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THE RELATIONSHIPS OF TEACHERS' LEVELS OF TECHNOLOGY INTEGRATION ON STUDENT ACHIEVEMENT IN READING AND MATHEMATICS

by

Valerie S. Fields, Ed. S

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

COLLEGE OF EDUCATION
LOUISIANA TECH UNIVERSITY

November 2004

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LOUISIANA TECH UNIVERSITY

THE GRADUATE SCHOOL

November 2004
Date

We hereby recommend that the dissertation prepared under our supervision by Valerie Savetria Fields

entitled The Relationships of Teachers' Levels of Technology Integration on Student Achievement in Reading and Mathematics

be accepted in partial fulfillment of the requirements for the Degree of Doctor of Education

Supervisor of Dissertation Research

Head of Department

Curriculum, Instruction, and Leadership
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Recommendation concurred in:

Advisory Committee

Approved:

Director of Graduate Studies

Dean of the College

Approved:

Dean of the Graduate School

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ABSTRACT

The purpose of this study was to determine to what extent the level of technology integration of fourth and eighth grade teachers in eleven rural school districts in northeastern Louisiana related to student achievement in reading and mathematics.

The sample consisted of 123 fourth and eighth grade teachers and their students from the eleven rural school districts in northeastern Louisiana. Fifty-eight percent of the teachers represented the fourth grade and 42% of the teachers represented the eighth grade. The teachers served a school age population in which 20% or more was from families with incomes below the poverty line.

Mean scores from the students' Louisiana Educational Assessment Program for the 21st Century (*LEAP 21*) were collected together with teacher demographic variables—teachers' ages, years of experience, highest degrees earned, certification status, levels of technology integration, current instructional practices, and personal computer use. Pearson correlation was used to determine if there was any significant relationship between the teacher's level of technology integration and the class means for reading and mathematics as well as for the demographic data. Regression analysis was used to determine if the level of technology use and the teacher demographic data would predict the *LEAP 21* reading and mathematics mean scores in grades 4 and 8.

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The data analysis from the study suggested that few hypotheses could be rejected due to the lack of significant relationships found.

The results showed that the eighth grade teacher's age is related to the teacher's level of technology integration; therefore, the older the teacher, the less likely that the teacher is to integrating technology in the classroom. The fourth grade teacher's certification status was related to the teacher's level of technology integration, meaning certified teachers were less likely to integrate technology into their classrooms. An eighth grade teacher's highest degree earned when using mathematics as the dependent variable is related to the teacher's level of technology integration, meaning the higher the education of the teacher, the less likely he or she will integrate technology into the classroom.

The lack of statistically significant differences between the teacher's level of technology integration and student achievement indicates that technology does not have an impact on students' achievement in these school districts. Impact on student achievement typically takes place when teachers use technology for more than just "drill and practice." Unfortunately, students will continue to perform at the Approaching Basic level if teachers are not properly trained using technology that will impact student achievement in their classrooms.

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DEDICATION

This dissertation is dedicated to my nephews, Caleb Deacue and Cade Dominque, the two most precious additions in my life during this process; to my mom and dad for the love, support, and many words of encouragement they have shown; my siblings and their spouses for understanding and encouragement; to Clarence "Val, you not finished yet?" for continuous support and love; to Margie Vernon, my "lil sis" from the Northeast Louisiana Big Brothers Big Sisters program, for motivation and support; to Dr. Phyllis Sanders who paved the way and did not forget about those left in the LEC program, and to Deacon Eugene Brown "when are you going to finish that doctorate?" He stated, "I will be on the front row." I thank God for making all of you a part of my life. Thanks for all you have done. I love each of you unconditionally.

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CHAPTER ONE

Introduction

In 1957, after the Russians launched Sputnik, the United States felt a sense of urgency to overhaul education. Following the launch, education reformers initiated what has become known as the "golden age" of education. During this time, five reform tenets were identified as significant issues that would assist with education reform (Molnar, 1997). First, the philosophy of education had to be modified from making mass education accessible to many individuals to affording all individuals an equal education. Second, it was necessary to prepare students who lived in impoverished areas to face a society that would be significantly different from the ones in which they lived. Third, individuals were to be conditioned for two or three career changes due to increased life expectancy. These changes implied that a high school diploma or even one college degree would no longer be sufficient to sustain the various career changes that might occur. Fourth, preparation of school curricula had to compete with the information-rich society that provided students with a variety of media creating an interesting, yet challenging, communication network. Finally, students had to be prepared for the emergence of technology in education that has become a catalyst for the historical moment known as Postmodernity (Molnar, 1997).

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Although the aforementioned reform tenets were clearly stated, the United States continues to lag in the area of student performance. The National Commission on Mathematics and Science (2000) recently reported that students' performance in the United States when compared to other countries is disappointingly below average.

The First International Study of Achievement in Mathematics, published in 1967, reported that American students finished next to last among 10 major industrialized nations (Husen, 1967). Another international study (Ma, 1999) showed students from Asia, Japan, and China consistently outperformed students from the United States in the area of mathematics. Ma (1999) further discovered some factors found to be responsible for American students performing below average to include differences in cultural contexts such as parental expectations and school organization, amount of time spent learning mathematics and content, and content allocation in mathematics curricula.

In 1992, an international comparison in mathematics revealed that the United States received an "F" in world competition (Bracey, 2000). For example, the Czechoslovakian Republic, which spends a third as much per pupil as the United States, ranked sixth in mathematics and second in science, while the United States ranked 28th in mathematics and 17th in science (Charp, 2001).

In addition, United States students continue to perform poorly in reading. One recent National Assessment of Educational Progress (NAEP) reported that only 32% of fourth-graders are reading proficiently, and the proportion in urban areas is even lower. Twenty-six percent of urban fourth graders were proficient readers as compared with 36% of suburban and 32% of rural fourth graders (National Center for Educational Statistics, 2002).

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Research clearly shows that students in the United States consistently perform below average in mathematics and reading. In addition to research indicating nationwide low performance in many subject areas (Bracey, 2002a; Collins & Dewees, 2001; & Riley, 2002), studies also indicate that some geographic areas, particularly rural areas, are reporting low performance. Riley's (2002) research further indicates that the achievement gap is persistent and intrinsically linked to the fact that millions of the nation's children still live in poverty.

Currently, a daunting new challenge and an exhilarating prospect faces the nation; equal access to education and opportunity for all children to learn is again at the forefront of education reform (Okpala, 2002). On January 8, 2002, President Bush signed the No Child Left Behind Act ushering in a new era in American education. According to Paige (2002), this era is "the most far-reaching reform of the nation's public education system" since the creation of the Department of Education in 1979 (p. 709). The No Child Left Behind Act should assist with narrowing the achievement gap for disadvantaged students, improve teacher preparation and rewards, and establish accountability measures for students, teachers, and schools that will be monitored closely by the Department of Education.

Challenged by the 21st century leaders and workforce, stakeholders and educators are increasingly embracing technology-based pedagogical strategies that will assist with student achievement and preparation for this workforce (Dede, 1998; Middleton & Murray, 1999). Given the increased access to technology in classrooms today, schools must produce students who are able to function comfortably in a technological society. If a student does not obtain computer literacy skills early in the education sequence, the

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student will not only be academically disadvantaged but face disadvantages in the workforce as well. It is unacceptable to produce students who are not able to compete in the technological job market (Henry, 1999); therefore, student technology training is essential.

Further, technology integration will not only prepare students for a technology-rich labor market, it can help students to gain traditional skills such as reading and mathematics. Technology enhanced instruction can increase "deep explorations and integration of information, high level thinking, and profound engagement by permitting students to design, explore, experiment, access information, and model complex phenomena" (Goldman, Cole, & Syer, 1999, p. 2). School reformers and stakeholders recognize that student achievement is "a function of variables other than per-pupil allocations of funds" (Okpala, 2002, p. 885). Educators are searching for variables that can predict and positively affect the levels of achievement in core subject areas of students in public schools. Since reading and mathematics are the two basic courses required for achieving in other areas in the curriculum, these subjects are of particular concern (Okpala, 2002). Middleton and Murray (1999) purport that the use of technology as a variable should "improve the way teachers teach and children learn" (p. 110).

Statement of the Problem

There are continuing concerns over the apparent failure of schools to teach students basic skills, particularly in basic reading and mathematics; students further need basic technology skills in order to be successful in the workplace. Many school restructuring efforts are underway, and technology initiatives continue to go

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hand-in-hand with these efforts. Implementation of these changes, however, is costly to school districts in terms of time and money. These large expenditures of funds need justification, particularly in poorer school districts. Therefore, it is important to determine if reading and mathematics achievement of students in rural schools is impacted by the integration of technology in the classroom.

Purpose of the Study

The purpose of this study was to determine to what extent the level of technology integration by fourth and eighth grade teachers in eleven rural school districts in northeastern Louisiana is related to student achievement in reading and mathematics.

Justification for the Study

There has been little research to date that specifically investigates the relationships of technology integration on achievement of students in rural schools. Interested educators and stakeholders wish to understand the role technology integration may have in the areas of mathematics and reading on student achievement.

This study extended the research regarding the relationship between student achievement in the critical areas of reading and mathematics in rural schools and the degree to which teachers integrate technology in their classrooms. Findings of this study provide administrators, teachers, and other stakeholders in rural school districts additional guidelines for structuring professional development and instructional activities. Further, this study provides direction for curriculum development, instructional methods and strategies as well as student and teacher roles when infusing technology into classroom instruction.

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Theoretical Model

The tenets of the philosophy of learning known as Constructivism guides this research. Constructivism, as described by Moersch (1998), displays values that reflect, "how we come to know and learn" (p. 50). There are three fundamental propositions that reflect these values:

1. Understanding is in the individual's interactions with the environment.

2. Cognitive conflict or puzzlement is the stimulus for learning and determines the organization and nature of what is learned.

3. Knowledge evolves through social negotiation and through the evaluation of the viability of individual understandings. (Savery & Duffey, 1995)

When Constructivism is fully implemented, teachers use the ideas of the student to assimilate and prepare the lessons that they will teach in their classrooms. That is, teachers use existing technology and community resources to transform classrooms into dynamic centers of purposeful and experiential learning that intuitively move students from awareness to authentic action. It is believed that the appropriate use of technology can reinforce higher cognitive skill development and complex thinking skills such as problem solving, reasoning, decision-making, and scientific inquiry (Moersch, 1999); or in other words, teachers can now use technology as a tool to promote students' "ability to reason and solve authentic problems" (Moersch, 1998, p. 53).

When teachers thoroughly integrate technology into the classroom, constructivist-learning environments can result. A constructivist-learning environment (Reeves, 1998) is a place where learners may work together and support each other as they use a variety of tools and information resources in their guided pursuit of learning goals and problem-

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solving activities. Constructivist learning environments usually encompass many different applications of media and technology. Such environments create active classrooms that combine the tools of Constructivism with communication and visualization tools that enable communication and collaboration among learners in a sociocultural context. Increased student achievement should result because of the synergy created through dynamic interactions.

Research Questions

This study investigated the following research questions:

Research Question 1. Is there a relationship between teacher levels of technology integration and students' achievement in reading?

Research Question 2. Is there a relationship between teacher levels of technology integration and students' achievement in mathematics?

Research Question 3. Is there a relationship between teacher levels of technology integration and teacher age?

Research Question 4. Is there a relationship between teacher levels of technology integration and teacher years of experience?

Research Question 5. Is there a relationship between teacher levels of technology integration and highest degree earned by the teacher?

Research Question 6. Is there a relationship between teacher levels of technology integration and teacher certification status?

Research Question 7. Is there a relationship between teacher current instructional practices and teacher levels of technology integration?

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Research Question 8. Is there a relationship between teacher personal computer use and teacher levels of technology integration?

Research Question 9. Is there a relationship between the dependent variable, reading, and the levels of technology integration subscales (0 - nonuse to 6 - refinement)?

Research Question 10. Is there a relationship between the dependent variable, mathematics, and the levels of technology integration subscales (0 – nonuse to 6 - refinement)?

Hypotheses

The following null hypotheses were tested.

H_1: There is no significant relationship between teacher's level of technology integration and student achievement in reading in grade four.

H_2: There is no significant relationship between teacher's level of technology integration and student achievement in reading in grade eight.

H_3: There is no significant relationship between teacher's level of technology integration and student achievement in mathematics in grade four.

H_4: There is no significant relationship between teacher's level of technology integration and student achievement in mathematics in grade eight.

H_5: There is no significant relationship between teacher's level of technology integration and the following demographic variables (age, total years of experience, highest degree earned, and certification status) do not predict a teacher's level of technology integration.

H_6: There is no significant relationship between teacher's level of technology integration and current instructional practices.

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H_7: There is no significant relationship between teacher's level of technology integration and personal computer use.

H_8: The independent variables provided in H_1-H_7 do not predict the dependent variables of fourth grade reading, eighth grade reading, fourth grade mathematics and eighth grade mathematics achievement.

H_9: The levels of technology integration subscales (0- nonuse to 6-refinement) do not predict the dependent variable of mathematics achievement.

H_{10}: The levels of technology integration subscales (0-nonuse to 6-refinement do not predict the dependent variable of reading achievement.

Assumptions

For purposes of this study, the following assumptions were made.

1. The dependent variable is at interval or ratio levels.
2. The dependent variable is normally distributed (Cronk,1999).
3. The levels of technology integration instrument is valid and appropriate for the purposes of this study.
4. Participants' responses accurately reflect their levels of technology integration.

Limitations

This study had the following limitations:

1. The sample was restricted to fourth and eighth grade students and teachers in eleven rural parishes in northeastern Louisiana.
2. The study was designed to explore possible relationships among variables; therefore, the analysis cannot establish cause and effect relationships.

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3. There existed unexamined factors affecting the relationship between technology integration into the mathematics and reading curriculum and student achievement that are not accounted for in the methodology.

4. All information in the survey was self-reported.

Definition of Terms

The following definitions were applied for this study:

1. Levels of Technology Integration: Integration levels measured by (a) a measurement instrument with a scale having terms nonuse, awareness, exploration, infusion, integration, expansion, and refinement (b) personal computer use: a profile that assesses a classroom teacher's comfort and skill level with using a personal computer and (c) current instructional practice: a profile that assesses a classroom teacher's current instructional practices relating to a subject-matter versus a learner-based curriculum approach defined by Moersch (1998).

0 Non-use: Lack of access to technology-based tools or a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based.

1 Awareness: The use of computers is generally one step removed from the classroom teacher. Computer-based applications have little or no relevance to the individual teacher's instructional program.

2 Exploration: Technology based tools serve as a supplement to the existing instructional program.

3 Infusion: Technology-based tools including databases, spreadsheets,

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graphing packages, probes, multimedia applications, desktop publishing, and telecommunications augment selected instructional events.

4 Integration (Mechanical): Technology-based tools are integrated in a mechanical manner that provides rich content for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials and/or outside resources to aid teachers in the daily operation of their instructional curriculum.

5 Integration (Routine): Technology-based tools are easily integrated in a routine manner that provides rich context for students' understanding of the pertinent concepts of themes and processes.

6 Expansion: Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from business enterprises, governmental agencies, research institutions, and universities to expand student experiences directed at problem-solving, issues resolution, and student action surrounding a major theme or concept.

7 Refinement: Technology is perceived as a process, product and tool utilized by students solving authentic problems related to an identified "real world" problem or issue.

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2. Technology Integration: A manner in which technology-based tools (multimedia, telecommunications, databases, spreadsheets, word processors, and others) are integrated to provide students with content that is rich; a working knowledge of concepts, themes, and processes (Bennett, 2002).

3. Student Achievement: Performance by a student as measured by the Louisiana Educational Assessment Program for the 21st Century (Louisiana Department of Education, 2002b).

4. The Louisiana Educational Assessment Program for the 21st Century (*LEAP 21*): A criterion-referenced test on content standards administered annually to measure fourth and eighth grade students' mastery of state aligned curriculum.

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CHAPTER TWO

Review of the Literature

Introduction

Technology is changing the way people live and work, and it is well documented that technology has had a positive impact on education (Baker, 1999; Cantu & Garza, 1998; Charp, 2001; Cavazos, 2002; Robyler, 2003; Smith 1997). This chapter provides a review of literature summarizing research on school reform efforts, technology standards and school reform, technology integration in classrooms, current instructional practices, the effects of teachers' technology use on student learning, effects of student technology use on learning, technology and student achievement, and technology in rural schools.

Since the 1980s, clear support for the use of technology in classrooms has developed. Some view technology skills as a basic literacy that students must have before they enter the workplace (Baker, 1999; Bracey, 2002b; Cantu & Garza, 1998); whereas, others view technology as a form of instructional support with the potential to improve test scores, enhance instructional practices, and improve higher order thinking skills in students (Allen, 2001; Bruce & Levin, 1997; Doherty & Orlofsky, 2001; Whetzel, 1992).

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When technology use is viewed as a basic literacy skill, an important starting point is to identify the skills students need in the workplace and the skills that entry-level jobs require. In 1990, the secretary of the Department of Labor established the Secretary's Commission on Achieving Necessary Skills (SCANS) to specify these skills (Whetzel, 1992).

According to the commission, to find worthwhile jobs, high school graduates need to master certain competencies. Three of the five competencies include technology-related skills:

1. Information skills -- using computers to process information, using computers to acquire information, using computers to evaluate information, using computers to interpret and organize information, using computers to maintain information, using computers to communicate information.
2. Systems skills -- understanding systems, monitoring system performance, correcting system performance, improving systems, designing systems.
3. Technology utilization skills -- selecting technology, applying technology, maintaining technology, troubleshooting technology (Whetzel, 1992).

Because concerns about student achievement continue, particularly in mathematics and reading, interest in school reform efforts continues along with interest in ways technology can facilitate needed changes. The latest 2002 report card on reading from the National Assessment of Educational Progress provides discouraging results. Fourth grade students' scores in reading were higher than in 1998, but not significantly different from 1992. Eighth grade students showed no improvement since the last report, and high school seniors' scores declined at every level. Recent writing results were only slightly better in

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grades four, eight, and twelve. Considering these results, if technology use is to remain an important point of emphasis in K-12 schools, it is increasingly important to approach its use from a basis of solid research (National Center for Education Statistics 2002).

School Reform Efforts

School districts across the nation have invested billons of dollars in an effort to reform their schools' accountability. During 1990-91, the nation spent about $231 billion on elementary and secondary education (Cavazos, 2002). Since the 1990s, education policy at both the federal and state levels has sent strong and consistent signals about the goals of standards-based reform: (a) high academic standards, (b) accountability for student outcomes, (c) the inclusion of all students in reform initiatives, and (d) flexibility to foster instructional change. The provisions of Title I of the Improving America's Schools Act of 1994 further requires states to establish challenging content and performance standards at least in reading and mathematics, to implement assessments that measure students' performance against these standards, to hold schools and school systems accountable for the achievement of all students, and to align their Title I programs with these state policies (Goertz, 2001).

Lee (2003) asserts that teachers and districts frequently compiain, however, that state standards are too general to guide effectively local curriculum and instruction and that district and school staff members do not have the time or the expertise to translate these broad goals into practice. Furthermore, Goertz (2001) purports nearly all districts have taken steps to align their curriculum and instruction, both vertically with state standards and horizontally, with other elements of district and school policies and programs. Yet how

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districts deployed curricular and instructional change and how they sought to achieve alignment varied substantially.

Charp (2001) asserted that school districts should adhere to reform efforts that develop a clear set of goals, expectations, and criteria for improvements in student learning. This information should be well disseminated and understood throughout the district. Teachers, students, administrators, and parents should have a shared understanding of what skills and abilities are important and how these attributes are being measured. In case of integrating technology, parents and representatives of the community should be actively involved with the school and district in setting and revising goals, thereby developing a vision for student learning through technology. Stakeholders should recognize that technology alone will not transform student achievement. Researchers such as Dodge (2002) emphasized that careful and sequential implementation of professional development can lead to the seamless integration of technology. Technology should be used to support the school or district's learning goals, which suggests that technology should be integrated into all aspects of teaching and learning, and it should address the learning of critical content (Charp, 2001).

