THE RELATIONSHIP BETWEEN TEACHER LEVELS OF TECHNOLOGY INTEGRATION (LoTi) ON 3RD-5TH GRADE STUDENTS ON THE TEXAS ASSESSMENT OF KNOWLEDGE AND SKILLS (TAKS) SCORES AT ALAMO HEIGHTS INDEPENDENT SCHOOL DISTRICT, SAN ANTONIO, TEXAS

A Record of Study

by

DANA M. BASHARA

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

August 2008

Major Subject: Educational Administration

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Approved by:

Co-Chairs of Committee,	Virginia Collier
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ABSTRACT

The Relationship Between Teacher Levels of Technology Integration (LoTi) on 3rd-5th Grade Students on the Texas Assessment of Knowledge and Skills (TAKS) Scores at Alamo Heights Independent School District, San Antonio, Texas. (August 2008)

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The purpose of this study was to examine Levels of Technology Implementation (LoTi) teacher self-ratings and Texas Assessment of Knowledge and Skills (TAKS) scores. The study assessed the relationship between LoTi ratings and TAKS scores of 3rd, 4th, and 5th grade students as reported in student records at Alamo Heights Independent School District (AHISD), San Antonio, Texas. The study determined the degree to which teacher LoTi ratings were a predictor of success on TAKS exam scores as reported in student records at Alamo Heights Independent School District, San Antonio, Texas. In addition, the study determined whether a teacher’s LoTi scores impacted students’ achievement levels for the variable of socioeconomic status.

School and student performance analysis included only Cambridge and Woodridge Elementary Schools in the Alamo Heights Independent School District. The student data in the study came from approximately 278 3rd graders, 268 4th graders, and

283 5th graders (829 total students). A total of 47 3rd, 4th, and 5th grade reading and math teachers from the two elementary campuses made up the population under study.

The research findings of this study included:

1. There was no significant relationship at the elementary level between teacher LoTi ratings and TAKS scores for reading and math for grades 3, 4, 5 students.
2. The grade 4 reading analysis results demonstrate that teachers with a higher LoTi level do impact student achievement on the TAKS test for students who are in the economically disadvantaged subpopulation.

The following recommendations were made:

1. Additional research is needed to examine how technology is specifically implemented in both reading and math classrooms at the elementary level.
2. Additional research is needed to examine how staff development on the LoTi instrument affected classroom practice and teacher responses on the LoTi survey.
3. Continued support is needed to provide teachers with professional development regarding the integration of technology as a teaching tool and repeat the research procedures after this initial year of using the LoTi instrument.

DEDICATION

To my daughters, Sadie Mae, Ainslie, and Addison

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There are so many people who contributed to the efforts of this project and for whom I am so very thankful. First, I am grateful for the support of the administration at Alamo Heights Independent School for allowing me the opportunity to conduct this research. A special thank you to Dr. Jerry Christian, Mary Zeigler, and Dr. Kevin Brown for their unending guidance throughout my professional career. Also, I thank Dr. Frank Alfaro for his encouragement, guidance, and friendship through the process and especially as I finished this project. I am most grateful for the many laughs along the way.

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I thank my mother for the many ways she supported and encouraged me throughout the doctoral program. At times she was needed to step in and help take care of my family in my absence, and it is because of her love that I ever even imagined I could take this on!

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CHAPTER I

INTRODUCTION

Today's instructional leaders continue to search for best practices of instruction to advance student academic achievement in schools throughout the country, and although research on these instructional practices is broad, common language about the importance of constructivist learning environments is evident. These kinds of classroom environments are ones in which students are active participants and decision-makers in their own learning, where higher order thinking skills are developed through student-centered learning, and where the teacher takes a facilitator role in the classroom (Marzano, Pickering, & Pollock, 2001; Roschelle, Pea, Hoadley, Gordin, & Means, 2000) instead of assuming traditional didactic teaching roles. With the onset of increased accountability and standards for student achievement, this kind of constructivist practice is essential in attaining high results within student learning outcomes. Research continues to support that teachers must teach through practices that meet the identified ways in which students learn best to attain these high levels of achievement (Caine & Caine, 1991; Roschelle et al., 2000) called for in today's accountability systems.

Imbedded in the constructivist learning literature, and prominently declared in the International Society for Technology Education literature, Instructional and Communications Technology (ICT) is noted as an important instructional component

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The style for this record of study follows that of the *Human Resource Development Quarterly*.

that contributes to student-centered learning and critical-thinking development (International Society for Technology in Education [ISTE], 2007; Robertson, 2003). Additionally, some research claims that technology integration within constructivist classrooms ultimately leads to these higher levels of student achievement (Kulik, 1994) by providing the students with opportunities for active participation and real life application in their learning environments (Brockmeier, Sermon, & Hope, 2005).

With the onset of technology expectations through the National Educational Technology Standards through ISTE in the early 1990s, the use of technology integration as an instructional tool became a priority for teachers. To assist with this prioritization, teachers across the country were called to receive training for effective implementation of technology into their classrooms as a means to meet student needs. Research claims that in order for teachers to use technology as an appropriate tool for instruction, it is essential that “their knowledge of educational technology encompass not just content knowledge, but pedagogy and pedagogical content knowledge” regarding technology integration as well (Leys & Adviser, 2004, p. 433).

Additionally, teachers progress through various stages of technology use in the classroom. From learning basic technology skills, to seeing value in using technology as a teaching tool, to rethinking the structure and goals of lessons, this progression of stages takes many forms. In order for teachers to sustain any kind of transformational learning for students through integrated technology, teachers must rethink their current teaching practices and continually modify the learning environment to utilize technology most effectively (Otero & Peressini, 2005). Basic training on computers evolved to professional development about "pedagogical content knowledge" regarding the appropriate use of technology within their instruction (Leys & Adviser, 2004) as new understandings concerning the way that computers are used in classrooms for instruction are surfacing (Warschauer, Knobel, & Stone, 2004). According to Wenglinsky (1998):

> Research also supports a link between teacher preparation and enhanced student achievement. Students of teachers who have had professional development in technology for teaching higher order thinking have higher levels of achievement than students whose teachers have not been prepared or who do not stress higher order thinking. (p. 435)

One tool that educational leaders use to assess the levels of technology integration in their schools is the LoTi (Levels of Technology Implementation) instrument designed by Chris Moersch in 2000. This tool provides educators with a framework for rating themselves in regard to their own technology implementation level in their classrooms. The framework focuses on the use of technology as a tool within the context of student-based instruction with an emphasis of the higher order thinking stressed above.

Another important issue in understanding the implication of technology integration in classrooms today is an understanding of how technology affects all kinds of learners. In today's system, educational accountability advocates for the academic achievement of all students in all demographic subgroups. In achieving this goal, it is important to analyze the way that appropriate technology integration as an instructional tool specifically benefits minority and low socio-economic students. Some research claims that students in these demographic groups identified as "at-risk" for failure are actually motivated through the use of instructional technology and the meaningful context it provides in their learning as well as the complex thinking skills they are called to utilize (Day, 2002; DiCinto & Gee, 1999; Means & Knapp, 1991). Additionally, research claims that in some cases, the disparities in student achievement in these populations is a result of “disparities in teacher readiness to use computers for educational purposes” (Chen & Price, 2006, p. 398).

