to call: ______________________

Or

Email: _______________________________________

Please place in the packet with the completed surveys and turn in to the office.

Thank you for your participation!

Appendix I

Semi-Structured Observation Guide List

Male ________ Female ______ Date of Observation ____________________
Observer: Ian Johnson Grade Level/Subject Area: _______________
Participant ID# : ___________

The following checklist will be used during the observation:

Not observed	*More emphasis*	*Satisfactory*	*Accomplished very well*
1	2	3	4

Educational climate for learning:

1. Students and teacher are interested and enthusiastic	1	2	3	4
2. Atmosphere of the classroom is participative	1	2	3	4

Use of Technology:

3. Use of appropriate Technology materials	1	2	3	4
4. Use of computer/s	1	2	3	4
5. Use of TV	1	2	3	4
6. Use of Electronic Smartboard	1	2	3	4
7. Use of other technology	1	2	3	4
8. Use of subject specific software	1	2	3	4
9. Use of general software	1	2	3	4
10. Teacher-student interaction with the technology	1	2	3	4
11. Internet Access	1	2	3	4
12. Visible technology related projects	1	2	3	4

Teacher comfort level with the technology:

13. Teacher appeared comfortable with the technology	1	2	3	4
14. Teacher demonstrated concepts with the technology	1	2	3	4
15. Demonstrated command of the technology	1	2	3	4

Appendix J

Semi-Structured Interview Questions

Date: ______________ Time:______________ Place: ____________________

Male: ______ Female: ______ Participant ID#: ___________

How many Internet connected computers do you have in your classroom?

What other types of technology do you have in your classroom?

What do you think was the most beneficial aspect of the InTech training received?

What did you see as the strengths and/or weaknesses of the InTech training?

Have you made an attempt to address the weakness?

Do you feel you are now better equipped to use technology in your classroom? If so, what are some of the ways you use technology?

Do you feel you are now better equipped to use technology for personal use? If so, what are some of the ways you use technology?

Do you have information and resources related to preparing and integrating technology into your classroom curricular? If so, what kind and how is it being used?

What kinds of changes are you making, if any, in your use of the InTech training materials developed during training?

What plans do you have in relation to your use of the InTech training received?

Do you talk with others about technology integration and computer use? If so, what do you tell them or ask them?

Are you working with others in integrating technology in your curriculum?

If no, see below

If yes -- Have you made any changes in your technology use based on the collaboration?

How do you work together and how frequently?

What do you see as the strengths and weaknesses of this collaboration?

If no -- Are you considering or planning to collaborate with others in the future?

Appendix K

IRB Approval

NSU

March 31, 2005
JDC:jdc

MEMORANDUM

From: James Cannady, Ph.D., Associate Professor, GSCIS
To: Ian Johnson

Subject: IRB Approval

After reviewing your IRB Submission Form and Research Protocol I have approved your proposed research for IRB purposes. Your research has been determined to be exempt from further IRB review based on the following conclusion:

Research using survey procedures or interview procedures where subjects' identities are thoroughly protected and their answers do not subject them to criminal and civil liability.

Please note that while your research has been approved, additional IRB reviews of your research will be required if any of the following circumstances occur:

1. If you, during the course of conducting your research, revise the research protocol (e.g., making changes to the informed consent form, survey instruments used, or number and nature of subjects).

2. If the portion of your research involving human subjects exceeds 12 months in duration.

Please feel free to contact me in the future if you have any questions regarding my evaluation of your research or the IRB process.

Dr. Cannady

Appendix L

WALTON COUNTY BOARD OF EDUCATION

115 Oak Street, Monroe, Georgia 30655, Telephone 770-267-6544, Fax 770-267-0375
www.walton.k12.ga.us

August 29, 2003

Mr. Ian P. Johnson
Monroe Elementary School
Monroe, GA 30656

Dear Mr. Johnson:

Your request to approve your study titled "An Investigation of the Effects on Teacher Self-Efficacy and Computer Utilization after taking the Georgia Framework for Integrating TECHnology (InTech) Training Program" was received and reviewed. I am pleased to notify you that your request is approved.

I am sure that you will work closely with all teachers and principals to ensure that the research is not intrusive to the instructional program, the confidentiality of teacher's information is maintained, and participant consent is obtained for each teacher participant.

I would appreciate receiving a copy of your findings and recommendations.

Please let me know if I can be of assistance.

Sincerely,

Roger D. Crim, Ed.D.
Coordinator for Testing and Research

cc H. Franklin
W. Widmer

In Pursuit of Excellence
Walton County Public Schools

Appendix M

LoTi Questionnaire Approval

> > -----Original Message-----

> > From: Dennee DeKay [mailto:dennee@learning-quest.com]

> > Sent: Mon 1/12/2004 11:16 AM

> > To: Johnson, Ian

> > Cc: Chris Moersch

> > Subject: LoTi Instrument

> > Ian,

> > Dr. Chris Moersch asked me to send you a paper copy of the LoTi

> > Instrument. It is attached in Adobe Acrobat Portable Document Format

> > (PDF) and can be opened with a free copy of Adobe Acrobat Reader. I

> > assume you're looking for the Inservice Teacher (standard) version of

> > the questionnaire. Please let me know if you need an additional

> > version.