Several factors should be addressed in developing a school plan that reflects a clear set of goals. North Central Regional Educational Laboratory (1999) further communicates that the school should establish realistic time frames for improving student achievement through technology. All stakeholders should recognize that new skills, new technologies, new curricula, and new practices take time to become effective parts of teachers and students' daily routines. A robust infrastructure with connections and equitable access should support engaged learning with technology. Alternative assessment methods should be used to

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complement standardized test information in order to determine the different skills and knowledge that students have obtained. Evaluation plans should be in place to ensure that technology is used for authentic tasks, generates continued improvement in student achievement, and is cost-effective (North Central Regional Educational Laboratory, 1999).

To assist with the promotion of technology reform, the Office of Educational Technology in the United States Department of Education (2000) launched a Technology Literacy Challenge. The Technology Literacy Challenge "envisions a 21st century where all students are technology literate and have access to the educational resources of the Information Superhighway" (p. 1). This vision calls attention to implementation of technology in classrooms as it impacts student achievement as well as prepares students for the workforce. Because workforce preparation is essential, the United States Department of Education (2000) has envisioned a modern classroom with infused technology that should positively impact all students. Some researchers, however, find that setting the mark may not be enough to ensure adequate progress in the nation's schools. If schools are to achieve real improvement in student learning and achievement, policy makers must determine how much variability is acceptable and what the proper balance must be between compliance and flexibility (Goertz, 2001; Dwyer, 1994; Lee, 2003).

As reported by Goertz (2001), there has been an increasing number of government, community and educational leaders calling for global changes in the nation's schools; therefore, the education system has experienced many reforms. According to Dodge (2002), The No Child Left Behind Act, which reauthorizes the Elementary and Secondary Education Act of 1965, has been called "the most far-reaching reform of the nation's public education system" (p. 675) since the creation of the Department of Education in 1979. The major goals

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of the bill include (a) closing the achievement gap for disadvantaged students, (b) improving teacher preparation and rewards, and (c) instituting closely monitored accountability systems for students, teachers, and schools. States are required to establish academic standards and to test students annually in grades three through eight (United States Department of Education, 2000).

Technology Standards and School Reform

In addition to reforms as global as the No Child Left Behind Act, technology integration efforts also represent a reform. In order for schools to sustain and support growth of high-quality technology, "everyone has to learn to be more aware of technology standards and goals" (Baker, 1999, p. 4). In order to ensure alignment of technology integration with curriculum standards, The International Society for Technology in Education (ISTE) collaborated with the National Council for the Accreditation of Teacher Education (NCATE) to create the National Educational Technology Standards for teachers and students (International Society for Technology in Education, 2003).

The National Educational Technology Standards for teachers suggest that teachers show evidence of competence in the following categories: (a) technology operations and concepts, (b) planning and designing learning environments and experiences conducive to technological use, (c) infusing technology in teaching, learning, and curriculum, (d) assessing and evaluating use of technological measures, (e) providing a productive and professional classroom setting when infusing technology, and (f) ensuring that social, ethical, legal, and human issues are safeguarded during technology use in the classroom (International Society for Technology in Education, 2003).

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While teachers model the use of technology-based methods in their classroom, they must also keep in mind the standards that were designed for students. ISTE National K-12 Educational Technology Standards for students maintains that students should be able to (a) demonstrate basic operation and understanding of concepts regarding technology, (b) understand the social, ethical, and human issues that reflect technological use, (c) use technology as a productivity tool, (d) use technology as a communication tool, (e) use technology to enhance research, and (f) use technology as a problem solving and decision making tool (International Society for Technology in Education, 2003).

Christie (2002) states that standards are a crucial component of states' efforts to improve student achievement in the classroom. To be effective, however, standards must be clear, measurable, comprehensive, challenging yet attainable, balanced between what students should know and what students should be able to do, and available to all. If the standards are not incorporated into school reform efforts, technology use alone is by no means an indication that positive changes in teaching and learning will result. Other variables such as "organizational leadership and structure, the teacher's role in the restructuring process, and the curriculum itself, impact the entire school restructuring process, including instructional uses of technology" (Moresch, 1995, p. 41). Too often and in too many places, standards-based reform is defined largely as making sure children do better on "tougher" and extensive standardized paper and pencil tests. This focus, in many instances, has helped reduce teaching to test preparation and the adoption of practices that research of the last few decades has shown can be detrimental to student learning practices including the mandated standardized lockstep curricula and increased testing. According to Falk (2002), in the

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primary grades, tracking ability, retention, and promotion decisions have been made on the basis of a single test result.

Technology Integration in Classrooms

It is important that all stakeholders recall that technology standards serve as a guide for teachers. By providing technology standards by grade level, ISTE outlines the framework of technology standards that requires teachers to be able to demonstrate effective technology usage and enhancement in their classrooms despite their economic environment (McKenzie, 1998). Because of students' attitudes towards learning and their self-concept, educators working in high-poverty schools should strive to create environments that reflect high expectations that link students to successful achievement (Lee, 2003). Since teacher levels of technology integration reveal that teachers hold the ultimate authority over what occurs in classrooms on a day-to-day basis, Peck, Cuban, and Kirkpatrick (2002), found that students are thus subject to the pedagogical choices of their teachers. If teachers chose not to use technology, students will receive little exposure to the technology. Peck et al. (2002) further asserted that teachers largely eschew the use of instruction technology on a sustained, systemic basis. Teachers rarely employ technology-based educational resources that can have an impact on student academic achievement and outcomes. Technology has simply become a small and largely peripheral element of a familiar, long running school routine. According to Peck et al. (2002), as little as 5 % of the students are affected by computers and other technologies.

Perhaps part of the problem is the rapid pace of changes in technology. Washenberger (2001) stated that technology has grown at such a tremendous rate that it has discouraged many educators from using this tool. The U.S. Department of Education (2000)

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quality education data report revealed that there were 200 computers per 1,000 students nationwide, or one computer for every five children (Bennett, 2002), yet despite this massive infusion of technology, overall improvements in education have been minimal. Further, according to Bennett (2002) scores on the National Assessment of Education Progress point out this lack of advancement. Results for 1999 showed no significant change in reading, mathematics, or science for students in grades fourth and eighth tested from 1994 through 1999, again, in spite of technology's increased availability and proven impact on instruction (Bennett, 2002).

Although technology is readily available in many districts, training in integrating technology effectively is necessary (Washenberger, 2001). In order for technology to impact student achievement in basic skills, appropriate technology training supports the following: (a) staff development, which allows teachers to explore the various opportunities available to them, (b) technology that is used for isolated activities that do not reflect a theme or concept, (c) technology that is only one step removed from the classroom teacher, (d) existing curricula rather than a curricula that would serve as a catalyst for change, and (e) lesson plans that do not reflect significant links between instructional priorities and the need for technology (Moersch, 1998).

According to North Central Region Educational Laboratory (1999), technology has four major functions when used to support learning. The functions include (a) drill-and-practice, various computer assisted instruction, and instructional television; (b) exploration functions, which provide students the ability to use CD-ROM encyclopedias, search engines, hypermedia, simulations, and microcomputer-based laboratories; (c) communication functions that will permit students to utilize interactive learning systems; and (d) email as a

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tool to create, compose, store, and analyze data. Various types of technology can be useful in enhancing teachers' levels of technology use in the classroom, which will ultimately impact student achievement (North Central Region Education Laboratory, 1999). Teachers can integrate technology by "engaging students in exploring, thinking, reading, writing, researching, inventing, problem solving and experiencing the real world. Technology media can be used for inquiry, communication, expression, and construction" (The North Central Region Educational Laboratory, 1999, p. 3).

In fact, technology can make a difference in how students learn. Technology integrated learning systems have the potential to increase standardized mathematics test scores and to improve students' attitudes towards computer based mathematics and reading lessons when used within the context of a cooperative-learning curriculum. Technology is an instrument that supports "authentic learning" (Brush, 1997, p. 3).

Not only do these functions support student learning, but they also enhance teacher productivity. Many teachers use the computer as a management tool. They create worksheets and tests, and some compute grades on the computer (Robyler, 2000). Additionally, technology allows teachers to enhance traditional lessons, as well as provide students with a view of how future lessons can possibly be designed (Schrum, 2000).

However, Henry (1999) communicates that technology will never take the place of basic skills and essential concepts that students need to know. According to Henry (1999), technology integration can serve as a tool that assists with enhancing the basic skills; therefore, it can positively impact student achievement. Further research demonstrates that technology can be used in the classroom to improve basic skills through drill and practice, to facilitate change in teachers' pedagogy that will motivate students to think critically,

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analytically, and gain the ability to solve problems that are identified as real-world. If high standards are going to be set, these standards must require teachers to move beyond strategies that are whole group and traditional (Heinecke, Blasi, Milman, & Washington, 1999).

Some research has shown that the development of integrated technological pedagogy must be guided to be effective. Unfortunately, some teachers have a misconception of how technology should be infused into classrooms. Teachers who have not been appropriately trained for technology integration tend to find a piece of software, place it into the disk drive and let students "play". In order for technology to impact student achievement teachers, should be trained in a manner that will reflect pedagogy or strategies that will ensure a positive impact on student achievement. Teachers should not view technology as a panacea (Viadero, 1997).

Bruce and Levine (1997) report that technology for inquiry should consist of basic skills, change of pedagogy, motivation to think, data modeling, spreadsheets, access to online observatories and microscopes, and hypertext. Three types of media offer educational opportunities for students that promote learning and higher order thinking (Lee, 2003). These researchers describe media for communication as word processing, e-mail, synchronous conferencing, graphics software, simulations, and tutorials. Media for expression was identified as interactive video, animation software, and music composition. Media for construction included robotics, computer-aided design, and control systems.

Studies show that the presence of millions of computers and the Internet in schools has not dramatically changed how teachers teach and how students learn. The need for improvement in education is still present. Cuban (2001) suggests that emulating the successful employment of computers by businesses is not simple. First, educators,

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politicians, parents, and concerned citizens must understand how schools can use computers more effectively to improve education and to benefit students and teachers. Second, commercial companies must create suitable software. Further, until schools can permit a major change in the way teaching is carried on, they must necessarily continue to miss out on the improvements that computer technology can bring (Bennett, 2002).

Current Instructional Practices

Hagner (2001) asserts that teachers are still in various stages of learning and incorporating new ways of presenting information to their students. Teachers have found themselves in environments where the use of new technologies is demanded by those who oftentimes possessed a superior understanding of their use. While teachers are familiar with the benefits of adopting technology into the teaching and learning process, many are uneasy about doing so given the environment of their students. Some students are now able to demonstrate various technologies to teachers due to the technological wave that has swept their generation. According to Smith (1997), teachers were often forced to bring in materials and approaches that simultaneously present information from the global perspective as well as the detailed perspective, which dictated that teachers offer concrete experiences as well as discovery options and present facts in non-linear and linear fashion.

Traditional, lecture-based approaches to education as described by Tharp (1999), emphasized receptive, reflective, abstract, analytic and linear styles of learning. In contrast, a collaborative, learner-centered approach offers opportunities for all learning styles to succeed, provides adequate information delivery, analysis, and makes application opportunities available to students. Tharp (1999) asserts that technology-supported learning options improve and greatly accommodate different styles, offering students the opportunity

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to benefit from the dominant one while learning a new one. Smith (1997) purports that individual styles of learning task completion and problem solving depend on the implementation of a variety of strategies. O'Malley and Chamot (1990) suggest three different types of strategies through which learners tackle knowledge acquisition opportunities "metacognitive (thinking about and planning for learning), cognitive (active participation in the learning process) and social/affective (interaction with others and control of affective factors)" (p. 23).

Dede (1998) emphasizes that guided inquiry, project-based collaboration, and mentoring relationships all evoke increased learner motivation, manifested via readily observable indicators such as better attendance, higher concentration, and increased time on task. In the 21st century, being a successful worker and an informed citizen will require sophisticated knowledge delineated in the national curriculum standards in technology and mathematics. Information technology can assist students not only to learn difficult concepts, but also to master the learning-how-to-learn skills need to keep capabilities current in a rapidly evolving economy. Dede (1998) further communicated that developing in learners the ability to use problem solving processes is similar to those of experts that are providing powerful evidence that students are retaining the skills needed to succeed in the 21st century. Learners should be emulating the behaviors of teams of scientists, mathematicians, designers, and other expert problem solvers. Research shows that students' outcomes on conventional achievement tests rise when technology-based educational innovations are implemented (Cavazos, 2002).

Amrein and Berlinder (2002) communicated that students can achieve when they are taught by teachers who use technology for higher-order thinking as opposed to drill and

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practice, yet teachers are spending an inordinate amount of time on drills leading to the memorization of facts rather than spending time on problem solving and the development of critical and analytical thinking. Rather than a push for higher standards, the high stakes test has driven instructional practices to that of mediocrity. Tharp (1999) asserts that there are five standards for effective pedagogy, which will assist teachers with integration of different instructional practices.

> (a) Joint Productive Activity: Teaching and Students Producing, facilitating learning through joint productive and activity among teacher and students; (b) Developing Language and Literacy Across the Curriculum, developing competence in the language and literacy of instruction across the curriculum; (c) Making Meaning: Connecting School to Students' Lives, connecting teaching and the curriculum with experiences and skills of students' home and community; (d) Teaching complex thinking, challenging students toward cognitive complexity; and (e) Teaching Through Conversation, engaging students through dialogue, especially the Instructional Conversation. The aforementioned instructional trends are critical to the way teachers communicate to their students. Developing creative ways of teaching is essential to success and how teachers use technology in particular can impact student achievement. (Tharp, 1999, p. 43-44).

Effects of Teachers' Technology Use on Student Learning

Recent research (cf. Jago, 2000; Cuban, 2001; Roblyer, 2003) focuses on the ability of teachers to integrate technology into all classroom activities and the impact of this type of

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learning environment on student learning and achievement. These studies represent a much smaller portion of the research, but represent an important point of emphasis for future research.

Middleton and Murray (1999) investigated 107 fourth and fifth grade teachers' levels of technology integration. The effect of those teachers' technology integration on student achievement in mathematics and reading was measured using the Metropolitan Achievement Test. Participating teachers completed The Levels of Technology Implementation *(LoTi)*: A Framework for Measuring Classroom Technology Use (Moersch, 1995), which evaluated their levels of technology integration. These teachers responded to a series of questions or statements regarding their knowledge, comfort level, and the amount of technology implemented in their classrooms. The sample consisted of fifth graders in the study who received more instruction that included technology than those students with limited technology instruction. Results from the Metropolitan Achievement Test and the *LoTi* instrument indicated that the teachers' level of technology integration had a positive, significant effect on reading scores ($n = 4.821$) for fifth grade students and on mathematics scores ($n = 12.018$) for fifth grade students.

In related research, Dreirer (2000) examined the effects of integrated classroom computer use on student achievement. The sample consisted of 142 second and third grade students from high technology classrooms and limited technology classrooms. While the overall results showed no statistically significant differences in achievement between students in high versus limited technology classrooms, there were differences with specific groups that favored high technology classrooms. Lower socio-economic status students, particularly boys, showed higher achievement in classrooms that utilized high technology,

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measured by the students' 1999 Stanford-9 test scores and the attitudes of the teachers regarding the effects of computers on student achievement.

A ten-year study of how the routine use of technology by teachers and students affected student learning, the Apple Classroom of Tomorrow (ACOT) project studied five classrooms throughout the United States (Dwyer, 1994; Sandholtz, Ringstaff, & Dwyer, 1997). Researchers provided each classroom with a wide variety of technology tools, training for teachers, and a coordinator at each school to provide technology assistance. The project's primary purpose was to investigate how routine use of computers and technology influenced teaching and learning.

The analysis of data from the evaluation of the ACOT project was based on a database of more than 20,000 entries, composed of email journals, unstructured audiotape reports of teachers, observations of classrooms, and in-depth interviews. Teachers at five schools from different regions in the U.S. were included in the research; researchers did case studies on three schools. Researchers saw technology "profoundly disturb[s] the inertia of traditional classrooms" (Dwyer, 1994, p. 7). Major findings suggest that the influence of technology on teaching and learning has taken place over the last decade. Within the last decade, teachers began to utilize constructivist teaching strategies in their day-to-day technology integrated activities. Teachers were encouraged to infuse cooperative learning and collaborative efforts as they used more complex tasks and materials in their instruction, along with more performance-based evaluation (Roblyer, 2003).

There is, however, a need for further research on the link between the degree to which teachers integrate technology into the classroom and student achievement. In spite of the apparent commitment of schools to technology, it appears that most teachers use computers

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to support their current teaching practices rather than as a tool to promote more innovative, constructivist practices (Cuban, 2001). For example, Doherty and Orlofsky (2001), in collaboration with Harris Interactive and Market Data Retrieval, conducted a technology poll of 500 students in grades 7-12. As part of this survey, researchers asked students how their teachers used computers for learning. The poll revealed that most students said their teachers do not use computers in sophisticated ways. While 86% of students said their teachers have demonstrated how to use computers to write papers, far fewer, 51%, said their teachers were using computers to help them visualize new concepts.

Furthermore, 43% of students said that their teachers never demonstrated how to use computers for homework help, and only 29% said that when they do not understand something, their teacher never used a computer to help them understand it in a different way. Unfortunately, some teachers have not received any technology training (Dodge, 2002). If teachers are not provided the support they need to integrate computers into the overall framework of the classroom, it is unlikely that their students will use computers in ways that will improve learning (Fuller, 2000).

Effects of Student Technology Use on Learning

Research on the impact of student technology use on learning and achievement is relatively new. Prior to 1980, researchers conducted more descriptive studies than experimental studies comparing computer-delivered instruction with traditional delivery modes. According to Maddux (1995), this trend shifted in the 1980s as researchers and educational software developers became interested in establishing cause-and-effect relationships between computer and non-computer delivery modes.

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Since the 1980s, hundreds of studies have dealt with a large number of variations of this topic, but many of these early studies lacked solid methodology (Dillon & Gabbard, 1998). Researchers simply compared the instructional delivery mechanism (e.g. computer-based flash cards vs. paper flash cards) and frequently found there was no significant difference in learning outcomes (cf. Garrud, 1993; Quade, 1993; Standish, 1992; Wiebe & Martin, 1996). Clark (1994) maintained that one major flaw in media comparison studies is the confusion of instructional methods with the delivery medium. Clark summarized this body of work stating:

> It is likely that when different media treatments of the same informational content to the same students yield similar learning results, the cause of the results can be found in a method which the two treatments share in common. . . [G]ive up your enthusiasm for the belief that media attributes cause learning. (p. 28)

Numerous studies (cf. MacArthur, Haynes, & Malouf, 1986; Schofield & Verban 1988; Waxman & Huang, 1996; Sivin-Kachala, 1998; Brush, 1997; Merriam, 1998; Wenglinsky, 1998) indicate there is no inherent significant difference in the educational effectiveness of any delivery medium such as a computer. The delivery medium does not directly influence achievement of learners; rather, it is the content, the quality of the instructional design, and the approach used by the teacher that are the important determinants of learning.

Kulik (1994) published the first study to summarize research on computers and learning using the research technique called meta-analysis to summarize findings from more than 97 separate research studies of computer-based instruction. Computer-based instruction is based on the individual needs and learning styles of students. The software consisted of

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tutorials, drill and practice, and integrated learning systems. Kulik found these studies demonstrated that students using computers learned more in less time, had a positive attitude toward their work, and scored, on average, at the 64th percentile on tests of achievement compared to the 50th percentile for non-computer-using students.

Many later studies (cf. Schacter, 2001; Allen, 2001; Blok, Oostdam, Otter, & Overmaat, 2002; Viadero, 2002; Murphy, Penual, Korbak, Whaley, & Allen, 2002) more effectively examine the computer as a tutor or as a tool for constructivist learning. In addition, several large-scale studies appear frequently in the literature and summarize the research on the effects of student use of technology on learning.