Statement of the Problem

Instructional leaders must make informed decisions regarding the use of integrated technology as an instructional tool. At this point, more research is needed in order to understand the relationship between technology integration and student achievement (Chen & Price, 2006; Leys & Adviser, 2004; Warschauer et al., 2004; Wenglinksy, 1998). Additionally, some research suggests that technology is only utilized in classrooms in limited ways (Glennan & Melmed, 1996) as educators do not understand the vision for it’s potential and face barriers to integration that include limited leadership by their campus principal, limitations in time for training, and collaboration as well as adequate support and opportunity to apply new learning (Anderson & Dexter, 2005; Brockmeier et al., 2005).

With the onset of high accountability standards, leaders are searching for instructional practices that meet standards and promote high levels of student achievement for all students. With that charge, they must look to technology as a tool to transform what schools do instead of just improving the effectiveness of what is already taking place. The greatest benefits of technology come from the opportunity it provides a learning community to transform current practices in new ways of teaching characterized as constructivist, or actively-engaging learning (Jones, Valdez, Nowakowski, & Rasmussen, 1994). Through the analysis of the impact of technology integration on student achievement, leaders are more equipped to transform the current practices in their schools and meet the learning needs of all students. This study provides information to school leaders regarding the impact of technology integration on student achievement at the elementary level in both reading and math.

Purpose of the Study

The purpose of this study was to examine Levels of Technology Integration (LoTi) teacher self-ratings and Texas Assessment of Knowledge and Skills (TAKS) scores. The study assessed whether any relationship exists between LoTi ratings and TAKS math and reading scores of 3^{rd}, 4^{th}, and 5^{th} grade students as reported in student records at Alamo Heights Independent School District (ISD), San Antonio, Texas. The study investigated the degree to which teacher LoTi ratings are a predictor of success on TAKS exam scores as reported in student records at Alamo Heights Independent School District, San Antonio, Texas. In addition, the study analyzed differences among selected demographic variables as reported in student records at Alamo Heights Independent School District, San Antonio, Texas.

Research Questions

This study was guided by the following research questions:

1. Is there a relationship between teacher LoTi ratings and TAKS scores as reported in student records for 3rd, 4th, and 5th graders in the Alamo Heights Independent School District, San Antonio, Texas?
2. Is there a relationship between teacher LoTi ratings and TAKS scores as reported for 3rd, 4th, and 5th grade economically disadvantaged students in the Alamo Heights Independent School District, San Antonio, Texas?

Operational Definitions

The findings of this study are to be reviewed within the context of the following definitions of operational terminology:

Academic Excellence Indicator System (AEIS): This statewide system database compiles specific information regarding the broad operations and achievements of all Texas state independent school districts and their respective public campuses. The AEIS database includes quantitative reporting on student performance from the Texas Assessment of Knowledge and Skills (TAKS) and information from the Public Education Information Management System (PEIMS).

Demographic Variables: Ethnicity, gender, and economically disadvantaged status are demographic variables.

Economically Disadvantaged: Students can be identified as economically disadvantaged by an independent school district if they are eligible for free or reduced-price lunch, meet requirements for Title II of the Job Training Partnership Act (JPTA), receive food stamp benefits, or qualify for other public assistance. In addition, if students are under the parental or custodial care of a family with an annual income at or below the official federal poverty line regardless of public assistance, they, too, can be identified as economically disadvantaged.

Higher Order Thinking: Higher order thinking refers to the top levels of Bloom's taxonomy of thought – knowledge, comprehension, application, analysis, synthesis, and evaluation. The categories of application through evaluation are operationally defined as high order thinking.

Levels of Technology Integration (LoTi): LoTi is a term referring to a framework designed to measure classroom technology use. The framework focuses on the use of technology as a tool within the context of student-based instruction with an emphasis on higher order thinking. Three scores are gleaned from teacher responses to questions designed to measure Current Instructional Practice (CIP), Personal Computer Use (PCU), and Levels of Technology Integration (LoTi). A CIP score reports what methods the teacher uses to deliver instruction. How involved are the students in the classroom decision-making process? Do students help determine the problem being studied or have input in the final product that is produced? A PCU score reports how comfortable teachers are in using the technology tools involved in technology integration.

Predictor: Predictor is an item from which one may state, tell about, or make known in advance.

Public Education Information Management System (PEIMS): PEIMS is a statewide data management system for public education information in the state of Texas. For the purpose of this study, the major categories reported by the PEIMS report include student demographic and program participation data.

Relationship: A connection between a dependent and an independent variable as determined by a given statistical test is a relationship.

Technology: Examples of technology include computer workstations, laptops, handheld computers, digital cameras, probes, scanners, digital video cameras, analog video cameras, televisions, VCRs, and digital projectors.

Texas Assessment of Knowledge and Skills (TAKS): The TAKS measures student mastery of the Texas Essential Knowledge and Skills (TEKS), the statewide curriculum, in reading at Grades 3-9; in writing at Grades 4 and 7; in English Language Arts at Grades 10 and 11; in mathematics at Grades 3-11; in science at Grades 5, 10, and 11; and social studies at Grades 8, 10, and 11. The Spanish TAKS is administered at Grades 3 through 6. Satisfactory performance on the TAKS at Grade 11 is prerequisite to a high school diploma.

Texas Education Agency (TEA): The TEA is comprised of the commissioner of education and agency staff. The TEA and the State Board of Education (SBOE) guide and monitor activities and programs related to public education in Texas. The SBOE consists of 15 elected members representing different regions. One member is appointed chair by the governor. Under the leadership of the commissioner of education, the TEA administers the statewide assessment program, maintains a data collection system on public schools for a variety of purposes, and operates research and information programs among numerous other duties. The TEA operational costs are supported by both state and federal funds.

Assumptions

1. The respondents surveyed understood the scope of the study, the language of the instrument, were competent in self-reporting, and responded objectively and honestly.
2. Interpretation of the data collected accurately reflected the intent of the respondent.
3. The methodology proposed and described here offered a logical and appropriate design for this particular research project.

Limitations

1. The study was limited to a select number of teachers at Cambridge Elementary and Woodridge Elementary in the Alamo Heights Independent School District in San Antonio, Texas.
2. The study was limited to the information acquired from the literature reviews, achievement data on TAKS, and the teacher LoTi survey instrument.
3. Findings were generalized only to one school district, Alamo Heights Independent School District, San Antonio, Texas.

Significance Statement

The study determined whether there was a relationship between a teacher's level of technology integration (as measured by LoTi scores) and their students' TAKS test scores (as a measure of academic achievement both in reading and math). This analysis provided additional research to educational leaders about the appropriate use of technology in the classroom and the impact that this instructional practice has on student achievement.

Currently, there is little quantitative data on the utilization of technology as an instructional tool and the impact that it has on student achievement. The findings of the study contribute to the literature regarding appropriate uses of technology in the classroom as well as provide educational leaders with additional information about best instructional practices for their campuses.

Organization of the Record of Study

The record of study is divided into five major units or chapters. Chapter I contains the introduction, a statement of the problem, a purpose for the study, research questions, a brief description of operational definitions, as well as a significance statement. Chapter II contains a review of the literature pertinent to technology integration in classrooms. Chapter III discusses the methodology of the record of study including a description of the population under study as well as instrumentation, procedures, and data analysis. Chapter IV contains the analysis and comparisons of the data collected during the study. Chapter V contains the researcher's implications, conclusions, and recommendations for further study.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this section is to review relevant information related to student outcomes as a result of technology integration in classrooms. The review of literature is reported in the following sections:

Section one establishes the context through which technology integration has evolved to become an important instructional tool to meet students' needs and achieve high levels of learning in today's classrooms. Its purpose is to identify technology implementation as a current instructional tool that promotes student learning and achievement.