> > Dennee DeKay

>

>

> Dennee DeKay

> Learning Quest, Inc.

> 395 Taylor Street

> Talent, OR 97540

> 541-535-3017

>

Appendix N

Computer Self-Efficacy Instrument Approval

Hi Ian,

Sorry for the delay in replying. We are happy for you to use the CUSE for research purposes. The scale and scoring instructions are included in the following article:

Cassidy, S & Eachus, P; (2002); Development of the Computer Self- Efficacy (CUSE) Scale: Investigating the Relationship Between CSE, Gender and Experience with Computers. *Journal of Educational Computing Research: Vol. 26(2), pp. 133-153.*

We would be very interested in you findings.

Best wishes

Simon.

> *Hello Dr. Cassidy:*
>
> *I am a doctoral student at Nova Southeastern University in Ft.*
> *Lauderdale, Florida. Would it be possible to obtain and use the Computer*
> *Self-Efficacy instrument and scoring guide that was developed by you and*
> *Dr. Eachus for my dissertation which is entitled "An Investigation of*
> *the Effects on Teacher Self-Efficacy and Computer Utilization after*
> *taking the Georgia Framework for Integrating TECHnology (InTech)*
> *Training Program." I am currently in the Formal Proposal stage and would*
> *like to conduct the data gathering in August 2004. Please advise me of*
> *the cost and usage of this instrument. Thanks for your help.*
>
> *Ian Johnson, doctoral student*
>
> *ianjohns@nova.edu - university email*
> *ijohnson@walton.k12.ga.us - work email*
> *706-255-1208 - cell*
> *706-548-0068 - home*
> *Address: 240 Parthenon Lane, #5*
> *Athens, GA 30605*

Appendix O

Frequency Scores for CSE from the CUSE Instrument

		Frequency	Cumulative Frequency	Percent	Valid Percent	Cumulative Percent
Valid	74	1	1	.8	.8	.8
	78	2	3	1.5	1.5	2.3
	80	2	5	1.5	1.5	3.8
	84	1	6	.8	.8	4.5
	87	1	7	.8	.8	5.3
	89	1	8	.8	.8	6.0
	92	1	9	.8	.8	6.8
	95	1	10	.8	.8	7.5
	98	1	11	.8	.8	8.3
	99	1	12	.8	.8	9.0
	100	2	14	1.5	1.5	10.5
	102	2	16	1.5	1.5	12.0
	103	1	17	.8	.8	12.8
	104	2	19	1.5	1.5	14.3
	106	1	20	.8	.8	15.0
	108	1	21	.8	.8	15.8
	109	1	22	.8	.8	16.5
	110	2	24	1.5	1.5	18.0
	111	1	25	.8	.8	18.8
	112	1	26	.8	.8	19.5
	113	3	29	2.3	2.3	21.8
	115	1	30	.8	.8	22.6
	116	3	33	2.3	2.3	24.8
	117	2	35	1.5	1.5	26.3
	119	2	37	1.5	1.5	27.8
	121	1	38	.8	.8	28.6
	122	1	39	.8	.8	29.3
	123	2	41	1.5	1.5	30.8
	124	1	42	.8	.8	31.6
	125	1	43	.8	.8	32.3
	126	1	44	.8	.8	33.1
	127	1	45	.8	.8	33.8
	128	4	49	3.0	3.0	36.8
	129	1	50	.8	.8	37.6
	132	2	52	1.5	1.5	39.1
	133	1	53	.8	.8	39.8
	134	2	55	1.5	1.5	41.4
	135	1	56	.8	.8	42.1
	136	1	57	.8	.8	42.9

	Frequency	Cumulative Frequency	Percent	Valid Percent	Cumulative Percent
137	3	60	2.3	2.3	45.1
138	2	62	1.5	1.5	46.6
139	1	63	.8	.8	47.4
140	2	65	1.5	1.5	48.9
142	1	66	.8	.8	49.6
143	3	69	2.3	2.3	51.9
144	4	73	3.0	3.0	54.9
145	4	77	3.0	3.0	57.9
146	1	78	.8	.8	58.6
147	2	80	1.5	1.5	60.2
148	6	86	4.5	4.5	64.7
149	5	91	3.8	3.8	68.4
150	2	93	1.5	1.5	69.9
151	2	95	1.5	1.5	71.4
152	1	96	.8	.8	72.2
154	2	98	1.5	1.5	73.7
156	2	100	1.5	1.5	75.2
157	1	101	.8	.8	75.9
158	3	104	2.3	2.3	78.2
159	3	107	2.3	2.3	80.5
160	2	109	1.5	1.5	82.0
162	1	110	.8	.8	82.7
163	2	112	1.5	1.5	84.2
164	2	114	1.5	1.5	85.7
165	1	115	.8	.8	86.5
166	1	116	.8	.8	87.2
167	2	118	1.5	1.5	88.7
168	3	121	2.3	2.3	91.0
170	2	123	1.5	1.5	92.5
171	1	124	.8	.8	93.2
172	4	128	3.0	3.0	96.2
175	2	130	1.5	1.5	97.7
177	1	131	.8	.8	98.5
178	1	132	.8	.8	99.2
179	1	133	.8	.8	100.0
Total	133		100.0	100.0	

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