Two researchers, Sivin-Kachala and Bialo (2000), reviewed 3,500 research studies and selected 311 studies using the best methodology according to McKenzie (1998) to create a summary of the research regarding the effects of student technology use on learning. These researchers concluded that technology has shown a significant positive effect on achievement in all major subject areas from preschool through higher education, including special needs students. For studies focusing on reading and language arts, technology use promotes higher learner achievement in phonemic awareness, vocabulary development, reading comprehension, and spelling. For studies focusing on mathematics, the research demonstrated that technology used to focus on problem solving, hands-on, constructivist activities produced students with superior conceptual understanding of mathematics topics when compared to students receiving traditional instruction. McKenzie (1998) claims that technology increased students' problem solving abilities.

Wenglinsky's (1998) national study of technology's impact on mathematics achievement assessed the effects of higher order thinking technologies on a sample of 7,146,

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eighth grade and 6,227, fourth grade students gathered by the National Assessment of Educational Progress. He controlled for class size, teacher characteristics, and socioeconomic status. Wenglinsky found that for both fourth and eighth grade students, the use of simulation and software that encouraged higher order thinking skills resulted in positive gains in student academic achievement in mathematics. Students in both grade levels who frequently used drill and practice software performed worse on measures of achievement in mathematics than students across the nation who did not use drill and practice software.

Waxman, Connell and Gray (2002) estimated the effects of teaching and learning with technology on students' cognitive, affective, and behavioral outcomes of learning. They used statistical data from 20 studies that contained a combined sample of about 4,400 students across all subject areas. The effect sizes average across all means outcomes was .30 ($p < .05$), with a 95% confidence interval of .004 - .598. This result indicates that teaching and learning with technology has a small positive, but significant effect on student outcomes when compared to traditional instruction. The mean effect size for the 13 comparisons containing cognitive outcomes was .39, and the mean effect size for the 60 comparisons that focused on student affective outcomes was .208.

The West Virginia Basic Skills/Computer Education Program was a large, longitudinal study that focused on the state's basic skills goals in mathematics, language arts, and reading (Mann, Shakeshaft, Becker, & Kottkamp, 1999). The program began with a group of kindergarten students in 1990. The students participated in the study for almost a decade. Each year, the state provided the classrooms of these children with computer technology and teacher training. Mann et al. (1999) analyzed data from the program. When the initial cohort was tested in the third grade using the Comprehensive Test of Basic Skills,

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Mann et al. (1999) asserted that their scores went up five points in one year, having risen only six points over the previous years. In 1997, the cohort's reading scores were the second highest among southern states.

The overall results of this research suggest that the program had a significant effect on the classrooms involved, particularly in those classrooms that used technology the most (Mann et al., 1999). There were significant gains in mathematics, writing, and reading. This intervention was more cost effective than other interventions, including the reduction of class size. Another significant finding demonstrated that the program was especially successful with low income and rural students and with girls. Overall, more recent studies (cf. O' Brien, 1999; Okpala, 2002; Schacter, 2002; Waxman et al. 2002) that investigate the effect of student technology use on achievement indicate that effective technology use produces consistent, if sometimes small, positive effects on student learning.

Technology and Student Achievement

Greater attention has recently been given to the role that technology plays in student achievement (Schacter, 2001). The research herein indicates that technology applications can support higher-order thinking by engaging students in authentic, complex tasks within collaborative learning (Schacter, 2001). To ensure that this new standard of learning fulfills the needs of school districts, The United States Department of Education (2000) established four National Technology Goals:

1. All teachers in the nation will have the training and support they need to help students learn using computers and navigating the Information Superhighway.
2. All teachers and students will have modern multimedia computers in their classrooms.

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3. Every classroom will have connection to the Information Superhighway.
4. Effective software and on-line learning resources will be an integral part of every school's curriculum to ensure that no child is left behind (The United States Department of Education, 2000).

The U. S. Department of Education (2000) has charged each school district in the nation to comply with these goals. As a result, there has been a decrease in the student to computer ratio and an increase in the number of classrooms that were connected to the Information Superhighway. However, in 1998 it was found that only 20% of the teachers with access to the various technologies felt comfortable using them in their classrooms due to lack of training (U.S. Department of Education, 2000).

A mission and vision for technology education was thus established. The mission of technology education has since established an organizational structure centered on "concepts, processes, and systems that are uniquely technological" (The Technology Education Lab, 2001, p. 1). In order for the mission to be carried out, three initiatives were identified to assist with enhancing the vision. The Technology Education Lab (2001) describes the initiatives as: (a) technology-integrated hands-on activities to accompany curriculum for teachers, (b) a plan for staff development that will ensure appropriate use of curriculum resources, (c) suggestions for types of equipment and facilities, and (d) revision of the curriculum.

In the state of Louisiana, the Center for Educational Technology reported that the goals have been established by the Statewide Distributive Learning Network to "improve student achievement by providing students and teachers the opportunity to access needed courses and appropriate curriculum and enrichment programs utilizing telecommunications systems" (The Louisiana Center for Educational Technology, 2001, p. 1).

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The center's main focus is to provide all educators and learners with access to technologies that are effective in improving student achievement. The center suggests that in order to achieve the aforementioned goals, the development of technology-rich learning environments and a K-12 network will be necessary. As a result of the goals established, professional development opportunities and the use of technologies that help students and teachers meet high standards will be incorporated, with accountability procedures also having been established. These procedures monitor the effectiveness of technology use and public awareness endeavors to promote excellence in student achievement through the use of educational technology.

In related research, the Committee for Advancing Technology Standards (CATS) is focusing on three major initiatives that regard implementing technology into the K-12 curriculum: (a) the development of K-12 Louisiana Educational Technology Standards, (b) expansion of the Secondary Computer Education curriculum through the identification and development of standards-based high school technology courses, and (c) course descriptions, identification and development of Standards for Distance Education (Louisiana Center for Educational Technology, 2001). Moreover, in the State of Louisiana, a program identified as the Delta Rural Systematic Initiatives (DRSI) is focusing on the needs of schools in rural, economically disadvantaged areas of the state. Many rural schools in the state have been identified as low achieving schools. The DRSI aims to enhance student learning by raising academic achievement in the rural parishes that are identified by its program (Louisiana Systemic Initiatives Program, 1998). Such programs have already proven to impact and improve achievement of low socioeconomic students.

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A research study completed by Viadero (1997) consisted of eighth grade language arts students in a Los Angeles, California, middle school who were members of minority groups and poor families. This study revealed that schools that were known for sustaining their investments in technology and continued use of technology in their school districts, communicated to their stakeholders that district administrators and school principals were committed to the project and the investment. The teachers believed that technology would assist with enhancing the curriculum and were actively involved in the planning and decision-making efforts. They received stipends and release time for staff development and ongoing training. Additionally, the school districts were open to educational paradigm shifts, as well as state and national technology standards being used to devise a framework for technology use in the school (Viadero, 1997). Falk (2002) emphasized that standards can support better learning if they are used to direct teaching toward worthy goals, to promote teaching that is responsive to the ways students learn, to examine students in ways that can be used to inform instruction, to keep students and parents apprised of progress, to trigger special supports for students who need them, and to evaluate school practices.

Technology in Rural School

Children in rural schools do not have the same level of access to the resources and experiences as children who live in suburban and urban areas. Increasing technology use, therefore, creates a vehicle for educators to address teaching and learning opportunities for students that would normally be non-existent. Beeson and Strange (2003) report that 43% of the nation's public schools are in rural communities or small towns of fewer than 25,000 people, and 31% of the nation's children attend these schools. Poverty is the largest persistent challenge rural schools face. Per capita income, salaries, computer use in the classrooms,

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school administrative cost and transportation were listed as other challenges. The state of Louisiana is ranked in the top ten of the lowest users of computers in rural classrooms (Beeson & Strange, 2003).

Two overriding issues that impact technology use in rural schools in the southern United States include the relationship that exists between technology and a lack of economic development, social class, and racial and ethnic inequities and technology being infused into the rural classroom (Collins & Dewees, 2001). The first overriding issue contributes to what is now known as the "digital divide" (p. 2). Jago (2000) reports that predominantly minority or high poverty schools show a gap of three to five grade levels existing between instructional content and test content. Students in these schools were being tested on skills and materials they had never seen.

The second issue that arises in rural schools, is that few teachers have changed their pedagogy since the 19th century (Collins & Dewees, 2001). Teachers are not always trained or knowledgeable of current pedagogy. Silvus (2000) asserts that although millions of dollars were invested into school districts for Internet connectivity, inequitable access still remains a problem for rural schools in southern states. It was reported by Collins and Dewees (2001) that in the fall of 1997, public schools with a large percentage of low-income students were less likely to have Internet access than schools with a higher socioeconomic level of students. School districts with a large number of minority students enrolled tend to have a smaller percentage of instructional rooms with Internet access than public schools with low minority enrollment (Collins & Dewees, 2001).

Muir (2002) conducted a qualitative investigation of rural schools measures the effects of implementing constructivism. Students in poor communities of Western Maine

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(Muir, 2002) were instructed based on the principles of Constructivism. They were measured by integrating inquiry-based, project-based, and problem-based learning models, which produced electronic portfolios. Once the students adapted the constructivist theory using technology, the school began to observe an increase in reading and mathematic achievement scores. If the students had computers available to them at home, achievement would be likely to increase due to the consistent use of technology.

Regarding computer access in the home, the Technology Education Lab (2001) reports that: (a) households in rural schools at most all income levels are less likely to own computers than urban or central city schools, (b) rural households are less likely to have Internet access than urban or central city households, (c) African American households in rural communities are one-third less likely to have computers, and (d) African American households in rural communities are two-fifths less likely to have Internet access than an average U.S. suburban or urban African American household.

Clearly, there is a problem directly related to income, race, and geographic location that continues to create a digital divide between those who have access to technology and those who do not. Collins and Dewees (2001) communicated that without the necessary tools, rural school districts in southern states will face isolation and that rural school classrooms in southern states do not exemplify a widespread usage of technology. In fact, only 24% of instructional rooms in public elementary schools have Internet access. In many cases, most of the schools across the nation were provided access to the Internet, but the classrooms were not. In rural schools where technology is present, administrators and teachers must remember that the presence of hardware and software alone are not enough to

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impact student achievement. Professional development must be an integral component to the success of technology use in classrooms (Collins & Dewees, 2001).

In order to bridge the digital divide, Charp (2001) reports that President Clinton and Congress devised programs that would assist rural schools in attempting to have the same opportunities as other schools. To reach this end, all fifty states have been recipients of a federal Technology Literacy Challenge Fund, which has distributed $2 billion from 2000 and continues through 2005. Some of the dollars from this fund were used to train teachers to use technology in their classrooms effectively. In addition to the fund, an E-rate program has been established to offer schools discounts on the purchasing of technology, giving preference to the low-income areas (Silvis, 2000).

Because more students in rural schools now have the opportunity to publish information, develop research and analysis skills, utilize computer mapping, and collaborate with other classrooms across the nation, they are more likely exposed to technologies that can promote higher order thinking. "If technology skills mean a richer experience for rural students, they may also help preserve the wilderness way of life, and if students want to stay in the community, they can do so by using the Information Superhighway for work" (Silvis, 2000, p. 4).

Summary

It is evident that politicians and other stakeholders have challenged the education system. Bracey (2002) argues that stakeholders and politicians should not assume that low-achieving students would always react negatively to policies that place a strong emphasis on achievement. Educational Evaluation and Policy Analysis of the LEAP 21 has been criticized for using retention as an incentive. Politicians and other stakeholders feel that such policies

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will raise and perhaps exacerbate issues of equity in students' resources and their opportunity to learn without directly addressing these students because such policies ultimately ignore the complexities of students' lives; the multidimensional nature of the problem of low achievement; and the limitations of work effort, motivation, and time-on-task as means of raising achievement (Amrien, A. L. & Berliner, D. C., 2002).

In the United States, billion dollar technology initiatives and reforms have been launched to ensure that technology is infused into classrooms in a meaningful manner (Cavazos, 2002). School reform issues which include administrators, teachers, students, and stakeholders continue to emphasize that technology standards, goals, and teachers' levels of use should be addressed before infusion can successfully take place in the classroom. Technology access is key. If all students do not have the same opportunities, achievement will continue to be skewed (Moersch, 1998). Teachers must use interactive technologies to help students master difficult and complex concepts, especially in reading and math. The success in using technology depends on one thing: content (Riley, 2002).

When teacher training and materials or equipment necessary to ensure that student achievement will prevail are in place, seamless technology integration will be found in the core subject areas (McKenzie, 1998). Student achievement in reading and mathematics is critical. If teachers infuse technology using a constructivist approach, achievement scores in reading and mathematics should increase. Previous research (cf. Kulik, 1994; Middleton & Murray 1999; Moresch, 1999; Schacter, 2001) indicates that technology can positively impact student achievement. This study examined whether the current teachers' level of technology integration has impacted student achievement in reading and mathematics particularly in rural schools located in northeastern Louisiana.

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CHAPTER THREE

Methodology and Procedures

Introduction

This chapter describes the methodology used to answer the research questions and to test the hypotheses proposed in this study. The chapter is divided into two sections that address research design and methodology. This study examined to what extent the level of technology integration by fourth and eighth grade teachers in rural schools in northeastern Louisiana affects student achievement in reading and mathematics. Therefore, fourth and eighth grade teachers' levels of technology integration was examined in relation to the following factors: (a) students' achievement in reading and mathematics as measured by the Louisiana Educational Assessment Program for the 21^{st} Century (*LEAP 21*); and (b) teacher demographics—age, years of experience, highest degree earned, and certification status.

Research Design

This study used a descriptive and correlational research design. Multiple regression was used to examine which independent variables predict achievement scores from the Levels of Technology Integration (*LoTi*), age, years of experience, highest degree earned, certification status, current instructional practices and personal

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computer use —with the dependent variables—student scores on the reading and mathematics section of the *LEAP 21*.

The descriptive element of the study involved an examination of the scores on the *LEAP 21* and *LoTi* to include the mean, median, standard deviation and frequencies. This study used correlational statistics to discover and clarify relationships among two or more variables and to describe the relationships among variables.

Methodology

Population

The 11 rural districts selected for this study were those districts identified by the Delta Rural Systemic Initiative, which was designed to bring about systemic reform in rural communities. This initiative selected school districts that generally serve a school-age population of which 20% or more come from families with incomes below the poverty line and only schools designated by the Secretary of Education with locale school code of 6, 7, or 8 or a school-age population of 800 or fewer. The sample for this study consisted of fourth and eighth grade teachers and their students from 36 elementary schools, 17 junior high or middle schools, and 13 combination schools in 11 rural districts in northeastern Louisiana. These districts received 3, 718 hours of professional development for technology and $10, 931, 503 from the Literacy Challenge Fund. The school districts were assigned letters to ensure anonymity. The sample included schools serving similar populations of minorities and students eligible for free and reduced lunches. Also included in the sample of the study were 186, fourth and eighth grade mathematics and reading teachers and 2,724, fourth grade students, and 2,525, eighth grade students. Teachers' demographic data included race and gender, total years of

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experience, certification status, and certification status by graduate degrees. The demographic information for students is presented by grade levels four and eight with the school districts' population in Table 1 (Louisiana Department of Education, 2002a).

Table 1

Student Population Data by District

District	Student Population Total District Population	4th Grade	8th Grade	Total 4th/8th
A	1,879	167	178	345
B	1,910	167	124	289
C	3,919	357	319	676
D	1,848	167	178	345
E	3,930	327	331	658
F	2,584	228	240	468
G	5,378	448	379	827
H	3,760	370	264	634
I	1,102	67	74	141
J	2,467	202	175	377
K	2,943	226	263	489
Total	31,720	2,724	2,525	5,249

The range of the fourth grade population is a low of 67 in District I to a high of 448 in District G, making a total for the fourth grade population of, 2,724. For the eighth

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grade population, the range is from a low of 74 in District I to a high of 379 in District G, making the total for the eighth grade population of 2,525.

The demographic information for both the fourth and eighth grade students was provided by the Louisiana Department of Education (2002a). Table 2 displays the percentages by race and the district population for fourth and eighth grade students in the 11 school districts in northeastern Louisiana included in the study.

Table 2

Percentage of Student Race and Population by District

District	District Total Population	Race			
		African American Population/Percent	European American Population/Percent	Other Population/Percent	Percent Total
A	1879	355 (18.9%)	1501 (79.9%)	23 (1.2%)	100%
B	1910	712 (37.3%)	1188 (62.2%)	10 (0.5%)	100%
C	3919	2010 (51.3%)	1905 (48.6%)	4 (0.1%)	100%
D	1848	1702 (92.1%)	139 (7.5%)	7 (0.4%)	100%
E	3930	1878 (47.7%)	2032 (51.7%)	24 (0.6%)	100%
F	2584	2230 (86.3%)	318 (12.3%)	36 (1.4%)	100%
G	5378	3436 (63.9%)	1904 (35.4%)	38 (0.7%)	100%
H	3760	2147 (57.1%)	1587 (42.2%)	26 (0.7%)	100%
I	1102	853 (77.4%)	217 (19.7%)	32 (2.9%)	100%
J	2467	523 (21.2%)	1919 (77.8%)	25 (1.0%)	100%
K	2943	1124 (38.2%)	1795 (61.0%)	24 (0.8%)	100%
Total	31,720	16,970 (53%)	14,505 (46%)	245 (1%)	100%

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The data show that the African American student population ranged from 18.9% in District A to 92.1% in District D. It is noteworthy that these districts have approximately the same total student numbers, with 1,879 in District A and 1,848 in District D. The European American student population ranged from 7.5% in District D to 79.9% in District A.

The data in Table 3 show the population and percentage of student who are receiving free or reduced lunch as reported by the Louisiana Department of Education (2002c). District D shows a high percentage (90.9%) of students receiving free or reduced lunch and District A shows a low percentage (54.2%) of students receiving free or reduced lunch. The average percentage of students receiving free or reduced lunch is 70.5%. District G shows a high population (n = 3904) of students who receive free and reduced lunch while District I shows a low population (n = 914) of students who receive free and reduced lunch. The total population receiving free and reduced lunch shows 22,389. Additionally, of the 31,720 student population in eleven school districts, 22, 389 receive free or reduced lunches.

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Table 3

Percentage and Population of Students with Free or Reduced Lunch by District

District	Total Population	Population of Free or Reduced Lunch	Percent of Free or Reduced Lunch
A	1,879	1,018	54.2%
B	1,910	1,146	60.0%
C	3,919	2,802	71.5%
D	1,848	1,679	90.9%
E	3,930	2,809	71.5%
F	2,584	2,170	84.0%
G	5,378	3,904	72.6%
H	3,760	2,560	68.1%
I	1,102	914	83.0%
J	2,467	1,569	63.6%
K	2,943	1,818	61.8%
Total	31,720	22,389	70.5%

The data in Table 4 show the teacher population for all districts with G and F having a high number of African American females (n = 98) while J has a low number (n = 8). District F has the highest number of African American males (n = 33) while K has none. District E has a high number of European American females (n = 203) while D has a low number (n = 20). District G has a high number of European American males (n = 54) while D has a low number (n = 6).

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Table 4

School District Teachers' Race and Gender

District	District Total	Race and Gender African America F	M	European America F	M	Hispanic F	M
A	141	9 (6%)	2 (1%)	111 (79%)	18 (13%)	1(1%)	0
B	145	14 (9%)	10 (7%)	94 (65%)	27 (19%)	0	0
C	264	87 (33%)	16 (6%)	138 (52%)	23 (9%)	0	0
D	130	81 (63%)	26 (20%)	20 (15%)	3 (2%)	0	0
E	291	42 (15%)	15 (5%)	203 (70%)	31(10%)	0	0
F	165	98 (60%)	33 (20%)	28 (17%)	6 (3%)	0	0
G	365	98 (27%)	25 (7%)	187 (51%)	54 (15%)	1	0
H	265	32 (12%)	16 (7%)	192 (12%)	25 (9%)	0	0
I	84	35 (43%)	13 (15%)	27 (33%)	7 (7%)	1 (1%)	1 (1%)
J	187	8 (4%)	1	148 (79%)	30 (17%)	0	0
K	213	11 (5%)	0	170 (80%)	32 (15%)	0	0
Total	2,250	515 (23%)	157 (7%)	1,318 (59%)	256 (11%)	3	1

The data in Table 5 show the years of teaching experience by teachers in the school districts. District D and F have the highest numbers of teachers with 0-1 years of experience (n = 33) while A has the lowest (n = 5). District C has the highest number of teachers with 25+ years of experience (n = 81) while I has the lowest (n = 17).