Section two addresses the various stages of technology integration in the classroom as well as the issue of the appropriate use of technology in the classroom. Both the understanding of the levels of technology integration as well as appropriate uses of technology in the classroom help identify conditions most conducive to student learning and student outcomes.

Section three expands on the previous section to present current issues of accountability that require high standards of instruction (that includes technology integration) for all students. More specifically in this section, equity issues for at-risk students are presented.

Section four describes different levels of technology implementation that can attribute to varying levels of student achievement. The Levels of Technology

Implementation (LoTi) instrument is described as a tool for assessing teachers' perceptions of their own level of technology implementation in their classrooms.

Section five presents relevant studies pertaining to technology integration and student achievement. There is a gap in literature that specifically identifies student achievement due to technology integration at the elementary level.

Technology Integration as an Instructional Tool

Almost 25 years ago, with the publication of *A Nation at Risk*, America engaged in an education reform movement that called instructional leaders to participate in a quest for instructional practices all aimed at the improvement of student achievement outcomes. This report incited a wealth of research to be conducted regarding what actually makes students learn best. Conversations and research took place about teaching and learning to reform current practices of instruction. According to Campoy (1992), the reform movement addressed two varying concerns that included both the need to address school improvement from within the current system and also the need to restructure parts of the education system away from a textbook-based curriculum, thus focusing on new ways of delivering student-centered learning. Computer technology was beginning to emerge as a critical part of this kind of learning and teaching (Campoy, 1992; Noble, 1996).

These kinds of student-centered classrooms began to evolve into environments in which the students became active participants and decision makers in their own learning. In these classrooms, higher order thinking skills were stressed and developed through student centered learning, and they are ones in which the teacher took a facilitator role in advancing student learning (Caine & Caine, 1991; Marzano et al., 2001; Roschelle et al., 2000). Traditional teaching roles where the teacher assumes a didactic, information disseminating approach, are abandoned to allow for this facilitator role where student needs are met and higher levels of achievement are attained (Roschelle et al., 2000). This kind of teaching is thought to reach students in the way they learn best and is also thought to make the most sense in constructing real world knowledge. The newly acquired knowledge attained through these kinds of learning situations is most apt to be transferred into real world applications.

Educators committed to this kind of teaching understand that knowledge and learning have to be constructed within the cognitive structure of the individual learner. This kind of constructivist environment facilitates student learning by: (a) focusing learners on what they already know, (b) promoting a receptive atmosphere for the introduction of new information, (c) preparing activities that extend learning to assimilate or revise students' current knowledge structure, and (d) providing time for reflection an sharing so learners become aware of a new cognitive structures and abilities (Zahorik, 1995).

This evolution of instructional practice then naturally led to the integration of technology as a teaching tool to help create these kinds of constructivist classrooms. Technology was introduced as a way to help students take a more active role in the classroom, make real world connections in their learning, and construct knowledge in more meaningful ways. During the time of the publication of *A Nation at Risk*, computers were evident and available in classrooms; however, effective ways to integrate technology in classrooms was a new topic for reform efforts. As far back as 1996, the U.S. Department of Education (as cited in Noble, 1996) report claimed that as the nation moves into the 21st century, a student's ability to "learn to higher standards" would be inseparable from the student's ability to understand and access technology. No longer was it acceptable to experience merely basic exposure to computer functions, it became essential for educators to prepare students for tomorrow's world where information and communication technology would shape the way they conducted business (Noble, 1996).

Instructional and Communications Technology (ICT) emerged as an important instructional component contributing to these kinds of learner-centered classrooms and ultimately yielding higher levels of student achievement (ISTE, 2007; Kulik, 1994; Robertson, 2003). Furthermore, according to Hadley and Sheingold (1990), technology integration facilitates constructivist teaching enabling teachers to:

1. increase individualized student-centered work
2. spend less time lecturing
3. better present more complex issues
4. expect more from students

According to the National Education Technology Standards (ISTE, 2007), technology is not to be promoted "in isolation, but rather as an integral component or tool for learning and communications with in the context of academic subject area" (p. 8). Therefore, it is important to understand that technology integration is dependent upon both a teacher's technical knowledge, integration with subject matter, and pedagogical knowledge (Otero & Peressini 2005; Sandholtz, 2001). True integration is viewed as an instructional strategy where teachers utilize technology hardware and software to engage student's construction of new knowledge.

Through an analysis of the research, it becomes apparent that constructivist approaches reinforce cognitive research showing that learning is most effective when four fundamental characteristics are present: "(1) active engagement, (2) participation in groups, (3) frequent interaction and feedback, and (4) connections to real world contexts" (Roschelle et al., 2000, p. 50) and further determines that the "structure and resources of traditional classrooms often provide quite poor support for learning, whereas technology, when used effectively—can enable ways of teaching that are much better matched to how children learn" (p. 79). And although "teachers can use a diverse range of approaches to implement constructivist-compatible teaching, policymakers increasingly are recognizing the potential role of computers for implementing constructivist approaches" (Becker & Ravitz, 2000, p. 357). Information and communications technology is linked repeatedly in the research to constructivism and the creation of the optimal environments in which student learning can take place (Kim, 2006; Perry, 2004; Siegle & Foster, 2001; Singhanayok & Hooper, 1998; Wilson, 2007).

With this evolution to appropriate technology integration as a sound educational practice, standards for implementation on the national level surfaced and have been continuously revised. The latest ISTE standards for technology integration include foundation standards for all students including:

1. Basic operations and concepts
2. Social ethical and human issues
3. Technology productivity tools
4. Technology communication tools
5. Technology research tools
6. Technology problem-solving and decision-making tools.

Additional standards were published by the National Education Technology Standards Project (ISTE, 2007) to identify profiles for students in PreK-12 that outline specific “technology skills that are to be developed by coordinated activities that support learning throughout a student’s education . . . [representing] essential, realistic, and attainable goals for lifelong learning and productive citizenry” (p. 7). Reinforced throughout the standards document is the assertion that technology is not to be utilized in isolation, “but rather as an integral component or tool for learning and communications within the context of academic subjects” (p. 8). With the onset of national technology standards to reinforce the utilization of technology integration in classrooms, it becomes increasingly important to understand the way instructional technology promotes high levels of student learning.

Stages of Technology Integration

Research regarding technology implementation and its effect on student achievement must take into account the varied and multiple stages of integration evident in classrooms. As stated above, technology integration involves a teacher’s technical knowledge as well as their pedagogical knowledge and practice. Primarily determined by the amount and levels of training received, technology integration can progress from the utilization of technology for basic skill processing to a complete rethinking of the classroom structure and pedagogical practices (Deacon, 1999; Denson, 2005; Griffin, 2003; Kitchenham, 2006; Leys & Adviser, 2004; Romano, 2004; Royer, 2002; Woodridge, 2003; Yang, 2004) by the classroom teacher. According to Otero and Peressini (2005), there are five specific phases through which teachers progress:

> In the **familiarization** phase, the teacher simply learns how to use the technology. At the **utilization** phase, the teacher uses technology in the classroom but has little understanding of, or commitment to, the technology as a pedagogical and learning tool. During the **integration** phase, the technology becomes an integral part of the course in terms of delivery, learning management, or other aspects of the class. In the **reorientation** phase, the teacher uses the technology as a tool to facilitate the reconsideration of the purpose and function of the classroom. Finally, teachers who reach the **evolution** phase are able to continually modify the classroom structure and pedagogy to include evolving learning theory, technologies, and lessons learned from experience. (p. 10)

Appropriate technology integration calls teachers to rethink current teaching practices and continually modify the learning environment to use computers in teaching most effectively (Martin, 2005; Otero & Peressini, 2005; Waxman, Lin, & Michko, 2003; Wenglinsky, 1998). This kind of integration presents a challenge for educators to "move away from using computers as a kind of modern tablet . . . and instead use computers to help students solve problems in the content areas" (Wenglinsky, 1998) ultimately promoting the use of technology as a means of reinforcing higher order thinking skills. According to Wenglinsky (1998), "students of teachers who have had professional development in technology use and whose teachers use technology for teaching higher order thinking have higher levels of achievement than students whose teachers have not been prepared or who do not stress higher order thinking" (p. 435).