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Table 5

Teachers' Total Years of Experience by District

District	Total Population	Years Experience						
		0-1	1-3	4-10	11-14	15-19	20-24	25+
A	141	05	25	42	17	14	10	28
B	145	19	11	30	19	17	21	28
C	264	13	35	50	18	35	32	81
D	130	33	02	14	11	17	14	39
E	291	22	32	62	43	27	39	66
F	165	33	27	21	08	16	11	49
G	365	30	73	115	39	19	30	59
H	265	14	33	66	29	39	33	51
I	84	18	19	14	06	04	06	17
J	187	09	29	37	20	25	29	38
K	213	08	29	50	22	28	36	40
Total	2,250	204	315	501	232	241	261	496

The data in Table 6 show District G has the highest number of teachers working with less than a bachelor's degree in the area of certification (n = 4). District G has highest number of teachers certified with a bachelor's degree (n = 172) while I has the lowest number (n = 36). District G has the highest number (n = 89) of teachers not certified with a bachelor's degree while District A has the lowest number (n = 10).

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Table 6

Teachers' Certification Status (Bachelor's Degree/Undergraduate)

District	Total District Population	Certification Status Less than Bachelor's Yes	No	Bachelor's Yes	No
A	141	0	0	81 (58%)	10 (7%)
B	145	0	0	87 (60%)	23 (16%)
C	264	0	0	128 (48%)	25 (10%)
D	130	0	0	55 (42%)	35 (28%)
E	291	0	0	149 (51%)	45 (16%)
F	165	0	1	47 (29%)	62 (37%)
G	365	0	4	172 (47%)	89 (25%)
H	265	0	0	126 (49%)	45 (17%)
I	84	0	0	36 (43%)	36 (43%)
J	187	0	0	105 (57%)	25 (13%)
K	213	0	0	132 (63%)	11 (5%)
Total	2,250	0	5	1,118 (50%)	406 (18%)

The data in Table 7 show District G has a high number of teachers (n = 71) certified with a Master's degree while District I has a low number of teachers (n = 7). District E has a high number of teachers (n = 52) certified with a Master's +30 while District I has a low number of teachers (n = 4). District E has a high number (n = 4) of teachers with an Educational Specialist degree with other parishes have two or fewer. District E has one teacher who possesses a Doctoral degree and is certified.

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Table 7

Teachers' Certification Status (Graduate Degree)

District	District Total	Certification Status Master's Yes	No	Master's +30 Yes	No	Ed. Specialist Yes	No	Doctorate Yes	No
A	141	24 (17%)	3 (2%)	21 (15%)	0	2 (1%)	0	0	0
B	145	12 (9%)	0	21 (14%)	0	2 (1%)	0	0	0
C	264	56 (21%)	3 (1%)	50 (19%)	0	2 (1%)	0	0	0
D	130	14 (11%)	0	25 (19%)	1	0	0	0	0
E	291	36 (12%)	4 (1%)	52 (19%)	0	4 (1%)	0	1	0
F	165	30 (18%)	6 (4%)	19 (12%)	0	0	0	0	0
G	365	71 (19%)	6 (2%)	21 (6%)	0	2 (1%)	0	0	0
H	265	46 (17%)	1 0	46 (17%)	1	0	0	0	0
I	84	7 (8%)	1	4 (5%)	0	0	0	0	0
J	187	30 (16%)	2 (1%)	25 (13%)	0	0	0	0	0
K	213	39 (18%)	1 0	29 (14%)	0	1	0	0	0
Total	2,250	365 (16%)	27 (1%)	313 (14 %)	2	13 (1%)	0	1	0

Instrumentation

A 50-item survey designed by Moersch (1999) of Learning Quest, Inc. referred to as the Levels of Technology Implementation (*LoTi*) Questionnaire was used to measure teachers' levels of technology integration, personal computer use, and current instructional practices. Demographic data collected as a part of the *LoTi* consisted of teachers' ages, years of experience, highest degrees earned, and certification statuses.

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The Technology Use Profile was designed to explore the current role of technology use in the classroom by measuring three key areas: (a) classroom teachers' levels of technology implementation (*LoTi*), (b) personal computer use (PCU), and (c) current instructional practices (CIP). The *LoTi* Profile portion assesses classroom teachers' current level of technology implementation based on the Level of Technology Implementation (*LoTi*) Framework developed by Moersch (1999); the PCU Profile portion assesses classroom teachers' comfort and skill levels with using a personal computer; and the stages of current instructional practices (CIP) profile portion assesses classroom teachers' current instructional practices relating to a subject-matter versus a learner-based curriculum approach. Technology Use Profiles provide schools with an action plan to raise their current levels of technology implementation in the classroom (Moersch, 1999).

Validity and Reliability

The Levels of Technology Implementation (*LoTi*): A Guide for Measuring Classroom Technology Use was piloted to affirm validity in studies completed in August of 1997 and in June of 1998. The piloted studies implied how technology implementation would be measured when based on the *LoTi* data. Informal interviews were conducted that enabled the investigators to exhibit ratings on the *LoTi* Level before the participants were given *LoTi* scores. Moersch (1998) ascertained reliability by using Cronbach's Alpha, which denoted .74 for the *LoTi*, .81 for Personal Computer Use and .73 for Current Instructional Practices.

The *LoTi* instrument measures the level of technology implementation ranging from 0 (nonuse) to 6 (refinement) as described below.

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Level 0: Non-Use. 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, overhead projector).

Level 1: Awareness. The use of technology-based tools is either: (a) one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pull-out programs, computer literacy classes, central word processing labs); (b) used almost exclusively by the classroom teacher for classroom and/or curriculum management tasks (e.g., taking attendance, using grade book programs, accessing email, retrieving lesson plans from a curriculum management system or the Internet); and/or (c) used to embellish or enhance teacher-directed lessons or lectures (e.g., multimedia presentations).

Level 2: Exploration. Technology-based tools supplement the existing instructional program (e.g., tutorials, educational games, basic skill applications) or complement selected multimedia and/or web-based projects (e.g., Internet-based research papers, informational multimedia presentations) at the knowledge/comprehension level. The electronic technology is employed either as extension activities, enrichment exercises, or technology-based tools and generally reinforces lower cognitive skill development relating to the content under investigation.

Level 3: Infusion. Technology-based tools including databases, spreadsheet and graphing packages, multimedia and desktop publishing applications, and Internet use complement selected instructional events (e.g., field investigation using spreadsheets/graphs to analyze results from local water quality samples)

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or multimedia/web-based projects at the analysis, synthesis, and evaluation levels. Though the learning activity may or may not be perceived as authentic by the student, emphasis is, nonetheless, placed on higher levels of cognitive processing and in-depth treatment of the content using a variety of thinking skill strategies (e.g., problem-solving, decision-making, reflective thinking, experimentation, scientific inquiry).

Level 4a: Integration (Mechanical). Technology-based tools are integrated in a mechanical manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials and/or outside resources (e.g., assistance from other colleagues), and/or interventions (e.g., professional development workshops) that aid the teacher in the daily management of their operational curriculum. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems as perceived by the students relating to an overall theme/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.

Level 4b: Integration (Routine). Technology-based tools are integrated in a routine manner that provide rich context for students' understanding of the pertinent concepts, themes, and processes. At this level, teachers can readily design and implement learning experiences (e.g., units of instruction) that empower students to identify and solve authentic problems relating to an overall theme/concept using the available technology (e.g., multimedia applications, Internet, databases, spreadsheets, word processing) with little or no outside assistance.

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Emphasis is again placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.

Level 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 via Internet), research institutions, and universities to expand student experiences directed at problem-solving, issues resolution, and student activism surrounding a major theme/concept. The complexity and sophistication of the technology-based tools used in the learning environment are now commensurate with: (a) the diversity, inventiveness, and spontaneity of the teachers' experiential-based approaches to teaching and learning, and (b) the students' levels of complex thinking (e.g., analysis, synthesis, evaluation) and in-depth understanding of the content experienced in the classroom.

Level 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/or 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.

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The content emerges based on the needs of the learner according to his or her interests, needs, and/or aspirations and is supported by unlimited access to the most current computer applications and infrastructure available.

The Current Instructional Practices (CIP) scale measures teachers' current instructional practices relating to a subject matter versus a learner-based curriculum approach based on six elements on a scale of 1 to 3 as described below.

Intensity Level 0. A CIP Intensity Level 0 indicates that one or more survey questions were not applicable to the participant's current instructional practices.

Intensity Level 1. At a CIP Intensity Level 1, the participant's current instructional practices align exclusively with a subject matter based approach. Teaching strategies tend to lean toward lectures and/or teacher-lead presentations. The use of curriculum materials aligned to specific content standards serve as the focus for student learning. Learning activities tend to be sequential and uniform for all students. Evaluation techniques focus on traditional measures such as essays, quizzes, short-answers, or true-false questions. Student projects tend to be teacher-directed in terms of identifying project outcomes as well as requirements for project completion.

Intensity Level 2. Similar to a CIP Intensity 1, the participant at a CIP Intensity Level 2 supports instructional practices consistent with a subject-matter based approach, but not at the same level of intensity or commitment. Teaching strategies tend to lean toward lectures and/or teacher-led presentations. The use of curriculum materials aligned to specific content standards serves as the focus for student learning. Learning activities tend to be sequential and uniform for all students. Evaluation techniques focus on traditional measures such as essays, quizzes, short-answers, or true-false questions.

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Student projects tend to be teacher-directed in terms of identifying project outcomes as well as requirements for project completion.

Intensity Level 3. At a CIP Intensity Level 3, the participant supports instructional practices aligned somewhat with a subject-matter based approach – an approach characterized by sequential and uniform learning activities for all students, teacher-directed presentations, and/or the use of traditional evaluation techniques. However, the participant may also support the use of student-directed projects that provide opportunities for students to determine the "look and feel" of a final product based on specific content standards.

Intensity Level 4. At a CIP Intensity Level 4, the participant may feel comfortable supporting or implementing either a subject-matter or learning-based approach to instruction based on the content being addressed. In a subject-matter-based approach, learning activities tend to be sequential, student projects tend to be uniform for all students, the use of lectures and/or teacher-directed presentations are the norm as well as traditional evaluation strategies. In a learner-based approach, learning activities are diversified and based mostly on student questions, the teacher serves more as a co-learner or facilitator in the classroom, student-projects are primarily student-directed, and the use of alternative assessment strategies including performance-based assessments, peer reviews, and student reflections are the norm.

Intensity Level 5. At a CIP Intensity Level 5, the participant's instructional practices tend to lean more toward a learner-based approach. The essential content embedded in the standards emerges based on what students "need to know" as they attempt to research and solve issues of importance to them using critical thinking and

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problem-solving skills. The types of learning activities and teaching strategies used in the learning environment are diversified and driven by student questions. Both students and teachers are involved in devising appropriate assessment instruments (e.g., performance-based, journals, peer reviews, self-reflections) by which student performance will be assessed. However, the use of teacher-directed activities (e.g., lectures, presentations, teacher-directed projects) may surface based on the nature of the content being addressed and at the desired level of student cognition.

Intensity Level 6. Similar to a CIP Intensity 7, the participant at a CIP Intensity Level 6 supports instructional practices consistent with a learner-based approach, but not at the same level of intensity or commitment. The essential content embedded in the standards emerges based on what students "need to know" as they attempt to research and solve issues of importance to them using critical thinking and problem-solving skills. The types of learning activities and teaching strategies used in the learning environment are diversified and driven by student questions. Students, teacher/facilitators, and occasionally parents are all involved in devising appropriate assessment instruments (e.g., performance-based, journals, peer reviews, self-reflections) by which student performance will be assessed.

Intensity Level 7. At a CIP Intensity Level 7, the participant's current instructional practices align exclusively with a learner-based approach. The essential content embedded in the standards emerges based on students "need to know" as they attempt to research and solve issues of importance to them using critical thinking and problem-solving skills. The types of learning activities and teaching strategies used in the learning environment are diversified and driven by student questions.

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Students, teacher/facilitators, and occasionally parents are all involved in devising appropriate assessment instruments (e.g., performance-based, journals, peer reviews, self-reflections) by which student performance will be assessed.

The Personal Computer Use (PCU) scale measures the skill and comfort level of teachers when using technology for personal use.

Intensity Level 0. A PCU Intensity Level 0 indicates that the participant does not feel comfortable or have the skill level to use computers for personal use. Participants at Intensity Level 0 rely more on the use of overhead projectors, chalkboards, and/or paper/pencil activities than using computers for conveying information or classroom management tasks.

Intensity Level 1. A PCU Intensity Level 1 indicates that the participant demonstrates little skill level with using computers for personal use. Participants at Intensity Level 1 may have a general awareness of various technology-related tools such as word processors, spreadsheets, or the Internet, but generally are not using them.

Intensity Level 2. A PCU Intensity Level 2 indicates that the participant demonstrates little to moderate skill level with using computers for personal use. Participants at Intensity Level 2 may occasionally browse the Internet, use email, or use a word processor program, yet may not have the confidence or feel comfortable troubleshooting simple technology problems or glitches as they arise. At school, their use of computers may be limited to a grade book or attendance program.

Intensity Level 3. A PCU Intensity Level 3 indicates that the participant demonstrates moderate skill level with using computers for personal use. Participants at Intensity Level 3 may begin to become regular users of selected applications such as the

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Internet, email, or a word processor program. They may also feel comfortable troubleshooting simple technology problems such as rebooting the machine or hitting the Back button on the browser, but rely on mostly technology support staff or others to assist them with any troubleshooting issues.

Intensity Level 4. A PCU Intensity Level 4 indicates that the participant demonstrates moderate to high skill level with using computers for personal use. Participants at Intensity Level 4 commonly use a broader range of software applications including multimedia (e.g., PowerPoint, Hyperstudio), spreadsheets, and simple database applications. They typically are able to troubleshoot simple hardware and/or peripheral problems without assistance from technology support staff.

Intensity Level 5. A PCU Intensity Level 5 indicates that the participant demonstrates high skill level with using computers for personal use. Participants at Intensity Level 5 are commonly able to use the computer to create their own web pages, produce sophisticated multimedia products, and/or effortlessly use common productivity applications (e.g., FileMaker Pro, Excel), desktop publishing software, and web-based tools. They are also able to troubleshoot most hardware and/or peripheral problems without assistance from technology support staff.

Intensity Level 6. A PCU Intensity Level 6 indicates that the participant demonstrates high to extremely high skill level with using computers for personal use. Participants at Intensity Level 6 are sophisticated in the use of most, if not all, multimedia, web-based, desktop publishing, and web-based applications. They typically serve as "troubleshooters" for others in need of assistance and sometimes seek certification for achieving selected technology-related skills.

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Intensity Level 7. A PCU Intensity Level 7 indicates that the participant demonstrates extremely high skill level with using computers for personal use. Participants at Intensity Level 7 are expert computer users, troubleshooters, and/or technology mentors. They typically are involved in training others on any technology-related task and are usually involved in selected support groups from around the world that allow them access to answers for all technology-based inquiries they may have.

The Levels of Technology Implementation (*LoTi)* Questionnaire correlates with the International Society for Technology in Educational and the National Educational Technology Standards (NETS) for Teachers. The ISTE/NETS addresses six areas that include performance indicators. The six areas are:

> (a) technology operations and concepts, (b) planning and designing learning environments, and experiences, (c) teaching, learning, and the curriculum, (d) assessment and evaluation, (e) productivity and professional practice, and (f) social, ethical, legal, and human issues. (International Society for Technology Education, 2003)

The *LoTi* addresses all six of the ISTE/NETS with its exploration of the (a) classrooms teachers' Level of Technology Implementation (*LoTi*), (b) Personal Computer Use (PCU), and (c) Current Instructional Practices (CIP) (Moersch, 1999).

Student achievement in reading and mathematics was determined by examination of mean scores of each subtest of the fourth grade and eighth students by school districts as determined by the Louisiana Educational Assessment Program for the 21st Century (Louisiana Department of Education, 2002b). The *LEAP 21* is a criterion-referenced test created to determine how successful a student has been in mastering state content

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standards. Schools in Louisiana were thereby assigned an annual school performance score, wherein 60% of the score was based on *LEAP 21* scores. The six Performance Labels are (a) School of Academic Excellence, (b) School of Academic Distinction, (c) School of Academic Achievement, (d) Above Average, (e) Below Average, and (f) Unacceptable. School Performance Scores ranged from 0-200 with zero being the lowest (Louisiana Department of Education, 2002b).

Procedures

Authorization to conduct this study was requested from the Human Use Committee and superintendents of the eleven rural parishes by letter, follow-up telephone conference, and visitation. Two versions of the survey were made available to participants: an on-line version and one administered using paper and pencil if the teacher was not comfortable utilizing the computer. After permission was granted, a series of dates was scheduled to administer the survey. The survey was administered by school, school district, or grade level depending on the specifications from the superintendent. The participants who completed the survey on-line were asked to complete 7 steps for successful completion. Each participant was (a) guided to the *LoTi* Lounge at http://www.lotilounge.com/; (b) greeted with a welcome screen and guided to click on the icon, login; (c) asked to click on the icon "sign me up," where it was communicated that at this time once he or she were registered, the user identification and password could always be used when re-accessing the *LoTi* Lounge; (d) prompted to enter his or her group identification and password (it was written for them in the directions); (e) further instructed to enter a user identification and password that they would be able to remember for future access; (f) prompted to enter an email address to have full access to

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LoTi Lounge; (g) prompted to select his or her organization from a structural list that was previously entered in the computer based on the group identification he or she was given, click, continue; and (h) once registration was complete to access the online *LoTi* Questionnaire, click on Take the *LoTi* questionnaire link at the top of the menu and complete the survey.

Participants who completed the survey using paper and pencil were guided by the superintendents' appointee. They received oral and written directions to complete the process. Upon completion, the surveys were packaged and mailed to the return address provided. Upon receipt of the surveys, each participant's information was entered into the computer database. The *LoTi* and accompanying demographic data were converted to hypertext markup language (html) and placed on the Internet. The teacher responses were emailed to a specific server, and the data were transferred into a password-protected account. Data from that account were then transferred to a spreadsheet for statistical analysis. All participants were assured that all responses would remain confidential.

Student mean scores on the reading and mathematics sections of the *LEAP 21* were obtained from the State of Louisiana Department of Education Office of Student and School Performance/ Division of Student Standards and Assessments. The scores were analyzed with teachers' levels of technology implementation to verify if the teachers' levels of implementation had an impact on student achievement.

Data Analysis

Interval data were collected from the *LoTi* instrument. Each teacher respondent was assigned a score for the *LoTi* and the current instructional practices and personal

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computer use according to administrator's guidelines. The units of measurement for this study were the teacher responses and the student scores.

All demographic data collected from each teacher were used in the correlation and multiple regression analysis. Percentages and frequencies were also calculated for each item as needed. A correlation matrix was used.

The following null hypothesis were tested.

H_1: There is no significant relationship between teacher's level of technology integration and student achievement in reading in grade four.

H_2: There is no significant relationship between teacher's level of technology integration and student achievement in reading in grade eight.

H_3: There is no significant relationship between teacher's level of technology integration and student achievement in mathematics in grade four.

H_4: There is no significant relationship between teacher's level of technology integration and student achievement in mathematics in grade eight.

H_5: There is no significant relationship between teacher's level of technology integration and the following demographic variables (age, total years of experience, highest degree earned, and certification status) do not predict a teacher's level of technology integration.

H_6: There is no significant relationship between teacher's level of technology integration and current instructional practices.

H_7: There is no significant relationship between teacher's level of technology integration and personal computer use.

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H_8: The independent variables provided in H_1-H_7 do not predict the dependent variables of fourth grade reading, eighth grade reading, fourth grade mathematics and eighth grade mathematics achievement.

H_9: The levels of technology integration subscales (0- nonuse to 6-refinement) do not predict the dependent variable of mathematics achievement.

H_{10}: The levels of technology integration subscales (0-nonuse to 6-refinement do not predict the dependent variable of reading achievement.

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CHAPTER FOUR

Data Presentation

The purpose of this study was to investigate to what extent the level of technology integration by fourth and eighth grade teachers in eleven rural school districts in northeastern Louisiana is related to student achievement in reading and mathematics.

Descriptive Analysis

One hundred twenty-three of the 186 reading and mathematics teachers sampled responded to the fifty-item questionnaire. Of this number, 38% were fourth grade teachers and 30% were eighth grade teachers. Demographic data associated with the teachers who responded from each of the eleven school districts selected to participate in this study were provided. The data in Table 8 show the percentage of teachers who responded to the Levels of Technology Implementation Questionnaire for Northeastern Louisiana Rural Schools by grade level. Fourth grade teachers had the largest number of respondents with 71.

Further, 42 teachers from the respondents represented the fourth grade reading classes and 28 teachers represented the eighth grade reading classes. Thirty-eight teachers represented the fourth grade mathematics class and 28 represented the eighth grade mathematics class. The number of respondents for the fourth grade totaled 80 for the subject areas. This number is more than 71 which is the number of respondents due

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to 9 teachers teaching both reading and mathematics, which would account for 9 more respondents. The number of respondents for eighth grade totaled 56 for the subject areas. This number is more than 52, which is the number of respondents for the eighth grade, due to 4 teachers teaching both reading and mathematics, which will account for 4 more respondents.

Table 8

Percentage of Respondents and Grade Taught

Grade Taught	Number of Respondents for Questionnaire	Percent of Respondents	Reading Respondents	Mathematics Respondents	Total Subject Respondents
4	71	38%	42	38	80
8	52	28%	28	28	56
No Response	63	34%			
Total	186	100%	70	66	136

The data in Table 9 show the population information for teachers who responded by district and grade level. District G had the highest percentage of respondents (25%) while District C had a low percentage of respondents (1%) of the total population. District G had the highest percentage of respondents (27%) in fourth grade while District C had none. Districts G and J had the highest percentage of respondents (19%) in grade eight while District A had none.

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Table 9

Population of Respondents by District and Grade Level

District	Total Population (%)	4^{th} Grade (%)	8^{th} Grade (%)
A	3 (2%)	3 (4%)	0
B	11 (9%)	3 (4%)	8 (16%)
C	2 (1%)	0	2 (3%)
D	5 (4%)	4 (5%)	1 (2%)
E	20 (17%)	16 (23%)	4 (9%)
F	19 (15%)	10 (14%)	9 (17%)
G	29 (25%)	19 (27%)	10 (19%)
H	11 (9%)	9 (14%)	2 (3%)
I	6 (5%)	2 (3%)	4 (9%)
J	14 (11%)	4 (5%)	10 (19%)
K	3 (2%)	1 (1%)	2 (3%)
Total	123 (100%)	71 (100%)	52 (100%)

The data in Table 10 show fourth grade respondents had the highest percentage of teachers (63%) with a Bachelor's degree only. Fourth grade teachers also had the highest percentage (21%) with a Master's degree. Eighty-four percent of the fourth grade teachers identified their highest degree earned. Seventy-nine percent of the eighth grade teachers identified their highest degree earned.

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Table 10

Highest Degree Earned of Respondents

Highest Degree Earned	Grade Level, Number and Percent			
	Number		Percent	
	4th	8th	4th	8th
Bachelor's	45	26	63%	50%
Master's	15	14	21%	27%
Specialist's	0	1	0	0
No response	11	11	16%	23%
Total	71	52	100%	100%

The data in Table 11 show Districts A and K having 100% of their respondents reporting a Bachelor's degree while District G respondents reported only 35% having a Bachelor's degree. District C has 50% of its respondents reporting a Master's degree while District A has none. The only Specialist degree reported was in District I. Eighty-four percent of the fourth grade teachers responded to this section and 98% of the eighth grade teachers responded to this section. Sixty-three percent of the fourth grade teacher respondents have a Bachelor's degree while 63% of the eighth grade respondents have a Bachelor's degree. Twenty-one percent of the fourth grade respondents have a Master's degree while 34% of the eighth grade respondents reported having a Master's degree.

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Table 11

Highest Degree Earned of Respondents by District and Grade Level

District	Total Population	Highest Degree Earned by District and Grade Level Bachelor's 4th	8th	(%)	Master's 4th	8th (%)	Specialist's 4th	8th (%)
A	3	3	0	(100%)	0	0	0	0
B	11	2	4	(55%)	1	3 (45%)	0	0
C	2	0	1	(50%)	0	1 (50%)	0	0
D	5	3	1	(80%)	1	0 (20%)	0	0
E	20	12	2	(75%)	5	0 (25%)	0	0
F	19	7	4	(58%)	3	5 (42%)	0	0
G	29	8	2	(35%)	0	0	0	0
H	11	5	2	(64%)	3	0 (36%)	0	0
I	6	1	3	(66%)	1	0 (17%)	0	1 (17%)
J	14	3	5	(57%)	1	5 (43%)	0	0
K	3	1	2	(100%)	0	0	0	0
Total	123	45 (63%)	26	(63%)	15 (21%)	14 (34%)	0	1 (1%)

The data in Table 12 show 80% of the respondents completed this section of the questionnaire. Forty-six percent of the fourth grade teachers responded while 34% of the eighth grade teachers responded. District E has the highest percent (15) of teachers responding to this section while District C has the lowest percent (2). Twenty percent of all respondents showed 0-4 years teaching experience. In grade four, 11% of the respondents showed 0-4 years while in grade eight, 9% showed 0-4 years. Fourteen

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percent of all respondents showed 5-9 years of teaching experience. In grade four, 9% of the respondents showed 5-9 years of teaching experience while grade eight showed 5%. Twenty-six percent of all respondents showed 10-20 years of teaching experience. In grade four, 17% of the respondents showed 10-20 years of teaching experience while 9% of the eighth grade responded. Twenty percent of all respondents showed over 20 years teaching experience. In grade four, 9% of the respondents showed over 20 years teaching experience while grade eight showed 11% percent.

Table 12

Years Teaching Experience of Respondents by District and Grade Level

District	Total Number of Respondents		0-4 years		5-9 years		10-20 years		over 20 years	
			4th	8th	4th	8th	4th	8th	4th	8th
A	3	(2%)	1	0	1	0	1	0	0	0
B	11	(9%)	1	3	0	0	2	4	0	1
C	2	(2%)	0	0	0	2	0	0	0	0
D	5	(4%)	1	0	1	0	1	0	1	1
E	19	(15%)	5	0	2	0	4	3	4	1
F	18	(14%)	0	3	3	2	3	0	3	4
G	9	(7%)	4	1	1	0	2	0	1	0
H	11	(9%)	0	2	2	0	5	0	2	0
I	6	(5%)	1	1	0	0	1	2	0	1
J	14	(11%)	1	2	1	1	1	2	1	5
K	3	(2%)	0	0	0	1	1	0	0	1
Total	101	(80%)	14 (11%)	12 (9%)	11 (9%)	6 (5%)	21 (17%)	11 (9%)	12 (9%)	14 (11%)

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Fifty-two percent of fourth grade teachers and 42% of eighth grade teachers responded to questions about certification (See Table 13). Forty-four percent of the fourth grade respondents were certified while 35% of the eighth grade respondents were certified. Eight percent of the fourth grade respondents were not certified while 7% of the eighth grade respondents were not certified. District G has a high percent (16%) of respondents certified while Districts A, C and K had a low percent (2%) of respondents certified. District E had a high percent (3.2%) of respondents not certified while Districts A, H, I, and K had a low percent (8%) of respondents not certified.

Table 13

Certification Status of Respondents by District and Grade Level

District	Total Certified	Certified 4th	Certified 8th	Total Not Certified	Not Certified 4th	Not Certified 8th
A	2 (2%)	2	0	1 (.8%)	1	0
B	9 (7%)	3	6	2 (2%)	0	2
C	2 (2%)	0	2	0	0	0
D	3 (2%)	2	1	2 (2%)	2	0
E	16 (13%)	12	4	4 (3%)	4	0
F	16 (13%)	10	6	3 (2.4%)	0	3
G	20 (16%)	11	9	2 (2%)	1	1
H	10 (8%)	9	1	1 (.8%)	0	1
I	5 (4%)	2	3	1 (.8%)	0	1
J	12 (10%)	3	9	2 (2%)	1	1
K	2 (2%)	0	2	1 (.8%)	1	0
Total	97 (79%)	54 (44%)	43 (35%)	19(15%)	10 (8%)	9 (7%)

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Figure 1 displays the *LoTi* profile approximates the degree to which each respondent is either supporting or implementing the instructional uses of technology in a classroom setting. Based on their responses, 41 respondents' highest level corresponded with a Level 0 (Non-Use) implementation of technology in the classroom while 23 of the respondents recorded their highest level of technology implementation at a Level 2 (Exploration).

A Level 0 implies technology-based tools (computers) are (1) completely unavailable in the classroom, (2) not easily accessible by the classroom teacher, or (3) there is a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based (ditto sheets, chalkboard, overhead projector). A Level 2 implies technology-based tools supplement the existing instruction program (tutorials, educational games, basic skills applications) or complement selected multimedia and/or web-based projects (internet-based research papers, informational multimedia presentations) at the knowledge/comprehension level.

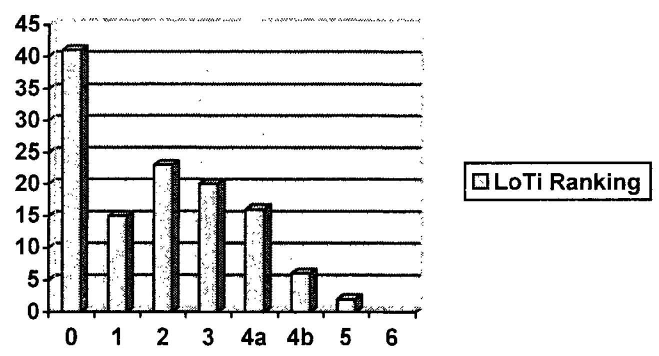

Figure 1

Teacher's *LoTi* Ranking

Figure 2 displays the personal computer use (PCU) addresses each respondents comfort and proficiency level with using computer (troubleshooting simple hardware

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problems, using multimedia applications) at home or in the workplace. Level 1-2 indicates "Not True of Me Now," 3-5 "Somewhat True of Me," and 6-7 "Very True of Me Now."

Seventy-two respondents perceived their ability to use basic software applications or troubleshoot routine computer problems as "Somewhat True of Me Now." Thirty-seven respondents perceived their ability to use basic software applications or troubleshoot routine computer problems as "Not True of Me Now." Fourteen respondents perceived their ability to use basic software applications or troubleshoot routine computer problems as "Very True of Me Now."

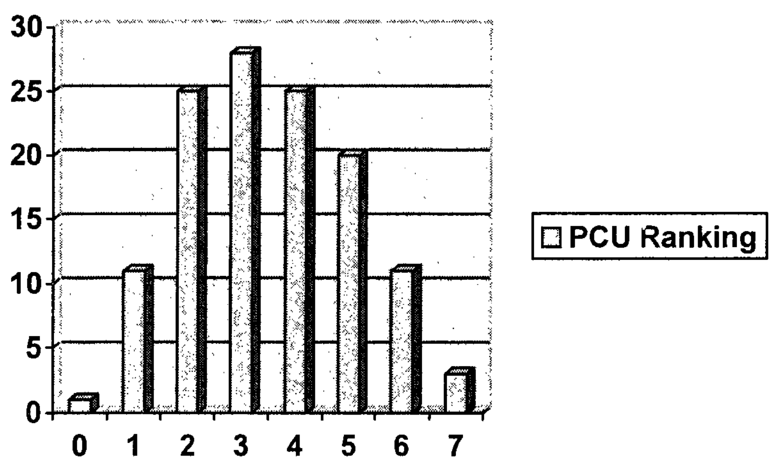

Figure 2

Teacher's Personal Computer Use Ranking

Figure 3 displays the current instructional practices (CIP) addresses each respondent's supports for or implementation of instructional practices consistent with a learner-based curriculum design (learning materials determined by the problem areas under investigation, multiple assessment strategies integrated authentically throughout the curriculum, teacher as co-learner/facilitator, focus on learner-based questions).

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Level 1-2 indicates "Not True of Me Now," 3-5 "Somewhat True of Me," and 6-7 "Very True of Me Now."

Ninety-four respondents perceived their instructional practices as aligning with a learner-based design as "Somewhat True of Me Now" while 14 teachers perceived their use of a learner-based curriculum as "Very True of Me Now." Fifteen respondents perceived their instructional practices as aligning with a learner-based design as "Not True of Me Now." Respondents consistently employ or support a subject-matter based instructional approach.

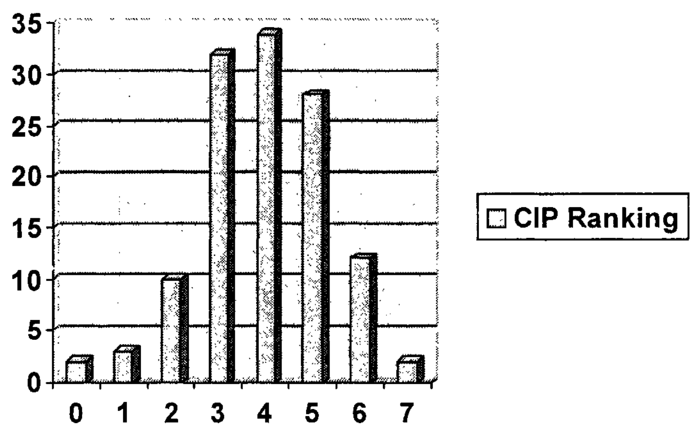

Figure 3

Teacher's Current Instructional Practices (CIP)

Analysis of Quantitative Data

An analysis of the data collected as described by the procedures in Chapter Three, was performed using SPSS (Statistical Package for the Social Sciences) (Cronk, 1999). A Pearson correlation was used to determine if there were significant relationships between each teacher's levels of technology integration and the class mean scores of reading and mathematics in grades four and eight.

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Additionally, a teacher's age, total years of experience, highest degree earned, certification status, current instructional practices and personal computer use were used to determine if there was a relationship between these variables, and *LoTi*. Regression analysis was used to determine if levels of technology use, age, total years of experience, highest degree earned, certification status, current instructional practices and personal computer use predicted *LEAP 21* in reading and mathematics class mean scores in grades four and eight.

Ten null hypotheses were tested in this study.

Hypothesis 1: There is no significant relationship between a teacher's level of technology integration and students' achievement in reading in grade four.

In order to determine if there is a relationship between teacher's level of technology integration and the class mean on the reading section of the *LEAP 21* test in grade four, the data were analyzed using a correlation coefficient between the level of technology integration and the reading class mean. Of the 71 fourth grade teachers, data were available for the 42 teachers that responded as teachers of reading. The results show the relationship between the level of technology integration and the class mean score on the reading test was not significant.

A Pearson correlation addressed the relationship between the level of technology integration ($M = 1.42$, $SD = 1.45$) and the mean score on the reading test ($M = 299.98$, $SD = 20.41$). For an alpha level of .05, the correlation between the level of technology and students' achievement in reading found no statistically significant relationship ($r = .048$, $p = .763$). This indicates that the level of technology integration by teachers and the class mean score on the reading test were not related.

Data for these results are presented in Table 14. Hypothesis 1 was accepted.

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Table 14

Pearson's Correlation of *LoTi* and Mean Score on Reading *LEAP 21* (Grade 4)

r	*p*	n
.048	.763	42

Hypothesis 2: There is no significant relationship between a teacher's level of technology integration and student achievement in reading in grade eight.

In order to determine if there was a relationship between teacher's level of technology integration and the class mean on the reading section of the *LEAP 21* test in grade eight, the data were analyzed using a correlation coefficient with the level of technology integration entered as the independent variable and the reading class mean as the dependent variable. Of the 52 eighth grade teachers, data were available for the 28 that responded as teachers of reading. The results show the relationship between the level of technology integration and the mean class score on the reading test.

A Pearson correlation addressed the relationship between the level of technology integration ($M = 2.14$, $SD = 1.48$) and the class mean the reading test ($M = 309.13$, $SD = 22.81$). For an alpha level of .05, the correlation between the level of technology and achievement in reading was not significant

($r = -.107$, $p = .587$). This indicates that the level of technology integration and the class mean on the reading test are not significantly related as indicated in Table 15. Table 15 presents information relevant to this correlation analysis. Hypothesis 2 was accepted.

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Table 15

Pearson's Correlation of *LoTi* and Mean Score on Reading *LEAP 21* (Grade 8)

r	*p*	n
-.107	.587	28

Hypothesis 3: There is no significant relationship between a teacher's level of technology integration and students' achievement in mathematics in grade four.

In order to determine if there was a relationship between teacher's level of technology integration and the class mean on the mathematics section of the *LEAP 21* test in grade four, the data were analyzed using a correlation coefficient with the level of technology integration entered as the independent variable and the mathematics class mean as the dependent variable. Of the 71 fourth grade teachers, data were available for the 38 that responded as teachers of mathematics. The results show the relative relationship between the level of technology integration and the class mean on the mathematics test.

The results of a Pearson correlation indicated the relationship between the level of technology integration ($M = 1.76$, $SD = 1.45$) and the class mean on the mathematics test ($M = 313.05$, $SD = 22.51$). For an alpha level of .05, the correlation between the level of technology and students' achievement in mathematics was not statistically significant ($r = .037$, $p = .824$). This indicates that the level of technology integration and the class mean on the mathematics test are not related. Specific data relative to this analysis are presented in Table 16. Hypothesis 3 was accepted.

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Table 16

Pearson's Correlation of *LoTi* and Score on Mathematics *LEAP 21* (Grade 4)

r	*p*	n
.037	.824	38

Hypothesis 4: There is no significant relationship between a teacher's level of technology integration and student achievement in mathematics in grade eight.

In order to determine if there was a relationship between teacher's level of technology integration and the class mean on the mathematics section of the *LEAP 21* test in grade eight, the data were analyzed using a correlation coefficient with the level of technology integration entered as the independent variable and the mathematics class mean as the dependent variable. Of the 52 eighth grade teachers, data were available for the 28 that responded as teachers of mathematics. The results show the relationship between the level of technology integration and the eighth grade students' class mean on the mathematics test.

A Pearson correlation addressed the relationship between the level of technology integration ($M = 1.82$, $SD = 1.82$) and the class mean on the mathematics test by eighth grade students ($M = 318.05$, $SD = 24.41$). For an alpha level of .05, the correlation analysis between the level of technology integration and students' achievement in mathematics found no statistically significant relationship ($r = -.197$, $p = .314$). This indicates that the level of technology integration and the class mean on the mathematics test are not related. Specific data relative to this analysis are presented in Table 17. Hypothesis 4 was accepted.

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Table 17

Pearson's Correlation of *LoTi* and Mean Score on Mathematics *LEAP 21* (Grade 8)

r	*p*	n
-.197	.314	28

Hypothesis 5: There is no significant relationship between a teacher's level of technology integration and the following demographic variables (age, total years of experience, highest degree earned, and certification status) and do not predict a teacher's level of technology integration.

In order to determine which independent variable best predicts the dependent variable, a stepwise multiple regression addressed the relationship between a teacher's level of technology integration and the following demographic variables (age, total years of experience, highest degree earned, and certification status). In grade four, a statistically significant relationship was found ($R^2 = .059$, $p = .03$); for the regression model the only variable that entered into the model was certification status. The regression equation was, ($y = -1.037x + 3.532$). This represents an inverse relationship between certification status and teacher's level of technology integration. The data in Table 18 show that certified teachers were less likely to use technology integration in their classroom. Eighty respondents for the fourth grade are represented in the table due to 9 respondents teaching both reading and mathematics; therefore, those teachers' information was counted twice. Because none of the other variables (years of experience, and highest degree earned) met the statistical requirements of the regression model, they were excluded from the regression analysis. In Hypothesis 5 the variable certification status for grade four and the variable age for grade eight was accepted.