Brockmeier et al. (2005) assert, "the integration of technology to achieve positive learning outcomes cannot be left to chance, but must emanate from implementation driven by an understanding of how best to use technology" (p. 55). Becker and Ravitz (2000) found that three resources must be present for teachers to change (a) opinion climate, (b) information and social support resources, and (c) appropriate educational resources in sufficient quantity. *Opinion climate* refers to the culture of the school regarding the taking of risk in changes of pedagogy as dependent upon the climate of peer opinion in the school. In other words, for teachers to make the investment of time and energy, the consensus in the school must be that a majority of the teachers see benefit to the change. *Information and social support resources* are those that refer to the networks of support available to the teachers as they learn and then change their way of delivering instruction. These kinds of support resources can vary from the amount of appropriated time teachers are afforded to process their new learning to the logistical support available by technology specialists in the schools who support teacher learning and implementation of new practices. *Appropriate educational resources in sufficient quantity* reinforces the need for materials, staff development, and planning time to implement this kind of appropriate technology integration where teachers are given the "opportunity to develop their own skills" (Roschelle et al., 2000). Teachers must be given ample training opportunities, time to process their new learning, and ample equipment to feel comfortable in implementing new teaching practices. It is only through these kinds of resources and support efforts that research links the highest levels of integration in the classroom (Denson, 2005; Fields, 2004; Griffin, 2003; Kozloski, 2006; Jones et al., 1994; Roschelle et al., 2000).

A final resource to consider when analyzing differing levels of technology implementation in the classroom is the leadership in the school in regards to instructional expectations and visioning. Principals in the schools play an important role in determining the climate and culture of a school adapting to new practices of integrating technology as an effective teaching tool (Jacoby, 2006; Scanga, 2004; Whitehead, Jensen, & Boschee, 2003). Brockmeier et al. (2005) explains

> as instructional leaders, principals facilitate teachers' integration of computer technology into the teaching and learning process . . . in the visionary role, principals establish a context for technology in the school and understand how technology can be used to restructure learning environments and empower teachers and students to be technologically astute. (p. 46)

Additionally, research does support the finding that for technology integration to reach high levels in the classroom and affect student achievement, the campus principal must be prepared to act as a technology leader (Anderson & Dexter, 2005; Brockmeier et al., 2005; Rogers, 2000).

When teachers reach high levels of technology integration, as evident in their classroom structure and pedagogy, students benefit from new learning opportunities that promote higher order thinking (Otero & Peressini, 2005). This finding is reiterated in the research conducted by Wenglinsky (1998) utilizing the data from the 1996 National Assessment of Educational Progress (NAEP) in mathematics. In this study, Wenglinsky records higher levels of achievement in math classrooms where students were using technology for application and simulations versus the results in classrooms where the students utilized technology for math drills.

For high levels of technology implementation to be attained in the classroom, teachers must abandon traditional teaching methods and adopt those in support of the constructivist classroom. This shift in pedagogical practice does require numerous resources and does occur in various stages of implementation. When analyzing the effect of technology integration on student achievement, it is essential to evaluate these stages of implementation as student achievement outcomes are often linked to *how* teachers use technology in their teaching (Leys & Adviser, 2004).

Current Accountability Issues

Another current issue in the educational research about technology integration and student achievement is the equity issue concerning the "digital divide," or the disparity in achievement by low socioeconomic students due to a perceived lack of exposure, high quality teaching strategies, and resource allocation in the area of technology (Queener, 2007; Warschauer et al., 2004). With the implementation of the No Child Left Behind legislature, education systems are called to higher level of accountability for all students in the classroom, focusing specific attention to the gaps in achievement evident in minority and low socio-economic populations in the schools. The disparity that was evident preceding this legislative accountability is still evident in both achievement data as well as technology opportunity in schools across the country (Lowther, Ross, & Morrison, 2003; Nichols & Berliner, 2007). Warschauer et al. (2004) explain:

> The rapid diffusion of information and communication technology (ICT) in the past decade has added an important new element to the issue of education inequality. New technologies are widely viewed as having the potential to either alleviate or exacerbate existing inequalities. On one hand, if computers and the Internet are distributed equally and used well, they are viewed as powerful tools to increase learning among marginalized students and provide greater access to a broader information society. On the other hand, many fear that unequal access to new technologies, both at school and at home, will serve to heighten educational and social stratification, thereby creating a new digital divide. (p. 563)

And although the disparities still do exist regarding the numbers and the quality of technology resources in schools, the gaps are being narrowed as technology is becoming more readily available to these students (Cuban, 2001).

The way these technologies are used in the classroom or the *how* of technology integration is becoming a more pronounced cause of some of the disparities noted (Dunkel, 1990; Merino, Legarreta, Coughran, & Hoskins, 1990; Warschauer et al., 2004). For example, students in wealthier schools were found to be more likely to use computers to develop higher order skills, while students in poorer schools used computers for repetition of drill practice (Cuban, 2001). Students in these schools, then, are not learning how to utilize computers to construct their own knowledge and explore their world. The concern is that these students will, therefore, never understand the utilization of technology as a learning tool.

Additional causes of the noted disparities are those commonly cited as frustrations in schools with high numbers of economically disadvantaged students: minimal opportunities for quality staff development and a lack of resources (time, money, leadership) focused on the integration of technology into instruction. Research does suggest that these students would benefit from instruction that was changed as a result of high quality teacher training in the appropriate strategies to integrate technology (Chen & Price, 2006) and from leadership at schools focused on this kind of technology implementation (Anderson & Dexter, 2005). To respond to the challenge to meet the learning needs of all students, educators rely on the evidence that supports the finding that the appropriate integration of technology does positively influence students (Dunkel, 1990; Means & Olson, 1995; Merino et al., 1990; Roschelle et al., 2000).

LoTi Instrument

In order to determine the effect technology implementation has on student achievement, it is essential to understand *how* teachers implement technology in the classroom. Furthermore, when analyzing the effects of implementation on students for equity purposes, a teachers' implementation stage can affect their practices and thus influence student outcomes. The researcher then introduces the use of a specific tool, the LoTi instrument, as a means for assessing the various levels of technology integration evident in classrooms.

The LoTi instrument was created by Dr. Moersch in 1995 to measure specific levels of technology integration. Based on research that demonstrates the importance of constructivist environments in learning for students, the instrument looks at the instruction taking place in the classroom instead of just focusing on the technology tools being utilized. The purpose of the instrument stated clearly by Moersch (2001) is to provide "policy makers, school administrators, and classroom practitioners with the most consistent data to make informed decisions as to the real needs for improving the technology infrastructure beyond hardware and software issues" as well as to plan for "the type of professional development interventions needed to maximize the level of technology implementation in the classroom" (p. 27).