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Table 18

Stepwise Multiple Regression with Dependent Variable *LoTi* (Grade 4)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	9.074	1	9.074	4.859	.030(a)
	Residual	145.658	79	1.867		
	Total	154.732	80			

a Predictors: (Constant), Certification Status
b Dependent Variable: *LoTi*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.532	.881		4.010	.000
	certstat	-1.037	.470	-.242	-2.204	.030

a Dependent Variable: *LoTi*

In order to determine which independent variable best predicts the dependent variable in grade eight, a stepwise multiple regression addressed the relationship between a teacher's level of technology integration and the following demographic variables (age, total years of experience, highest degree earned, and certification status). In grade eight a statistically significant relationship was found ($R^2 = .106, p = .018$). For the regression model the only variable that entered into the model was age. The regression equation was (y = -.511x + 3.932). The data in Table 19 show an inverse relationship between age and the level of technology integration. This finding indicates that the older the teachers were, the less likely they were to integrate technology. Because none of the other variables met the statistical requirements of the regression model they were excluded from the regression analysis. Hypothesis 5 for the variable age for grade eight was accepted.

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Table 19

Stepwise Multiple Regression with Dependent Variable *LoTi* (Grade 8)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.418	1	14.418	5.933	.018(a)
	Residual	121.504	50	2.430		
	Total	135.922	51			

a Predictors: (Constant), AGE
b Dependent Variable: *LoTi*

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.932	.838		4.694	.000
	AGE	-.511	.210	-.326	-2.436	.018

a Dependent Variable: *LoTi*

Hypothesis 6: There is no significant relationship between a teacher's level of technology integration and current instructional practices.

In order to determine if there was a correlation between the level of technology integration in grades four and eight and current instructional practices, the data were analyzed using a correlation coefficient between the level of technology integration and current instructional practices. The correlation shows the relationship between the level of technology integration and teacher's current instructional practices in grades four and eight.

A Pearson correlation addressed the relationship between the level of technology integration in grade four ($M = 1.61$, $SD = 1.48$) and teacher's current instructional practices in grade four ($M = 3.78$, $SD = 1.31$). For an alpha level of .05, the correlation between the level of technology integration and teacher's current instructional practices was statistically significant ($r = .374$, $p = .001$).

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This indicated that the level of technology integration and the teacher's current instructional practices in grade four were positively correlated as indicated in Table 20. Hypothesis 6 was rejected.

Table 20

Pearson's Correlation of *LoTi* and Teacher's Current Instructional Practices (Grade 4)

R	*p*	n
.374**	.001	71

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

A Pearson correlation addressed the relationship between the level of technology integration in grade eight ($M = 1.96$ $SD = 1.64$) and teacher's current instructional practices in grade eight ($M = 4.07$, $SD = 1.398$). For an alpha level of .05, the correlation analysis between the level of technology integration and teacher's current instructional practices was statistically significant ($r = .422$, $p = .002$).

This indicates that the level of technology integration and the teacher's current instructional practices in grade eight are positively correlated. Specific data relative to this analysis are presented in Table 21. Hypothesis 6 was rejected.

Table 21

Pearson's Correlation of *LoTi* and Teacher's Current Instructional Practices (Grade 8)

R	*p*	n
.422**	.002	51

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

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Hypothesis 7: There is no significant relationship between a teacher's level of technology integration and personal computer use.

In order to determine if there was a correlation between the level of technology integration and teacher's personal computer use, the data were analyzed using correlation with the level of technology integration and teacher's personal computer use in grades four and eight. The correlation showed the relative relationship between the level of technology integration and teacher's personal computer use.

A Pearson correlation addressed the relationship between the level of technology integration in grade four ($M = 1.61$, $SD = 1.48$) and teacher's personal computer use in grade four ($M = 3.22$, $SD = 1.33$). For an alpha level of .05, the correlation between the level of technology and teacher's personal computer use was statistically significant ($r = .512$, $p = .000$).

This indicates that the level of technology integration and the teacher's personal computer use in grade four were positively related. Specific data related to this analysis are presented in Table 22. Hypothesis 7 was rejected.

Table 22

Pearson's Correlation of *LoTi* and Teacher's Personal Computer Use (Grade 4)

R	*p*	n
.512**	.000	71

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

A Pearson correlation addressed the relationship between the level of technology integration in grade eight ($M = 1.96$, $SD = 1.64$) and teacher's personal computer use in grade eight ($M = 3.84$, $SD = 1.79$). For an alpha level of .05, the correlation between

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the levels of technology and teacher's personal computer use was statistically significant. (r = .474, p = .000).

This indicates that for the eighth grade teachers, the level of technology integration and the teacher's personal computer use were positively related. Specific data relative to this analysis are presented in Table 23. Hypothesis 7 was rejected.

Table 23

Pearson's Correlation of *LoTi* and Teacher's Personal Computer Use (Grade 8)

r	*p*	n
.474**	.000	51

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

Hypothesis 8: The independent variables (age, total years of experience, highest degree earned, and certification status) provided in H_1-H_7 do not predict the dependent variable of fourth grade reading achievement, eighth grade reading achievement, fourth grade mathematics achievement and eighth grade mathematics achievement.

In order to determine which independent variable best predicted the dependent variable, a stepwise multiple regression was used. A stepwise multiple regression addressed the relationship of the independent variables provided in H_1- H_7. Because none of the variables met the statistical requirements of the regression model for grade four, they were excluded from the regression analysis. However, in grade eight, a statistically significant relationship was found (R^2 = .086, p = .035). For the regression model the only variable that entered into the model was the teacher's highest degree earned. The regression equation was (y = -16.264x + 339.980). The data in table 24

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show an inverse relationship between level of technology integration and highest degree earned. Indicating that the higher the teacher's degree the less likely the teacher was to use technology in the classroom. Because none of the other variables met the statistical requirements of the regression model, they were excluded from the regression analysis. Hypothesis 8 independent variable highest degree earned for grade eight was accepted.

Table 24

Stepwise Multiple Regression with Dependent Variable Mathematics (Grade 8)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1380.022	1	1380.022	4.675	.035(a)
	Residual	14760.558	50	295.211		
	Total	16140.579	51			

a Predictors: (Constant), Highest Degree
b Dependent Variable: MATH

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	339.980	10.415		32.644	.000
	DEGM	-16.264	7.522	-.292	-2.162	.035

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

Hypothesis 9: Levels of technology integration subscales (0- nonuse to 6-refinement) do not predict the dependent variable of mathematics achievement.

In order to determine which independent variable (LoTi subscales) best predicts the dependent variable, a stepwise multiple regression was used. A stepwise multiple regression addressed the relationship of the levels of technology subscales to the mathematics test scores. Because none of the variables met the statistical requirements of the regression model, they were excluded from the regression analysis.

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Therefore, no relationship was found between the independent (*LoTi* subscales) and dependent variables (mathematics test scores). Hypothesis 9 was accepted.

Hypothesis 10: The levels of technology integration subscales (0-nonuse to 6-refinement) do not predict the dependent variable of reading.

In order to determine which independent variable (*LoTi* subscales) best predicts the dependent (reading test scores) variable, a stepwise multiple regression was used. A stepwise multiple regression addressed the relationship of the levels of technology Integration subscales to the reading test scores. Because none of the variables met the statistical requirements of the regression model, they were excluded from the regression analysis. Therefore no relationship was found between the independent (*LoTi* subscales) and dependent (reading test scores) variables. Hypothesis 10 was accepted.

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CHAPTER FIVE

Findings, Conclusions, and Recommendations

The purpose of this study was to investigate to what extent the level of technology integration by fourth and eight grade teachers in rural schools is related to student achievement in reading and mathematics.

The sample population for this study was drawn from eleven rural school districts located in northeastern Louisiana. Fourth and eighth grade reading and mathematics teachers and their students were the focus of this study because of their required participation in the Louisiana State Department of Education's high stakes testing. This testing places major emphasis on the reading and mathematics sections that strongly influence whether or not fourth and eighth grade students are promoted to the next grade.

One hundred twenty-three teachers were used to conduct the study. All 123 teachers in the study were provided a fifty-item instrument, the Level of Technology Implementation (*LoTi*). The *LoTi* was administered to the fourth and eighth grade teachers to determine if their level of technology use related to student achievement in reading and mathematics. The instrument generated a profile for each participant in three domains:

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level of technology implementation (*LoTi*), personal computer use (PCU), and current instructional practices (CIP). The *LoTi* approximated the degree to which each participant's score either supported or implemented the instructional use of technology in a classroom setting along with their classroom mean scores on the *LEAP 21* in reading and mathematics.

The null hypotheses for this study were tested at the .05 level of significance. Analyses were performed for any statistically significant relationships found using Pearson correlations and step-wise multiple regression.

Findings

The following is a summary of the findings revealed through data analysis:

1. There was no significant relationship between the level of technology used by teachers in grades four and eight and students' achievement in reading and mathematics.
2. There was a significant inverse relationship between certification status and teachers' level of technology integration in grade four.
3. There was significant relationship between eighth grade teacher's age and teacher's level of technology integration in grade eight. Younger teachers, meaning below the age of thirty, were more likely to integrate technology in grade eight.
4. There was a significant relationship among fourth and eighth grade teacher's level of technology integration, current instructional practices, and personal computer use.

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5. In grade eight, using the highest degree earned as the independent variable and mathematics as the dependent variable, a significant inverse relationship was shown for teachers with a Master's degree as opposed to those who did not have a Master's degree. In addition, this inverse relationship was also shown as relating to a teacher's level of technology integration.

Discussion

A review of literature pertaining to a summary of research on the relationships of teachers' technology use on student learning was presented. The review of literature also examined school reform efforts, technology standards and school reform, technology integration in classrooms, current instructional practices, effects of student technology use on learning, technology and student achievement, and technology in rural schools. Teacher's level of technology use and student achievement varies under certain conditions (Moresch, 1999)

In order for teachers' levels of technology integration to show a relationship with student achievement, Viadero (2002) emphasized that teachers must use interactive technologies to help students master difficult and complex concepts, especially in reading and mathematics. The success in using technology depends on one thing: content (Riley, 2002). Because of the challenge politicians and other stakeholders have placed on the education system, Bracey (2002b) suggests that assumptions that low-achieving students would always react negatively to policies that place a strong emphasis on achievement were not necessarily appropriate. The Educational Evaluation and Policy Analysis of the *LEAP 21* was criticized for using retention as an incentive (Amrien and Berliner, 2002). Such policies would raise and perhaps exacerbate issues of equity in students' resources

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and their opportunity to learn without directly addressing the policies. Such policies ultimately ignore the complexities of students' lives; the multidimensional nature of the problem of low achievement; and the limitations of work effort, motivation, and time-on-task as means of raising achievement. Educators working in high-poverty schools should strive to create environments that will reflect high expectations that link students to successful achievement (Lee, 2003). The National Center of Education Statistics (2002) concurs with the findings of this study showing no significant relationship between teacher's technology integration and its impact on students' achievement in reading and mathematics. The National Center of Education Statistics (2002) showed no significant change in reading, mathematics or science for students in grades four and eight that tested from 1994-2000.

Another finding from this study showed that there were significant relationships in a teacher's current instructional practices and personal computer use. Although these findings were contrary to what one might have expected, they support the literature. Moresch (1999) also believed that a teacher's current instructional practices and personal computer use would have a significant relationship with the level of technology integration. Many teachers in Moresch's (1999) study communicated that they were comfortable with their ability to use basic software applications, and support implementation of instructional practices consistent with their schools' learner-based curriculum design.

Additionally, Middleton and Murray (1999) investigated 107 fourth and fifth grade teachers' current instructional practices and personal computer use using the *LoTi*

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instrument. These researchers found positive relationships with teacher's level of technology integration.

Findings from the stepwise multiple regression analysis of the data from eighth grade teacher respondents showed the independent variable of highest degree earned using mathematics as the dependent variable had a significant negative relationship. Again, Lee (2003) contends that regardless of the degree earned by the teacher, educators working in high-poverty schools should be high achievers and continue to consume knowledge that keeps them abreast of current trends, strategies, and pedagogy.

Another finding supported by the literature was that a teacher's age showed a significant relationship with current instructional practices and personal computer use for eighth grade teachers. Findings in this study indicate that teachers with 10 or more years of teaching experience were less likely to integrate technology. Tarleton (2002) reported that teachers who are 41 to 50 years of age will generally be less likely to integrate technology in their classrooms, especially if they are teachers who have taught between 6 and 10 years. Viadero (1997) contended that teachers who fall into this category generally do not deem it necessary to change pedagogy that will motivate student thinking; therefore, technology misconceptions assist them with not being encouraged to receive appropriate training. Additionally, Washenberger (2001) stated that technology has grown at such a tremendous rate that it has discouraged seasoned educators from using these tools.

Conclusions

The basic purpose of this study was to investigate fourth and eighth grade teachers' levels of technology integration in their reading and mathematics classes and to

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determine if a there was a relationship with student performance as measured by the *LEAP 21*. Few conclusions can be made on the basis of this study alone due to the lack of significant relationships found in the results between the dependent variables for fourth and eighth grade reading and mathematics scores and the independent variable teacher's level of technology use.

However, some conclusions are apparent:

1. An eighth grade teacher's age is related to the teacher's level of technology integration. The older the teacher, the less likely the teacher is to integrate technology in the classroom.
2. A fourth grade teacher's certification status is related to the teacher's level of technology integration. Certified teachers are less likely to integrate technology in their classrooms.
3. In mathematics, an eighth grade teacher's highest degree earned is related to the teacher's level of technology integration. The higher the teacher's education level, the less likely they are to integrate technology in their classrooms.

Recommendations for Practice

The following recommendations are presented to be considered for future practice.

1. Fourth and eighth grade teachers should have the opportunity to participate in professional development activities that address the integration of technology.
2. Professional development activities for fourth and eighth grade teachers should connect the use of technologies with higher order thinking skills into the curriculum.
3. The extension of more professional development for teachers thirty-five years and older is needed to ensure that current trends, appropriate technology use,

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and technology integration in the classroom is continuously and consistently available.

Recommendations for Further Study

The following recommendations are presented to be considered for further study.

1. This study should be replicated in non-rural school districts in northeastern Louisiana to determine if teacher's level of technology integration is impacting student achievement.
2. This study should be replicated in other states' rural school districts to determine if the correlation between the level of teacher's technology integration and each state's high stakes testing instrument show similar results to correlation of this study.
3. It is recommended that this study be replicated using only certified teachers to determine if the level of teacher's technology use show a higher correlation to student achievement.

Even as businesses and other stakeholders have rapidly incorporated these technologies, schools have fallen far behind (Tharp, 1999). There were no strong links between student achievement and the level of the teacher's technology integration (Dwyer, 1994). Yet this is due, to the level of integration and the type of instructional practices that accompany the use of technology as reported by (Waxman, Connell, & Gray, 2002). The current educational system of rural schools districts must change and also adopt instructional practices that will impact students' achievement (Tarleton, 2002). Technology can facilitate this change. It can individualize instruction, allow students to organize, analyze, interpret, develop and evaluate their own work (Schrum, 2000). Further, technology will allow universal access anywhere, anytime.

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REFERENCES

Allen, R. (2001, Fall). Technology and learning: How schools map routes to technology's promised land. *ASCD Curriculum Update,* 1-3, 6-8.

Amrein, A. L. & Berliner, D. C. (2002). High-stakes testing, uncertainty, and student Learning. *Education Policy Analysis Archives,* 10, (18). Retrieved June 4, 2003, from http://epaa.asu.edu/epaa/v10n18/.

Baker, E. (1999). *Technology: How do we know it works?* Presented at The Secretary's Conference on Educational Technology-1999. UCLA

Beeson, E., & Strange, M. (2003). Why rural matters 2003: The continuing need for every state to take action on rural education. A report of the rural school and community trust policy program.

Bennett, F. (2002). The future of computer technology in K-12 education. *Phi Delta Kappan*, 83, (8), 621-625.

Blok, H., Oostdam, R., Otter, M.E., & Overmaat, M. (2002). Computer-assisted instruction in support of beginning reading instruction: A review. *Review of Educational Research, 72,* 101-130.

Bracey, G. W. (2000). The 10th Bracey report on the condition of public education. *Phi Delta Kappan,* 83, (2), 133-144.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Bracey, G.W. (2002a). Raising achievement of at-risk-students or not. *Phi Delta Kappan,* 83, (6), 431-432.

Bracey G. W. (2002b). What students do in the summer? *Phi Delta Kappan*, 83, (7), 497-498.

Bruce, B. C., & Levin, J. A. (1997). Educational technology: Media for inquiry, communication, construction, and expression. *Journal of Educational Computing Research,* 17, (2), 79-102.

Brush, T. A. (1997). The effects of student achievement and attitudes when using integrated learning systems with cooperative pairs. *Educational Technology Research and Development*, 45, (1), 51-53.

Cantu, L., & Garza, D. (1998). Coca-Cola valued youth program students meet peers via video conference. *Technology for Education,* 25, (7), 1-2.

Cavazos, L. F. (2002). Emphasizing performance goals and high-quality education for all students. *Phi Delta Kappan*, 83, (9), 690-697.

Christie, K. (2002). Getting policy makers literate on literacy. *Phi Delta Kappan,* 84, (1), 6-8.

Charp, S. (2001). Bridging the digital divide. *The Journal of Technological Horizons in Education*, 28, (10), 10-12.

Charp, S. (2001) Assessment and accountability. *The Journal of Technological Horizons in Education*, 29, (5), 7-8.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Clark, R.E. (1994). Media will never influence learning. *Educational Technology Research and Development*, *42,* (2), 21-29.

Collins, T., & Dewees S. (2001). Challenge and promise: Technology in the classroom. *Southern Rural Development Center*, 18, 1-6.

Cronk, B. (1999). *How to use spss*. A-step-by-step guide to analysis and intepretation. Pyrczak Publishing.

Cuban, L. (2001). *Oversold and underused: Computers in the classroom*, pp. 131-175, Cambridge, Massachusetts: Harvard University Press.

Dede, C. (1998). Six challenges for educational technology. *(The 1998 ASCD Yearbook).*

Dillon, A. and Gabbard, R. (1998). Hypermedia as an educational technology: A review of the quantitative research literature on learner comprehension, control, and style. *Review of Educational Research*, 68, 322 - 349.

Dodge, K. A. (2002). Coming of age: The department of education. Phi Delta Kappan, 83, (9), 674-676.

Doherty, K. M., & Orlofsky, G. F. (2001). Technology counts: Education week/MDR/Harris interactive poll of students and technology. *Education Week,* 20, (35), 47. *Retrieved July 19, 2003, from http://www.edweek.org/sreports/tc01/35survey.pdf.*

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Dreier, R.K. (2000). *A quantitative and qualitative study of computer technology and student achievement in mathematics and reading at the second and third grade levels: A comparison of high versus limited technology integration.* Unpublished doctoral dissertation: The University of Southern California.

Dwyer, D. (1994). Apple Classroom of Tomorrow: What we've learned. *Educational Leadership,* 51, 4-10.

Falk, B. (2002). Standards-based reforms: Problems and possibilities. *Phi Delta Kappan*, 83, (8), 612-620.

Fuller, H.L. (2000). First teach their teachers: Technology support and computer use in academic subjects. *Journal of Research on Computing in Education*, 32, (4), pp. 511-535.

Garrud, P., Chapman, I.R., Gordon, S.A. and Herbert, M. (1993). Non-verbal communication: evaluation of a computer-assisted learning package. *Medical Education*, 27, 474-478.

Goertz, M. (2001). Redefining government roles in an era of standards -based reform. *Phi Delta Kappan,* 83, (1), 62-66.

Goldman, S., Cole, K., & Syer, C. (1999). *The technology/content dilemma.* Presented at The Secretary's Conference on Educational Technology. Menlo Park, CA: Institute for Research On Learning.

Hagner, P. R. (2001). Interesting practices and best systems in faculty engagement and support. Presented at NLII Focus Session. Seattle, WA: National Learning Infrastructure Initiative.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Heinecke, W. F., Blasi, L., Milman, N., & Washington, L. (1999). *New directions in the evaluation of the effectiveness of educational technology.* Presented at The Secretary's Conference on Educational Technology. University of Virginia.

Henry, T. (1999, 26/1). Do classroom pcs help kids learn? *USA Today.*

International Society for Technology in Education (2003). Retrieved May 4, 2003 from the World Wide Web: http://www.iste.org.

Husen, T. (1967). A comparison of twelve countries: International study of achievement in mathematics. Stockholm: Almquist & Wiksell, (1-2).

Jago, C. (2000). When nothing is new. *Phi Delta Kappan,* 82, (1), 90-92.

Kulik, J. A. (1994). Meta-analytic studies of findings on computer-based instruction. In E. L. Baker, and H. F. O'Neil, Jr. (Eds.). Technology assessment in education and training. Hillsdale, N. J.: Lawrence Erlbaum.

Lee, J. O. (2003). Implementing high standards in urban schools: Problems and solutions. *Phi Delta Kappan,* 84, (6), 449-455.

Louisiana Center for Educational Technology (Department of Education). (2001). T*echnology Initiatives.*

Louisiana Department of Education (2002a). 2001-2002 Louisiana district accountability report card. Retrieved July 22, 2003, from http://www.doe.state.la.us/DOE/asps/home.asp?I=REPORTD

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Louisiana Department of Education (2002b). *2001-2002 annual report: LEAP for the 21st Century and GEE for the 21st Century.* Baton Rouge, LA: Division of Student Standards and Assessments.

Louisiana Department of Education (2002c). 152nd Annual Financial and Statistical Report 2000-2001.

Louisiana Systemic Initiatives Program. (1998). *Improving student performance in mathematics, science and technology.* Baton Rouge, LA: Louisiana Systemic Initiatives Program.

Ma, Liping. (1999). *Knowing and teaching elementary mathematics.* Mahwah, N. J.: Lawrence Erlbaum Associates, Inc.

MacArthur, C.A., Haynes, J. A., & Malouf, D.B. (1986). Learning disabled students' engaged time and classroom interaction: The impact of computer assisted instruction. *Journal of Educational Computing Research, 2,* 189-198.

Maddux, C. D. (1995). Research in educational computing: Problems of internal and external validity. *Computers in the Schools,* 11, (3), 7-10.

Mann, D., Shakeshaft, C., Becker, J., & Kottkamp, R. (1999). *West Virginia story: Achievement gains from a statewide comprehensive instructional technology program.* Retrieved July 10, 2003, from http://www.mff.org/pubs/ME155.pdf.

McKenzie, J (1998). The missing piece: Strategic Teaching. *The Educational Technology Journal,* 8, (1), 56-58.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Merriam, S. B. (1998). *Qualitative research and case study applications in education.* San Francisco, CA: Jossey-Bass Publishers.

Middleton, B. M., & Murray, R. K. (1999). The impact of instructional technology on student academic achievement in reading and mathematics. *International Journal of Instructional Media*, 26, (1),109-116.

Moersch, C. (1995). Levels of technology implementation (LoTi): A framework for measuring classroom technology use. *Learning & Leading with Technology,* 23, (3), 40-42.

Moersch, C. (1998). Enhancing students' thinking skills. *Learning & Leading with Technology,* 25, (6), 50-53.

Moersch, C. (1999). Assessing current technology use in the classroom: A key to efficient staff development and technology planning. *Learning & Leading with Technology,* 26, (8), 40-49.

Molnar, A. (1997). Computers in education: A brief history. *Technological Horizons in Education*, 24, (11).

Muir, M. (2002). The electronic guild network. Retrieved October 6, 2002, from University of Maine at Farmington Web site: http://pt3.umf.maine.edu/ProjOverview.html.

Murphy, R., Penuel, W., Means, B., Korbak, C., Whaley, A., & Allen, J. (2002). *E-DESK: A Review of recent evidence on discrete educational software* (SRI International Report). Menlo Park, CA: SRI International.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

National Center for Educational Statistics (2002). The nation's report card: Reading 2002. Retrieved July 22, 2003, from http://nces.ed.gov/nationsreportcard/reading/.

National Center for Education Statistics (2002). The nation's report card: Writing 2002. Retrieved July 21, 2003, from http://nces.ed.gov/nationsreportcard/writing/results2002.

National Commission on Mathematics and Science (2000). Before it's too late: A report to the nation from the national commission on mathematics and science teaching for the 21st century. Jessup, MD: U.S. Department of Education.

North Central Regional Educational Laboratory. (1999). *Critical issue: Using technology to improve student achievement.*

O'Brien, T.C. (1999). Parrot math. *Phi Delta Kappan,* 80, (6), 434-436.

O'Malley, M. & Chamot A. U. (1990). *Learning strategies in second language Acquisition.* Cambridge University Press.

Okpala, C. (2002). Educational resources, student demographics and achievement scores. Journal of Education Finance, 27(3), 885-907.

Paige, R. (2002). An overview of America's education agenda. Phi Delta Kappan, 83, (9),708-713.

Peck, C., Cuban, L. & Kirkpatrick, H. (2002). Techno-promoter dreams, student realities. *Phi Delta Kappan,* 83, (6), 472-480.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Quade, A. M. (1993). An Assessment of the Effectiveness of a Hypertext Instructional Delivery System when Compared to a Traditional CAI Tutorial. In Proceedings of Selected Research and Development Presentations at the Convention of the Association for Educational Communications and Technology Sponsored by the Research and Theory Division (15th, New Orleans, Louisiana, January 13-17, 1993). ED362195.

Reeves, T. C. (1998). The impact of media and technology in schools. *A research report prepared for the Bertelsmann Foundation.* The University of Georgia.

Riley, R.W. (2002). Education reform through standards and partnerships, 1993-2000. Phi Delta Kappan, 83 (9), 700-707.

Roblyer, M. D. & Edwards, J. (2000). *Integrating educational technology into teaching.* Upper Saddle River, NJ: Prentice-Hall, Inc.

Roblyer, M. D.(2003). *Integrating educational technology into teaching* (3rd ed.). Prentice-Hall, Inc.

Sandholtz, J. H., Ringstaff, C., & Dwyer, D. C. (1997). *Teaching with technology: Creating student-centered classrooms.* New York: Teachers College Press.

Savery, J. R., & Duffy, T. M. (1995). Problem-based learning: An instructional model and its constructivist framework. *Educational Technology,* 35, (6), 31-38.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Schacter, J. (2001). *The impact of education technology on student achievement: What the most current research has to say.* Santa Monica, CA: Milken Exchange on Education Technology.

Schofield, J. W., & Verban, D. (1988). Computer usage in teaching mathematics: Issues which need answers. In D. A. Grouwse & T. J. Cooney (Eds.), *Effective mathematics teaching* (Vol. I, pp. 169-193). Hillsdale, NJ: Erlbaum.

Schrum, L. (2000). Let's put the pedagogy first: Technology as a tool to support instruction. *Education World* [Online]. Available: http://www/educationworld.com/a_tech/tech004.shtml (Accessed 9/2/2001).

Silvis, H. (2000). Forget isolation, we're online now: Technology and good teaching practices combine to connect rural students with wider worlds. *Northwest Regional Educational Laboratory,* 6,(2), 43-44.

Sivin-Kachala, J. (1998). *Report on the effectiveness of technology in schools, 1990-1997.* Washington, DC: Software Publisher's Association.

Sivin-Kachala, J., & Bialo, E.R. (2000). Research report on the effectiveness of technology in schools. Washington, D.C.: Software Information Industry Association.

Smith, K. L. (1997). Preparing faculty for instructional technology: From education to development to creative independence. *CAUSE/EFFECT*, 20,(3), 36-44, 48.

Standish, D.G. (1992). The use of CD-ROM based books to improve reading comprehension in second grade students. (ERIC Document Reproduction Service No. ED 352 605.)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Symonds, W. C. (2000, 25/September). Wired schools. *Business Week*, pp. 116-128.

Tarleton, B. (2002). Teachers and computer: Are teachers up to speed? *TechDirections*. Tech Directions Books (2002). Retrieved June 6, 2003 from the World Wide Web: http//www.techdirections.com/html/tarleton.html

Tharp, R. G. (1999). *Effective teaching: How the standards came to be. Effective Teaching Document Series.* Santa Cruz: Center for Research on Education, Diversity & Excellence, University of California, (1), 43-44.

The Technology Education Lab. (2001). What is technology education. *Education World* [Online]. Available: http://www.techedlab.com/define.html (Accessed 3/25/01).

United States Department of Education (Office of Educational Technology). (2000). *Educational technology evaluation activities.*

Viadero, D. (1997). A tool for learning. *Education Week* [Online]. Available: http://www.edweek.org/sereports/tc/class/cl-n.htm (Accessed 21/1/02).

Viadero, D. (2002). Education department picks groups to develop database of effective practices. *Education Week.* Retrieved December 9, 2002, from http://www.edweek.org.ew/ed_printstory.cfm?slug=01whatworks.h22

Washenberger, M. (2001). Classroom web sites and student success. *Technological Horizons in Education*, 29, (2), 18-22.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

Waxman, H.C., & Huang, S. L. (1996-97). Differences by level of technology use on students' motivation, anxiety, and classroom learning environment in mathematics. *Journal of Educational Technology Systems, 25*(1), 66-77.

Waxman, H.C., Connell, M.L., & Gray, J. (2002) *A quantitative synthesis of recent research on the effects of teaching and learning with technology on student outcomes.* Naperville, IL: North Central Regional Educational Laboratory.

Wenglinsky, H. (1998). *Does it compute? The relationship between educational technology and student achievement in mathematics.* Princeton, N.J.: Educational Testing Service Policy Information Center.

Whetzel, D. (1992). The Secretary of Labor's Commission on Achieving Necessary Skills. Retrieved July 11, 2003, from http://www.ed.gov/databases/ERIC_Digests/ed339749.htm

Wiebe, K. J., & Martin, N. J. (1996). The impact of a computer-based adventure game on achievement and attitudes in geography. *Journal of Computing in Childhood Education*, 5, (1), 61–71.

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APPENDIX A

LO TI QUESTIONNAIRE

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LoTi Questionnaire

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 (*LoTi)* 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*: Louisiana ____________________

Name of Intermediate Unit *: Northeastern Louisiana Rural Schools ____________________

Name of School District*: ____________________

Name of School*: ____________________

Subject/Specialty: Reading, Math, (Math & Reading) PLEASE CIRCLE ONE

Grade Level: 4th or 8th PLEASE CIRCLE ONE

How many years of experience do you have in education? ____________________

What is your highest level of education? BA M Ed. S

What is your age? ____________

What is your certification status? Certified Non-Certified

Participant ID#* (last 4 digits of SSN): ☐ ☐ ☐ ☐

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.

What technology tools (software, e.g.) have you as a teacher used in your classroom to teach reading during the past year?

What technology tools (software, e.g.) have you as a teacher used in your classroom to teach math during the past year?

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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, spread-sheets, 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 communicating 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.

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 multi-media 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.

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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*	

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.

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.

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).

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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*	

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.

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 students.

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APPENDIX B

LOTI QUESTIONNAIRE/CORRELATION TO ISTE/NETS

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LoTi Questionnaire/ Correlation to ISTE/NETS

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 Standard IA, IIIB
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 Standard IVB, VD, VC
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 Standard IIA, IIB, IIC, IIE, IIIC
I currently use instructional units acquired from colleagues, curriculum resource catalogs, or the internet that integratethe 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 Standard IA, IIB, IIIB
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 Standard VA, VC, VD
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 Standard IIIB, IIIC, IIID
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 Standard IIA, IIB, IID, IIE, IIIA, IIIB, IIIC, IIID
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 Standard IIA, IIB, IIIA, IIIB, IIIC, IIID
Students in my classroom use the available technology resources (e.g., websites, multimedia applications, spread-sheets, MIDI devices) to complete projects that focus on critical content and higher order thinking skills (e.g., analysis, synthesis, evaluation).

9 Standard VD
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 communicating with parents via email.

10 Standard IA, IB, VA, VB
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.

11 Standard IA
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 Standard VD
Technical problems prevent me and/or my students from using the classroom computers during the instructional day.

13 Standard VD, IVB
I access the computer daily to browse the internet, send/ receive email, and/or use different productivity and multi-media tools (e.g., word processor, spreadsheet, database, presentation software).

14 Standard VA VB
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 Standard IA
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 Standard IID, IIE
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 Standard IID, IIIA
Getting more comfortable with using computers during my instructional day is my goal for this school year.

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LoTi Questionnaire/Correlation to ISTE/NETS

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*	

18 Standard IA, IB
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 Standard VC
The current student-to-computer ratio in my classroom(s) is not sufficient for me to use computer(s) during my instructional day.

20 Standard IVA, IVC
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 Standard IIB
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.

22 Standard IIIB, IIID, VID
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 Standard VB, VC
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 Standard VB, VC
I use my classroom computer(s) primarily to locate and print out lesson plans appropriate to my grade level or content area.

25 Standard VC
Using the classroom computers is not a priority for me this school year.

26 Standard IA, IB
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 Standard IIIA, IIC
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 Standard IIIC, IIID
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 Standard IVB, IVC, VD
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 Standard IIA, IIC, IID, IIE
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 Standard IIA, IIC, IID, IIE
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.

32 Standard IIIB, IIIC, IIID
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 Standard VD
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 Standard IIC, IIIC
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).

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LoTi Questionnaire/Correlation to ISTE/NETS

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*	

35 Standard IVB
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 Standard IIIC, IIIB
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 Standard IIIC, IIID
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 Standard IA , IIA, IIB, IID
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 Standard VIA, VIB, VID
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 Standard IB
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 Standard IIA, IIIB, IIID, VD
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.

42 Standard IA, IB, VA, VC, VD
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 Standard IIA, IIB, IIE, IIIA, IIIB, IIIC, IIID
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 Standard IIC, IIE
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 Standard VIA, IVA, IVC
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 Standard IIIB, VIC
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 Standard IVB, IVC, VC
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 Standard IA, IB, IIA, IIB, IIIA, IIIC
I need access to more resources and/or training to start using computers as part of my instructional day.

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

50 Standard IIB, IIIB,
Students' questions and previous experiences heavily influence the content that I teach as well as how I design learning activities for my students.

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APPENDIX C

STUDY INFORMATION FOR HUMAN USE REVIEW COMMITTEE

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Information for Human Use Committee

Title:
The Effects of the Teacher's Levels of Technology Integration on Student Achievement in Reading and Mathematics

Project Directors:
Dr. Kimberly Kimbell-Lopez
Valerie S. Fields

Department:
Curriculum, Instruction, and Leadership

Purpose of Study/Project:
The purpose of the study is to determine to what extent the level of technology integration by fourth and eighth grade teachers in rural schools affects student achievement in reading and mathematics.

Participants:
Approximately 1300 elementary and middle school students in Grades 4 and 8 enrolled in A, B, C, D, E, F, G, H, I, J, and K school districts.

Procedure:
Data for this study will be collected during the months of January and February of the 2004 school year. The researchers will obtain permission from the superintendent to administer the survey in their school district. A stamped addressed envelope will accompany the letter for his/her reply. Once permission has been granted by the superintendent another letter will be sent to principals with an attached copy from the superintendent granting permission to conduct the survey. Each principal at each elementary and middle school will receive a packet that will include step by step instructions to be placed in each 4 and 8 grade reading and mathematics teacher's box. Each teacher will follow instructions and complete the survey online or by paper pencil.

NOTE: Permission for all data collection and analysis will be requested through the aforementioned School Board Offices, principals of schools involved, and teachers at each school.

Instruments and Measures to Insure Protection of Confidentiality, Anonymity:
All teachers who agree to participate will complete the online survey. Participants' names will not be used on any responses or reactions published with the results of this study. The teacher responses will be emailed to a specific server, and data will be transferred into a password-protected account. Data from the account will remain confidential. Teachers' fourth and eighth grade mean scores form the *LEAP 21* reading and mathematics areas will be analyzed with teachers' levels of technology implementation to verify if the teachers' level of implementation had an impact on student achievement. Aggregated scores from the eighth grade will be analyzed with

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teachers' levels of technology implementation to verify if the teachers' level of implementation had an impact on student achievement.

Risks/Alternatives Treatments:
There are no risks associated with participation in this study.

Benefits/ Compensations:
Upon request each school district will be provided with a profile for each teacher that will reflect the following domains:

- Level of Technology Use
- Personal Technology Use
- Current Instructional Practices

Specifically, each school district will be able to identify to what degree technology is being integrated, if teachers are comfortable or proficient with using technology, and if teachers feel that instructional practices are consistent with a learner-based curriculum design. This information can be used to assist in the writing of school technology improvement plans.

Safeguards of Physical and Emotional Well-Being:
Data will not be collected until permission is secured from the Human Use Committee of Louisiana Tech University. Individuals will be given the opportunity to ask questions of the research administrator and to call the project director or the Human Use Review Committee if they have further questions or concerns. The participants may withdraw from the investigation at any time without penalty.

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APPENDIX D

PERMISSION FROM THE SUPERINTENDENT

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Louisiana Education Consortium
Valerie S. Fields, Ed. S. (La Tech Student)
Home* 903 East Rimes * Monroe, LA 71201 * e-mail: vfields@ulm.edu*
Work* University of Louisiana at Monroe
700 University Ave. SUB 201* Monroe, LA 71209

Dear : (Superintendent)

I am requesting your assistance in completing a study on the effects of the teacher's levels of technology integration on student achievement in reading and mathematics. I am particularly interested in how the level of technology implementation by fourth and eighth grade teachers in rural schools affects student achievement in reading and mathematics. My desire is that the research I conduct on the level of technology implementation will provide state legislators and policy makers with essential information in improving technology training, access, and integration. Additionally, this survey will provide your school district with a profile on each teacher that will reflect the following domains:

I. Level of Technology Implementation
II. Personal Computer Use
III. Current Instructional Practices

Specifically, your school district will be able to identify to what degree technology is being integrated, if teachers are comfortable or proficient with using technology, and if teachers feel that instructional practices are consistent with a learner-based curriculum design, which will assist with meeting the purposes and goals for Part D Enhancing Education Through Technology in the No Child Left Behind Act.

With your consent, a 50-item survey referred to as the Levels of Technology Implementation (LoTi) Questionnaire, as well as 3 open-ended questions will be administered to all fourth and eighth grade teachers in your district. Additionally, it will be necessary to examine the mean scores of the fourth and eighth grade students as determined by the Louisiana Educational Assessment Program (LEAP). The 50-item survey and open-ended questions should take approximately 30-45 minutes to complete. The survey is online. All responses will remain confidential. Only group data will be reported.

Access to a computer for each teacher or a computer lab will be necessary to administer the survey. The survey can be conducted at individual schools or to all teachers in the system collectively. I would like to schedule times during the month of January or February to administer the survey. I will call your office as a follow-up to answer any questions you may have, secure your consent for the study, and to schedule

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dates to administer the survey. I appreciate your interest in and contribution to our profession.

Sincerely,

Valerie S. Fields, Ed. S.

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Permission from the Superintendent

Dear Colleague:

I am requesting permission to collect data from your school district's fourth and eighth grade teachers and students. Your signature is separate from the signatures that must also be obtained from the principals, teachers, and parents who wish to let their children participate in the study. Information pertaining to the study is listed below.

Title:
The Effects of the Teacher's Levels of Technology Integration on Student Achievement in Reading and Mathematics

Project Directors:
Dr. Kimberly Kimbell-Lopez
Valerie S. Fields

Department:
Curriculum, Instruction, and Leadership

Purpose of Study/Project:
The purpose of the study is to determine to what extent the level of technology integration by fourth and eighth grade teachers in rural schools affects student achievement in reading and mathematics.