Through a series of 40 questions, teachers self-rate their Current Instructional Practice (CIP), Patterns of Computer Use (PCU), and Levels of Technology Implementation (LoTi). A CIP score reports (on a scale of 0-7) how a teacher delivers instruction in the classroom. These reports identify classroom characteristics that promote constructivist classroom environments including: (a) student involvement in the decision-making process, (b) student involvement in the evaluation process, and (c) student ownership of final projects, cooperative learning, and opportunities to advance higher order thinking. The PCU score reports how comfortable teachers are (on a scale of 0-7) in using technology tools involved in integration. The LoTi score (on a scale of 0-6) reports the level of implementation of technology in a classroom for teaching and learning. Teachers can demonstrate the following implementation levels: Nonuse (Level 0), Awareness (Level 1), Exploration (Level 2), Infusion (Level 3), Mechanical Integration (Level 4A), Routine Integration (Level 4B), Expansion (Level 5), and Refinement (Level 6). Moersch explains "as a teacher progresses from one level to the next, a series of changes to the instructional curriculum is observed. The instructional focus shifts from being teacher-centered to being learner-centered" (p. 41) as in a constructivist learning environment. He explains:

> Computer technology is employed as a tool that supports and extends students' understanding of the pertinent concepts, processes and themes involved . . . [and] heavy reliance on textbooks and sequential

> instructional materials is replaced by the use of extensive and diversified resources determined by the problem area under discussion. Traditional evaluation practices are supplanted by multiple assessment strategies that utilize portfolios, open-ended questions, self-analysis, and peer review. (p. 41)

Moersch (2001) provides a framework for analyzing characteristics and benchmarks of technology implementation according to the teacher's LoTi level as noted in Table 2.1.

Levels of Technology Implementation (LoTi): A Framework for Measuring Classroom Technology Use, Last Updated, September 30, 2004

A study to assess the validity of the LoTi survey was conducted in 2006 by Dr. Jill Stoltzfus of Temple University and addressed the following: internal reliability, content validity, and construct validity (Stoltzfus, 2006). The results of this study indicated that each of the three measures (CIP, PCU, and LoTi) achieved content validity. Therefore, the content of the survey accurately reflects levels of technology integration.

The second finding reported that both the PCU and CIP measures were considered statistically reliable measures and, therefore, correlated with each other as an accurate gauge of traits indicating technology integration. Finally, the study reported that LoTi level 0 as a base point was statistically reliable and, therefore, is an empirically valid measurement.

Table 2.1. Framework for Analyzing Characteristics and Benchmarks of Technology Implementation According to the Teacher's Loti Level

LoTi Level	General Technology Use	Specific Characteristics
0 - Nonuse		• No technology use • Perception that technology use has no value to learning
1 - Awareness		• No student use of technology tied to content • Computer is a reward station for non-content related work • Technology is used mostly by the teacher/facilitator
2 - Exploration	Teacher-Centered	• Lower order thinking skills (i.e., knowledge, comprehension) • Focus is strictly on content understanding
3 - Infusion	Teacher-Centered	• Higher order thinking skills (i.e., application, analysis, synthesis, & evaluation) • Focus is on the content and the process • Teaching may be learner-centered
4 - Integration	Student-Centered	• Students are applying learning to real world • Learning becomes authentic and relevant • 4a – teacher experiences management concerns • 4b – teacher is in comfort zone • Teaching is student-centered
5 - Expansion	Student-Centered	• Two-way collaboration with community • Multiple technologies in use
6 - Refinement	Student-Centered	• Same as level 5 • Infrastructure and funding are in place

For the purpose of this study, two categories of the LoTi instrument were utilized. First, the LoTi category provides information regarding the teachers' own perception of their technology implementation level. Second, the instrument provides a measurement of the degree to which new instructional practices are child-centered, hands on, constructivist, and collaborative in the Stages of Instructional Practice (CIP) category. Both the LoTi score and the CIP score can provide information regarding how the teacher is implementing technology as a teaching tool in the classroom. It is important to remember that the instrument is apt to fall bias to subjective responses of the teachers since it is based on a self-rating scale.

Student Achievement and Technology in the Literature

Although computers have been utilized in classrooms for over two decades, there is not a wealth of information regarding the way the use of technology correlates with student achievement outcomes, resulting in a need for specific research in this area (Cradler, McNabb, Freeman, & Burchett, 2002; Merino et al., 1990; Micheaux-Gordon, 2006). Furthermore, the current research available varies extensively according to grade levels, content area focus, specificity of technology applications, and overarching purpose causing the findings to be limited and not easily generalized throughout the field (Fields, 2004; Glennan & Melmed, 1996; Jones et al., 1994; Lowther et al., 2003; Martin, 2005; Micheaux-Gordon, 2006; Queener, 2007; Wendt, 2007; Wilson, 2007). For educators to make appropriate decisions about utilizing technology in the most beneficial ways to impact student learning, it is critical to understand some of the key findings in the body of research.

First, research does indicate that successful technology – rich schools generate impressive results for students including improved achievement, higher test scores, improved student attitude, and engagement in school (Anderson, & Dexter, 2005; Campoy, 1992; Glennan & Melmed, 1996; Jones et al., 1994). Additionally, these technology-rich schools, according to a U.S. Department of Education funded study, promote "educational gains for all students regardless of age, race, parental income, or other characteristics" (Means & Olson, 1995, p. 46). More benefits of technology integration are cited through Cradler et al.'s (2002) meta-analysis of the findings from many studies, and cite the following outcomes:

1. An increase in student performance with interactivity present.
2. An increase in interactivity within the instructional program.
3. An increase in effectiveness when multiple technologies are present (video, computer, telecommunication, etc.).
4. An improvement in attitude and confidence, especially for "at-risk" students.
5. An increase in instructional opportunities not otherwise available.
6. Opportunity for an increase in student-constructed learning.
7. An increase in student collaboration on projects.
8. An increase in the mastery of vocational and workforce skills.
9. Preparation for students for work and an increase in problem-solving skills.
10. Improved writing skills and feelings about writing for urban LEP students.

Further support for a connection between student achievement and technology integration is cited in Kulik's (1994) comprehensive *Meta-Analytic Studies of Findings on Computer-Based Instruction Analysis of Computer-Based Instruction*. In this analysis, the following results were reported:

1. Students usually learn more in classes in which they receive computer-based instruction.
2. Students learn their lesson in less time with computer-based instruction.
3. Students also like their classes more when they receive computer help in them.
4. Students develop more positive attitudes toward computers when they receive help from them in school.

Wenglinsky (1998) published another widely cited study based on the test scores from the 1996 National Assessment of Educational Practices in *Does It Compute: The Relationship Between Educational Technology and Student Achievement*. The research in this study reported:

1. Eighth graders whose teachers used computers mostly for “simulations and applications” generally associated with higher order thinking performed better on NAEP than students whose teachers did not.
2. Fourth graders whose teachers used technology for learning games scored higher than students whose teachers did not.
3. Fourth graders whose teachers were trained in technology integration outperformed students whose teachers did not.

One of the most significant and current studies, conducted through The Center for Applied Research in Educational Technology (CARET)(Cradler et al., 2002), gathered findings from a body of research on ways technology influences student achievement in three goal areas including: (a) achievement in content area learning, (b) higher order thinking and problem-solving skill development, and (c) workplace preparation (Cradler et al., 2002). According to Cradler et al. (2002), findings in regard to achievement in content area conclude that "technology can have the greatest impact when integrated into the curriculum to achieve clear, measurable educational objectives" (p. 47). One specific finding claims that in English language arts and social studies, teachers reported "significant change in student skills and knowledge" after utilizing technology for learning. Additionally, the report cited technology does "aid the development of critical thinking skills" and it can be useful in "linking workforce experiences with academic subjects" (Cradler et al., 2002, p. 47). In an analysis of the findings of this report, Cradler suggests that "the research indicates the need for understanding the combined efforts necessary for technology to positively influence students' academic performance" (p. 49).