Participants:
Approximately 1300 elementary and middle school students in Grades 4 and 8 enrolled in A, B, C, D, E, F, G, H, I, J, and K school districts.

Procedure:
Data for this study will be collected during the months of January and February of the 2004 school year. The researchers will obtain permission from the superintendent to administer the survey in their school district. A stamped addressed envelope will accompany the letter for his/her reply. Once permission has been granted by the superintendent another letter will be sent to principals with an attached copy from the superintendent granting permission to conduct the survey. Each principal at each elementary and middle school will receive a packet that will include step by step instructions to be placed in each 4 and 8 grade reading and mathematics teacher's box. Each teacher will follow instructions and complete the survey online or by paper pencil.

NOTE: Permission for all data collection and analysis will be requested through the aforementioned School Board Offices, principals of schools involved, and teachers at each school.

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Instruments and Measures to Insure Protection of Confidentiality, Anonymity:
All teachers who agree to participate will complete the online survey. Participants' names will not be used on any responses or reactions published with the results of this study. The teacher responses will be emailed to a specific server, and data will be transferred into a password-protected account. Data from the account will remain confidential. Teachers' fourth and eighth grade mean scores form the *LEAP 21* reading and mathematics areas will be analyzed with teachers' levels of technology implementation to verify if the teachers' level of implementation had an impact on student achievement. Aggregated scores from the eighth grade will be analyzed with teachers' levels of technology implementation to verify if the teachers' level of implementation had an impact on student achievement.

Risks/Alternatives Treatments:
There are no risks associated with participation in this study.

Benefits/ Compensations:
Upon request each school district will be provided with a profile for each teacher that will reflect the following domains:

- Level of Technology Use
- Personal Technology Use
- Current Instructional Practices

Specifically, each school district will be able to identify to what degree technology is being integrated, if teachers are comfortable or proficient with using technology, and if teachers feel that instructional practices are consistent with a learner-based curriculum design. This information can be used to assist in the writing of school technology improvement plans.

Safeguards of Physical and Emotional Well-Being:
Data will not be collected until permission is secured from the Human Use Committee of Louisiana Tech University. Individuals will be given the opportunity to ask questions of the research administrator and to call the project director or the Human Use Review Committee if they have further questions or concerns. The participants may withdraw from the investigation at any time without penalty.

Contact: The principal investigator listed below may be reached to answer any questions you may have about the research, participants' rights, or related matters.

Dr. Kimberly Kimbell-Lopez	257-2982
Valerie S. Fields	342-5287

The Human Use Committee may also be contacted if a problem cannot be discussed with the experimenter:

Dr. Mary Livingston	257-4315
Dr. Terry McConathy	257-2924
Mrs. Margaret Nolan	257-5075

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I, ________________________________, attest with my signature that I have read and understood the description of this study and its purposes and methods. I understand that my parish's participation in this research is strictly voluntary. Further, I understand that we may withdraw our participation at any time or refuse to answer questions without penalty. Upon completion of the study, I understand that the results will be freely accessible only to the principal investigators, a legally appointed representative, or myself. I have not been requested to waive, nor do I waive any of my rights related to participating in this study. I also understand that this agreement is separate from the written agreement that must also be obtained from the teachers who agree to participate in the study as well as the parental consent forms that must be obtained.

________________________________ ________________________________

Superintendent's Signature Date

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APPENDIX E

PERMISSION FROM THE PRINCIPAL

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Permission from the Principal

Dear Colleague

I am requesting permission to collect data in at your school in Grades 4 and 8. Your signature is separate from the signatures that must also be obtained from the teacher as well as the parents who wish to let their children participate in the study. Information pertaining to the study is listed below.

Title:
The Effects of the Teacher's Levels of Technology Integration on Student Achievement in Reading and Mathematics

Project Directors:
Dr. Kimberly Kimbell-Lopez
Valerie S. Fields

Department:
Curriculum, Instruction, and Leadership

Purpose of Study/Project:
The purpose of the study is to determine to what extent the level of technology integration by fourth and eighth grade teachers in rural schools affects student achievement in reading and mathematics.

Participants:
Approximately 1300 elementary and middle school students in Grades 4 and 8 enrolled in A, B, C, D, E, F, G, H, I, J, and K school districts.

Procedure:
Data for this study will be collected during the months of January and February of the 2004 school year. The researchers will obtain permission from the superintendent to administer the survey in their school district. A stamped addressed envelope will accompany the letter for his/her reply. Once permission has been granted by the superintendent another letter will be sent to principals with an attached copy from the superintendent granting permission to conduct the survey. Each principal at each elementary and middle school will receive a packet that will include step by step instructions to be placed in each 4 and 8 grade reading and mathematics teacher's box. Each teacher will follow instructions and complete the survey online or by paper pencil.

NOTE: Permission for all data collection and analysis will be requested through the aforementioned School Board Offices, principals of schools involved, and teachers at each school.

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Instruments and Measures to Insure Protection of Confidentiality, Anonymity:
All teachers who agree to participate will complete the online survey. Participants' names will not be used on any responses or reactions published with the results of this study. The teacher responses will be emailed to a specific server, and data will be transferred into a password-protected account. Data from the account will remain confidential. Teachers' fourth and eighth grade mean scores form the *LEAP 21* reading and mathematics areas will be analyzed with teachers' levels of technology implementation to verify if the teachers' level of implementation had an impact on student achievement. Aggregated scores from the eighth grade will be analyzed with teachers' levels of technology implementation to verify if the teachers' level of implementation had an impact on student achievement.
Risks/Alternatives Treatments:
There are no risks associated with participation in this study.

Benefits/ Compensations:
Upon request each school district will be provided with a profile for each teacher that will reflect the following domains:

- Level of Technology Use
- Personal Technology Use
- Current Instructional Practices

Specifically, each school district will be able to identify to what degree technology is being integrated, if teachers are comfortable or proficient with using technology, and if teachers feel that instructional practices are consistent with a learner-based curriculum design. This information can be used to assist in the writing of school technology improvement plans

Safeguards of Physical and Emotional Well-Being:
Data will not be collected until permission is secured from the Human Use Committee of Louisiana Tech University. Individuals will be given the opportunity to ask questions of the research administrator and to call the project director or the Human Use Review Committee if they have further questions or concerns. The participants may withdraw from the investigation at any time without penalty.

Contact: The principal investigator listed below may be reached to answer any questions you may have about the research, participants' rights, or related matters.

Dr. Kimberly Kimbell-Lopez	257-2982
Valerie S. Fields	342-5287

The Human Use Committee may also be contacted if a problem cannot be discussed with the experimenter:

Dr. Mary Livingston	257-4315
Dr. Terry McConathy	257-2924
Mrs. Margaret Nolan	257-5075

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I, ________________________________, attest with my signature that I have read and understood the description of this study and its purposes and methods. I understand that my school's participation in this research is strictly voluntary. Further, I understand that we may withdraw our participation at any time or refuse to answer questions without penalty. Upon completion of the study, I understand that the results will be freely accessible only to the principal investigators, a legally appointed representative, or myself. I have not been requested to waive, nor do I waive any of my rights related to participating in this study. I also understand that this agreement is separate from the written agreement that must also be obtained from the teachers who agree to participate in the study as well as the parental consent forms that must be obtained.

________________________________ ________________________________

Signature Date

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APPENDIX F

PERMISSION FROM THE TEACHER

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Permission from the Teacher

Dear _______________,

I am requesting permission to collect data in your classroom. Your signature is separate from the signatures that must also be obtained from your superintendent and principal who wish to participate in the study. You will be provided a summary of this project at the end of the study. Please let me know if there are any further questions I can answer concerning this project. If you agree to this proposal, then please sign below acknowledging your district's wish to participate.

Thank you,

Valerie S. Fields

Title:
The Effects of the Teacher's Levels of Technology Integration on Student Achievement in Reading and Mathematics

Project Directors:
Dr. Kimberly Kimbell-Lopez
Valerie S. Fields

Department:
Curriculum, Instruction, and Leadership

Purpose of Study/Project:
The purpose of the study is to determine to what extent the level of technology integration by fourth and eighth grade teachers in rural schools effects student achievement in reading and mathematics.

Participants:
Approximately 1300 elementary and middle school students in Grades 4 and 8 enrolled in A, B, C, D, E, F, G, H, I, J, and K school districts.

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NOTE: Permission for all data collection and analysis will be requested through the aforementioned School Board Offices, principals of schools involved, and teachers at each school.

Instruments and Measures to Insure Protection of Confidentiality, Anonymity:
All teachers who agree to participate will complete the online survey. Participants' names will not be used on any responses or reactions published with the results of this study. The teacher responses will be emailed to a specific server, and data will be transferred into a password-protected account. Data from the account will remain confidential. Teachers' fourth and eighth grade mean scores form the *LEAP 21* reading and mathematics areas will be analyzed with teachers' levels of technology implementation to verify if the teachers' level of implementation had an impact on student achievement. Aggregated scores from the eighth grade will be analyzed with teachers' levels of technology implementation to verify if the teachers' level of implementation had an impact on student achievement.

Risks/Alternatives Treatments:
There are no risks associated with participation in this study.

Benefits/ Compensations:
Upon request each school district will be provided with a profile for each teacher that will reflect the following domains:

- Level of Technology Use
- Personal Technology Use
- Current Instructional Practices

Specifically, each school district will be able to identify to what degree technology is being integrated, if teachers are comfortable or proficient with using technology, and if teachers feel that instructional practices are consistent with a learner-based curriculum design. This information can be used to assist in the writing of school technology improvement plans

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Dr. Kimberly Kimbell-Lopez	257-2982
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I, ________________________________, attest with my signature that I have read and understood the description of this study and its purposes and methods. I understand that my participation in this research is strictly voluntary. Further, I understand that I may withdraw my participation at any time or refuse to answer questions without penalty. Upon completion of the study, I understand that the results will be freely accessible only to the principal investigators, a legally appointed representative, or myself. I have not been requested to waive, nor do I waive any of my rights related to participating in this study.

______________________________ ______________________________
Signature Date

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APPENDIX G

INTERCORRELATIONS BETWEEN INDEPENDENT AND DEPENDENT VARIABLES (4TH GRADE READING)

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Intercorrelations Between Independent and Dependent Variables (4th Grade Reading)

		Reading	LOITR	CIPR	PCUR	HIGHR	YRSR	AGER	CERTR
Reading	Pearson Correlation	1	.048	-.043	-.108	.124	.261	-.063	.142
	Sig. (2-tailed)	.	.763	.787	.496	.478	.131	.705	.395
	N	42	42	42	42	35	35	38	38
LOITR	Pearson Correlation	.048	1	.276	.323	-.045	.305	.064	-.080
	Sig. (2-tailed)	.763	.	.077	.037	.799	.074	.701	.632
	N	42	42	42	42	35	35	38	38
CIPR	Pearson Correlation	-.043	.276	1	.600	.294	.247	.326	-.134
	Sig. (2-tailed)	.787	.077	.	.000	.087	.153	.046	.422
	N	42	42	42	42	35	35	38	38
PCUR	Pearson Correlation	-.108	.323	.600	1	.141	-.031	.015	-.083
	Sig. (2-tailed)	.496	.037	.000	.	.420	.861	.927	.620
	N	42	42	42	42	35	35	38	38
HIGHR	Pearson Correlation	.124	-.045	.294	.141	1	.448	.402	.194
	Sig. (2-tailed)	.478	.799	.087	.420	.	.008	.017	.265
	N	35	35	35	35	35	34	35	35
YRSR	Pearson Correlation	.261	.305	.247	-.031	.448	1	.684	.241
	Sig. (2-tailed)	.131	.074	.153	.861	.008	.	.000	.170
	N	35	35	35	35	34	35	34	34
AGER	Pearson Correlation	-.063	.064	.326	.015	.402	.684	1	.014
	Sig. (2-tailed)	.705	.701	.046	.927	.017	.000	.	.934
	N	38	38	38	38	35	34	38	38
CERTR	Pearson Correlation	.142	-.080	-.134	-.083	.194	.241	.014	1
	Sig. (2-tailed)	.395	.632	.422	.620	.265	.170	.934	.
	N	38	38	38	38	35	34	38	38

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

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

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APPENDIX H

INTERCORRELATIONS BETWEEN INDEPENDENT AND DEPENDENT VARIABLES (8TH GRADE READING)

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Intercorrelations Between Independent and Dependent Variables (8th Grade Reading)

		Reading	LOTIR	CIPR	PCUR	DEGR	YRSR	AGER	CERTR
Reading	Pearson Correlation	1	-.107	-.036	-.070	-.009	-.047	-.041	.021
	Sig. (2-tailed)	.	.587	.854	.719	.966	.829	.859	.915
	N	29	28	29	29	23	24	21	29
LOTIR	Pearson Correlation	-.107	1	.324	.493	.027	-.489	-.498	-.030
	Sig. (2-tailed)	.587	.	.092	.008	.904	.018	.025	.879
	N	28	28	28	28	22	23	20	28
CIPR	Pearson Correlation	-.036	.324	1	.468	-.095	-.150	-.249	-.161
	Sig. (2-tailed)	.854	.092	.	.010	.665	.483	.275	.404
	N	29	28	29	29	23	24	21	29
PCUR	Pearson Correlation	-.070	.493	.468	1	.003	-.523	-.115	-.193
	Sig. (2-tailed)	.719	.008	.010	.	987	.009	.618	.316
	N	29	28	29	29	23	24	21	29
DEGR	Pearson Correlation	-.009	.027	-.095	.003	1	.423	.547	.215
	Sig. (2-tailed)	.966	.904	.665	.987	.	.044	.013	.325
	N	23	22	23	23	23	23	20	23
YRSR	Pearson Correlation	-.047	-.489	-.150	-.523	.423	1	.785	.435
	Sig. (2-tailed)	.829	.018	.483	.009	.044	.	.000	.033
	N	24	23	24	24	23	24	21	24
AGER	Pearson Correlation	-.041	-.498	-.249	-.115	.547	.785	1	.278
	Sig. (2-tailed)	.859	.025	.275	.618	.013	.000	.	.222
	N	21	20	21	21	20	21	21	21
CERTR	Pearson Correlation	.021	-.030	-.161	-.193	.215	.435	.278	1
	Sig. (2-tailed)	.915	.879	.404	.316	.325	.033	.222	.
	N	29	28	29	29	23	24	21	29

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

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

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APPENDIX I

INTERCORRELATIONS BETWEEN INDEPENDENT AND DEPENDENT
VARIABLES (4TH GRADE
MATHEMATICS)

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Intercorrelations Between Independent and Dependent Variables (4th Grade Mathematics)

		MATH	LOTIM	CIPM	PCUM	HIGHM	YRSM	AGEM	CERTM
MATH	Pearson Correlation	1	.037	-.059	.068	.292	.199	.275	.297
	Sig. (2-tailed)	.	.824	.725	.684	.100	.276	.110	.084
	N	38	38	38	38	33	32	35	35
LOTIM	Pearson Correlation	.037	1	-.054	.015	-.176	-.117	.241	.126
	Sig. (2-tailed)	.824	.	.748	.928	.328	.525	.164	.471
	N	38	38	38	38	33	32	35	35
CIPM	Pearson Correlation	-.059	-.054	1	.493	.299	-.157	.117	-.447
	Sig. (2-tailed)	.725	.748	.	.002	.091	.390	.504	.007
	N	38	38	38	38	33	32	35	35
PCUM	Pearson Correlation	.068	.015	.493	1	.361	-.060	-.027	-.292
	Sig. (2-tailed)	.684	.928	.002	.	.039	.744	.876	.088
	N	38	38	38	38	33	32	35	35
HIGHM	Pearson Correlation	.292	-.176	.299	.361	1	.420	.193	.222
	Sig. (2-tailed)	.100	.328	.091	.039	.	.017	.283	.214
	N	33	33	33	33	33	32	33	33
YRSM	Pearson Correlation	.199	-.117	-.157	-.060	.420	1	.164	.301
	Sig. (2-tailed)	.276	.525	.390	.744	.017	.	.370	.095
	N	32	32	32	32	32	32	32	32
AGEM	Pearson Correlation	.275	.241	.117	-.027	.193	.164	1	.366
	Sig. (2-tailed)	.110	.164	.504	.876	.283	.370	.	.031
	N	35	35	35	35	33	32	35	35
CERTM	Pearson Correlation	.297	.126	-.447	-.292	.222	.301	.366	1
	Sig. (2-tailed)	.084	.471	.007	.088	.214	.095	.031	.
	N	35	35	35	35	33	32	35	35

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

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APPENDIX J

INTERCORRELATIONS BETWEEN INDEPENDENT AND DEPENDENT
VARIABLES (8TH GRADE
MATHEMATICS)

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Intercorrelations Between Independent and Dependent Variables (8th Grade Mathematics)

		MATH	LOTIM	CIPM	PCUM	DEGM	YRSM	AGEM	CERTM
MATH	Pearson Correlation	1	-.197	-.227	.125	-.325	-.170	-.237	.179
	Sig. (2-tailed)	.	.314	.246	.527	.130	.449	.289	.391
	N	28	28	28	28	23	22	22	25
LOTIM	Pearson Correlation	-.197	1	.491	.527	.020	-.159	-.184	.065
	Sig. (2-tailed)	.314	.	.008	.004	.927	.480	.412	.756
	N	28	28	28	28	23	22	22	25
CIPM	Pearson Correlation	-.227	.491	1	.605	-.040	-.140	-.362	.069
	Sig. (2-tailed)	.246	.008	.	.001	.858	.536	.098	.743
	N	28	28	28	28	23	22	22	25
PCUM	Pearson Correlation	.125	.527	.605	1	-.193	-.365	-.230	.029
	Sig. (2-tailed)	.527	.004	.001	.	.379	.095	.302	.890
	N	28	28	28	28	23	22	22	25
DEGM	Pearson Correlation	-.325	.020	-.040	-.193	1	.343	.102	.208
	Sig. (2-tailed)	.130	.927	.858	.379	.	.118	.659	.365
	N	23	23	23	23	23	22	21	21
YRSM	Pearson Correlation	-.170	-.159	-.140	-.365	.343	1	.511	.029
	Sig. (2-tailed)	.449	.480	.536	.095	.118	.	.018	.903
	N	22	22	22	22	22	22	21	20
AGEM	Pearson Correlation	-.237	-.184	-.362	-.230	.102	.511	1	-.039
	Sig. (2-tailed)	.289	.412	.098	.302	.659	.018	.	.873
	N	22	22	22	22	21	21	22	19
CERTM	Pearson Correlation	.179	.065	.069	.029	.208	.029	-.039	1
	Sig. (2-tailed)	.391	.756	.743	.890	.365	.903	.873	.
	N	25	25	25	25	21	20	19	28

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

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VITA

Valerie Savetria Fields was born in Monroe, Louisiana on June 23, 1967. The oldest of three children, Valerie was reared in a rural town, Winnsboro, Louisiana.

She graduated from Winnsboro High School in 1985. After graduation, Valerie attended Southern University Agricultural and Mechanical College in Baton Rouge, Louisiana. She received her bachelor's degree in Elementary Education (Early Childhood) in 1989.

Valerie accepted employment with the Monroe City School System as a kindergarten teacher in 1989. After teaching for two years, she entered graduate school at Northeast Louisiana University (NLU), now known as the University of Louisiana at Monroe, while working full-time. In 1992, Valerie earned her Master's Degree in Administration and Supervision and in 1997 earned her Education Specialist Degree in Administration and Supervision from Northeast Louisiana University, while working full-time.

In the Fall of 1998, she entered the Louisiana Consortium (LEC) doctoral program, home based at Louisiana Tech University, seeking a doctorate in Education (Curriculum and Instruction) with a cognate in technology. Again she continued to work full-time as the Director of Student Development at the University of Louisiana at Monroe. While pursing her doctorate, she served as mathematics consultant for East Carroll parish schools, and several committees at the university.

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Valerie was promoted to Assistant Dean of Student Life and Leadership at the University of Louisiana at Monroe, in 2003, she has been guest presenter at several conferences, civic, and social groups, as well as remaining an active participant on various university committees.

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