Finally, a comprehensive report published by Apple Classrooms of Tomorrow (2002) concludes:

1. Students, especially those with few advantages in life, learn basic skills – reading, writing, and arithmetic – better and faster if they have a chance to practice those skills using technology.
2. Technology engages students, and as a result, they spend more time on basic learning tasks than students who use a more traditional approach.
3. Technology offers educators a way to individualize curriculum and customize it to the needs of individual students so all children can achieve their potential.

4. Students who have the opportunity to use technology to acquire and organize information show a higher level of comprehension and a greater likelihood of using what they learn later in their lives.
5. By giving students access to a broader range of resources and technologies, students can use a variety of communication media to express their ideas more clearly and powerfully.
6. Technology can decrease absenteeism, lower dropout rates, and motivate more students to continue on to college.
7. Students who regularly use technology take more pride in their work, have greater confidence in their abilities, and develop higher levels of self-esteem.

Research is varied and broad regarding the uses of technology for increased student achievement. Fundamentally, however, there is a breadth of research asserting that technology must be used in *appropriate* ways to achieve the desired results (Day, 2002; Merino et al., 1990; Royer, 2002; Yang, 2004). Using technology in such a way that creates a constructivist environment in the classroom, for example, according to Roshelle et al. (2000), leads to “increased motivation, a deeper understanding of concepts and an increased willingness to tackle difficult questions” (p. 81). Overall, the researchers claim: “Technology – when used effectively – can enable ways of teaching that are a much better match to how children learn” (Roschelle et al., 2000, p. 79).

This study aims to specifically determine whether there is a relationship between teachers who appropriately integrate technology in classrooms and the achievement of their students at the elementary level. Little research has been conducted on this level

(Schechter, 2000; Truett, 2006; Wendt, 2007) and further investigation will provide additional understandings into the way technology impacts student learning.

Conclusion

The preceding areas of literature review outline the importance of additional research in regards to technology implementation and student achievement at the elementary level. The record of study formulated as a result of the review of literature aims to provide teachers and administrators with pertinent information regarding one such sample from two elementary campuses in Alamo Heights Independent School District.

As pointed out in the literature review, technology implementation has evolved historically to include constructivist, higher order teaching practices that accommodate students' needs as learners. This evolution calls for a careful understanding of the levels of implementation of technology in classrooms and the differentiation of appropriate uses of technology to meet student needs. Additionally, then, with this understanding, an analysis of the accountability standards for all students was discussed as a means of providing information about how technology can impact even the at-risk student (for the purposes of this study as identified by their low-socio-economic status). Finally, the LoTi instrument was discussed to provide information about ways to assess technology integration in classrooms. An overview of the research related to student achievement and technology integration was provided and supports the need for additional time to be invested in further study, particularly at the elementary level.

CHAPTER III

METHODOLOGY

The purpose of this chapter was to describe the sampling, testing, and statistical procedures used in the study. Additionally, the researcher's two research questions that frame the study are reintroduced to provide more detail about the procedures of the study.

After completing the literature review, it is evident that appropriate technology integration in the classroom can affect student achievement. Teachers in Alamo Heights Independent School District were trained to use the LoTi instrument to determine their own personal levels of technology integration and current instructional practices as a means of informing their practice. The LoTi instrument, developed by Dr. Chris Moersch, is a self-rating evaluation tool to assess a teacher's perception of his/her own level of technology integration in the classroom. Three different scores are derived from the instrument including a teacher's Current Instructional Practices (CIP), Patterns of Computers Use (PCU) and Levels of Technology Implementation (LoTi). The LoTi scores are utilized in this study in attempt to determine whether teachers with higher levels of technology integration have positive effects on student achievement outcomes on the TAKS test in the 3^{rd}, 4^{th}, and 5^{th} grades for math and reading.

A LoTi score ranges 0-6 and reports the teacher's perceived level of technology implementation in their classroom. The following categories label the levels of implementation: 0=Nonuse, 1=Awareness, 2=Exploration, 3=Infusion, 4=Mechanical Integration/Routine Integration, 5=Expansion, and 6=Refinement. Teachers are provided with training opportunities to determine the characteristics of a classroom with technology integration at each level. It is understood through this training that teachers move from one level of integration to the next based on observable instructional practices that integrate technology into the current curriculum (Moersch, 2001).

Currently, there is not any research particular to teacher perception of technology integration on the elementary levels and student achievement in Alamo Heights Independent School District. The following two research questions were analyzed in attempt to determine whether there was a relationship between technology implementation and student achievement:

1. Is there a relationship between teacher LoTi ratings and TAKS scores as reported in student records for 3^{rd}, 4^{th}, and 5^{th} graders in the Alamo Heights Independent School District, San Antonio, Texas?
2. Is there a relationship between teacher LoTi ratings and TAKS scores as reported for 3^{rd}, 4^{th}, and 5^{th} grade economically disadvantaged students in the Alamo Heights Independent School District, San Antonio, Texas?

The researcher utilized existing data from the district's LoTi database and aligned it with student achievement TAKS data. Additionally, existing Public Education Information Management Systems (PEIMS) data were utilized to determine socio-economic background to address the second research question. The specific procedures used for the data collection process are described in the following sections.

Population

Student and teacher data from Alamo Heights Independent School District (AHISD) two elementary schools (Cambridge Elementary and Woodridge Elementary) was used for the purpose of this study. The student data were derived from the 829 students who took the math TAKS tests in grades 3, 4, and 5 and the 822 students who took the reading TAKS test in grades 3, 4, and 5. Further, the teacher LoTi scores were derived from the 17 3rd grade teachers, 15 4th grade teachers, and 15 5th grade teachers at both elementary schools. Data from a total of 47 teacher LoTi survey scores were used for the analysis. The population for the math analysis is summarized below in Table 3.1 and the population for the reading analysis is summarized below in Table 3.2.

Table 3.1. Summary of Population of Math Students and Teachers Under Study From Cambridge and Woodridge Elementary Schools in the Alamo Heights Independent School District, San Antonio, Texas

Population	Grade 3	Grade 4	Grade 5
Students	278	268	283
Teachers	17	15	15

Table 3.2. Summary of Population of Reading Students and Teachers Under Study From Cambridge and Woodridge Elementary Schools in the Alamo Heights Independent School District, San Antonio, Texas

Population	Grade 3	Grade 4	Grade 5
Students	277	267	278
Teachers	17	15	15

Instrumentation

This study utilized the LoTi questionnaire developed and validated by Chris Moersch (1995) consisting of 40 questions through which teachers self-rated their level of technology integration in the classroom (Appendix A). The questionnaire is considered a valid and reliable instrument for measuring teachers' self-perceptions relating to their level of technology integration (Moersch, 1995; Stolzfus, 2006). A letter was written to Dr. Moersch requesting permission for use of the questionnaire in the current study. Permission was granted to use the LoTi questionnaire (Appendix B). Additionally, a letter was written granting the researcher permission to use the data from the survey from the school district.

The 40 questions on the instrument are divided throughout eight sections. Five questions are dedicated to each of the eight Levels of Technology Implementation as depicted in Table 3.3.

Levels of Technology Implementation (LoTi): A Framework for Measuring Classroom Technology Use, Last Updated, September 30, 2004

When teachers originally took the survey in February 2007 as part of an annual district requirement, 10 additional questions were administered to determine Current Instructional Practice and Personal Computer Use levels. For the purpose of this study, only the LoTi scores were used since they directly depict the levels of technology implementation in the classroom and fit best with the goal of the research questions. Teacher LoTi scores were exported into a Microsoft Excel spreadsheet for data analysis.

Table 3.3 Levels of Technology Implementation

LoTi Level	General Technology Use	Specific Characteristics
0 - Nonuse		• No technology use • Perception that technology use has no value to learning
1 - Awareness		• No student use of technology tied to content • Computer is a reward station for non-content related work • Technology is used mostly by the teacher/ facilitator
2 - Exploration	Teacher-Centered	• Lower order thinking skills (i.e., knowledge, comprehension) • Focus is strictly on content understanding
3 - Infusion	Teacher-Centered	• Higher order thinking skills (i.e., application, analysis, synthesis & evaluation) • Focus is on the content and the process • Teaching may be learner-centered
4 - Integration	Student-Centered	• Students are applying learning to real world • Learning becomes authentic and relevant • 4a – teacher experiences management concerns • 4b – teacher is in comfort zone • Teaching is student-centered
5 - Expansion	Student-Centered	• Two-way collaboration with community • Multiple technologies in use
6 - Refinement	Student-Centered	• Same as level 5 • Infrastructure and funding are in place

Procedures

The procedures for collecting the data were coordinated with the Alamo Heights ISD Central Office. Permission was granted by the district for the research study during the Spring of 2007 and data were collected in the Summer of 2007. A total of 47 teachers took the LoTi survey on their own campuses during the Spring of 2007. All

LoTi data were stored centrally on a district-managed database that listed teacher identification numbers and teacher scores. These scores were then transferred to a Microsoft Excel file (excluding the identity of the teacher) for the purpose of the research study.

Student data were derived from the Spring 2007 TAKS results for math and reading for grades 3, 4, and 5. Data were attained through the AEIS-IT software and was listed as a scale score by each individual student identification number. This data were then exported into a Microsoft Excel spreadsheet for data analysis.

A Master Microsoft Excel database was created and divided into three sections as follows:

- Section 1. The first section was composed of all the teacher LoTi data scores for technology implementation. Teacher identities were kept confidential by utilizing their teacher ID numbers in this section.
- Section 2. The second section collected all the student test data on the state test (the Texas Assessment of Knowledge and Skills [TAKS] test). In this section, student demographic data were collected along with their TAKS scores. Students were identified by their PEIMS number, full name, current grade level, and socio-economic status. Alamo Heights ISD uses a student's free/reduced lunch status to determine if a student is economically disadvantaged. It is important to note that the PEIMS number and full name were used only to ensure that no duplicate entries occurred. Once duplicated

records were confirmed, the PEIMS number category and full name category were removed to ensure the anonymity of the students.

- Section 3. This final section listed the teacher identification numbers that coincided with the student identification numbers so that the researcher could determine student achievement scores by teacher survey during the 2006-2007 school year.

All of the Microsoft Excel databases that contained the data listed in the instrumentation section were compiled into a master database that connected all student data with the coordinating appropriate teacher LoTi scores. This master Excel database provided the data string to be used in the Statistical Package for Social Studies (SPSS) analysis.

Data Analysis

The data were analyzed using quantitative statistical techniques as outlined in *Educational Research: An Introduction* by Gall, Borg, and Gall (1996). Using version 11/5/1 of the Statistical Package for Social Studies (SPSS) software, both one- and two-way Analysis of Variance (ANOVA) tests were run. To answer the first research question, an ANOVA test was run first for each subject combining the results of grade 3, 4, and 5 TAKS results and teacher LoTi score. Then, the researcher utilized the same inferential statistical tools to analyze the data broken up by each grade level by subject (reading/math) to compare mean TAKS scale scores for all students assigned to a particular teacher. The teachers on each grade level were grouped into three groups based on their LoTi rating for the ANOVA test: high LoTi, middle LoTi, and low LoTi.

Through an ANOVA for each grade level by subject (reading/math), mean scale scores of the students assigned to a particular teacher for instruction were compared.

To answer the second research question, the steps to investigate the first question were repeated. Next, the teacher LoTi score groups were further categorized into low socioeconomic and non-low socioeconomic status. Student PEIMS data were collected to determine this status based on a students' free and reduced lunch status. Finally, a two-way ANOVA was run to compare the differences in the mean scale scores of students of low socio-economic (SES) status and other students by the differing teacher groups based on LoTi scores. The data were grouped in the same way as data in the first research question, by overall subject (all grade levels combined) and then disaggregated by grade level by subject.

CHAPTER IV

PRESENTATION OF FINDINGS

The purpose of this record of study was to determine the relationship between teacher Level of Technology Implementation (LoTi) scores and student achievement on the Texas Assessment of Knowledge and Skills (TAKS) scores for 3rd, 4th, and 5th grade students in the Alamo Heights Independent School District. The research investigated whether there was a relationship between the teacher LoTi scores and student achievement scores as measured by the reading and math TAKS for students at the two elementary campuses in the district. Additionally, the research study investigated whether there was a relationship between teacher LoTi scores and student achievement for students in the economically disadvantaged subpopulation. Essentially, the research investigated if students in this subpopulation attained differing achievement levels than their peers based on the LoTi scores of their assigned teacher. The research study was guided by the following research questions:

1. Is there a relationship between teacher LoTi ratings and TAKS scores as reported in student records for 3rd, 4th, and 5th graders in the Alamo Heights Independent School District, San Antonio, Texas?
2. Is there a relationship between teacher LoTi ratings and TAKS scores as reported for 3rd, 4th, and 5th grade economically disadvantaged students in the Alamo Heights Independent School District, San Antonio, Texas?

Findings for Research Question 1

Is there a relationship between teacher LoTi ratings and TAKS scores as reported in student records for 3^{rd}, 4^{th}, and 5^{th} graders in the Alamo Heights Independent School District, San Antonio, Texas?

Student data were collected and categorized into groups based on the teacher assigned to the student. Teachers were grouped by their level of technology integration as measured by their LoTi scores in reading and math. There were five possible levels of teacher implementation. For example, all students who were assigned a math teacher with a LoTi score of 2 were grouped together and the mean of their TAKS scores was calculated. This was repeated with all groups 1 through 5 in each subject. The mean TAKS score was calculated for each LoTi score category, and these mean scores were then compared according to the appropriate inferential statistical test to determine if there was a relationship between the different levels of technology implementation categories.

Two different levels of analysis were completed for both math and reading. First, the researcher combined the results for grades 3, 4, and 5 TAKS results and teacher LoTi scores. Then, the researcher utilized the same inferential statistical tools to analyze the data broken up into specific grade level results. Therefore, the second level of analysis shows the ANOVA results for each of the grade levels tested on the elementary level.

Combined Grades 3, 4, and 5 Math TAKS Scores and Teacher LoTi scores

All student math TAKS scale scores were entered and sorted by the score codes into frequency tables according to the teacher LoTi scores. Next, all score codes were filtered out of the data set so that only valid “S” codes were included in the data set. This eliminated all students who were either absent or took a different version of the State Developed Alternative Assessment due to their special education status. Next, the data were filtered to include only those teacher LoTi scores that had the most significant number of students assigned. In this process, teacher LoTi scores of 2, 3, and 4 were included to analyze differences of means through a one-way ANOVA test using the Statistical Package for the Social Science (SPSS) software, version 11.0. Table 4.1 displays the total of 829 students as the N used for the statistical analysis. There were no students assigned to a LoTi teacher code of either 1 or 5, so these groups were eliminated from Table 4.1.

Table 4.1. Distribution in Groups, by Math Teacher Level of Technology Implementation (LoTi) Score, of Students Who Took the Math Texas Assessment of Knowledge and Skills (TAKS) Test in Spring 2007 at Alamo Heights High School in the Alamo Heights ISD in San Antonio, Texas

Math Teacher LoTi	Students N
2	318
3	410
4	101
Total	829

Table 4.2 shows the group results from the one-way Analysis of Variance (ANOVA) performed and Table 4.3 shows the results of the ANOVA for the independent samples of students in varying groups (based on their assigned teacher's LoTi score).

Table 4.2. Descriptive Statistics of Math 2007 TAKS Scale Scores for Groups of Students Formed by Math Teacher Level of Technology Implementation (LoTi) Scores of Elementary Students in the Alamo Heights ISD in San Antonio, Texas

Math teacher LoTi	Students N	TAKS scale score mean	Standard deviation	Standard error	95% confidence interval for mean Lower bound	Upper bound	Minimum	Maximum
2	318	2363.87	205.513	11.528	2341.19	2386.55	1836	2808
3	410	2337.75	192.321	9.498	2319.08	2356.42	1814	2808
4	101	2350.81	192.222	19.127	2312.86	2388.76	1775	2808
total	829	2349.36	197.636	6.864	2335.89	2362.84	1775	2808

Table 4.3. Summary of Inferential Statistics Test Analysis of Variance (ANOVA) Math Scale Scores From the Spring 2007 Administration of TAKS and Math Teacher Level of Technology Implementation (LoTi) Scores of Elementary School Students in the Alamo Heights ISD in San Antonio, Texas

	Sum of squares	Degree of freedom	Mean square	F	Significance*
Between groups	122375.4	2	61187.719	1.569	.209
Within groups	32219244	826	39006.349		
Total	32341619	828			

*Significant at the 0.05 level.

Results of Combined Grades 3, 4, and 5 Math TAKS Scores and Teacher LoTi Scores

The ANOVA test compares the level of significance generated through inferential statistics to the critical level of significance (.05). For this analysis, the significance level .209, which is greater than the critical value, was generated as shown in Table 4.3. Therefore, there was not a statistically significant difference in the three group means and the data fails to reject the null hypothesis. According to this data, there is not a relationship between teacher LoTi scores and student achievement on TAKS math for all elementary students combined.

Disaggregated Grades 3, 4, and 5 Math TAKS Scores and Teacher LoTi Scores

The 829 students displayed in Table 4.1 were further disaggregated by their grade level assignment in the following analysis to determine if there were any significant statistical relationships by grade level performance and teacher LoTi scores. Table 4.4 displays the descriptive statistics for this one-way ANOVA and the significance levels are recorded in Table 4.5.

Results of Disaggregated Grades 3, 4, and 5 Math TAKS Scores
and Teacher LoTi Scores

The ANOVA test compares the level of significance generated through inferential statistics to the critical level of significance (.05). For this analysis, according to Table 4.5, the significance level generated for grade 3 was .091, grade 4 was .200, and grade 5 was .063. All of these values are greater than the critical value .05 and, therefore, do not show a statistically significant difference in the group means of the LoTi scores for each grade level, and the data fails to reject the null hypothesis.

According to this data, there is not a relationship between teacher LoTi scores and TAKS scores for math for grades 3, 4, or 5 students after disaggregating the data by grade level.

Table 4.4 Descriptive Statistics for Groups by Math Teacher Level of Technology Implementation (LoTi) Score, and by Grade Level Assignment, of Students Who Took the 2007 Spring Math Texas Assessment of Knowledge and Skills (TAKS) Test

Grade	Math teacher LoTi	Students N	TAKS scale score mean	Standard deviation	Standard error	95% confidence interval for mean Lower bound	Upper bound	Minimum	Maximum
3	2	78	2307.10	165.480	18.737	2269.79	2344.41	1950	2709
	3	163	2274.87	179.008	14.021	2247.18	2302.55	1838	2709
	4	37	2339.22	175.269	28.814	2280.78	2397.65	1877	2709
Total		278	2292.47	175.726	10.539	2271.73	2313.22	1838	2709
4	2	103	2361.48	190.729	18.793	2324.20	2398.75	1859	2682
	3	142	2357.31	184.520	15.485	2326.70	2387.92	1814	2682
	4	23	2429.78	93.306	19.456	2389.43	2470.13	2225	2682
Total		268	2365.13	181.638	11.095	2343.29	2386.98	1814	2682
5	2	137	2397.99	229.546	19.611	2359.20	2436.77	1836	2808
	3	105	2408.93	193.775	18.911	2371.43	2446.43	1978	2808
	4	41	2316.98	234.635	36.644	2242.92	2391.04	1775	2808
Total		283	2390.31	219.107	13.025	2364.67	2415.95	1775	2808

Table 4.5. Summary of Inferential Statistics Test Analysis of Variance (ANOVA) by Math Teacher Level of Technology Implementation (LoTi) Score, and by Grade Level Assignment, of Students Who Took the 2007 Spring Math Texas Assessment of Knowledge and Skills (TAKS) Test

		Sum of Squares	Degree of Freedom	Mean Square	F	Sig
Gr. 3	Between Groups	148072.8	2	74036.422	2.422	0091
	Within Groups	8405542	275	30565.609		
	Total	8553615	277			
Gr. 4	Between Groups	106198.5	2	53099.230	1.617	.200
	Within Groups	8702748	265	32840.558		
	Total	8808946	267			
Gr. 5	Between Groups	264983.2	2	132491.578	2.795	.063
	Within Groups	13273247	280	47404.455		
	Total	13538231	282			

Combined Grades 3,4, and 5 Reading TAKS Scores and Teacher LoTi Scores

All student reading TAKS scores were entered and sorted by the score codes into frequency tables according to the teacher LoTi scores. Next, all score codes were filtered out of the data set so that only valid "S" codes were included in the data set. This eliminated all students who were either absent or took a different version of the State Developed Alternative Assessment due to their special education status. Next, the data were filtered to include only those teacher LoTi scores that had the most significant number of students assigned. In this process, teacher LoTi scores of 2, 3, and 4 were included to analyze differences of means through a one-way ANOVA tests using the Statistical Package for the Social Science (SPSS) software, version 11.0. Table 4.6 displays the total of 822 students as the N used for the statistical analysis. There were no students assigned to teachers with LoTi codes of a 1 or 5, so those groups were eliminated from Table 4.6.

Table 4.6. Distribution in Groups, by Reading Teacher Level of Technology Implementation (LoTi) Score, of Students Who Took the Reading Texas Assessment of Knowledge and Skills (TAKS) Test in the Spring 2007 Administration With a Score Code at Alamo Heights High School in the Alamo Heights ISD in San Antonio, Texas

Math Teacher LoTi	Students N
2	353
3	418
4	51
Total	822

Table 4.7 shows the group results from the one-way Analysis of Variance (ANOVA) performed and Table 4.8 shows the results of the ANOVA for the

independent samples of students in varying groups (based on their assigned teacher's LoTi score).

Table 4.7. Descriptive Statistics of Reading 2007 TAKS Scale Scores for Groups of Students Formed by Reading Teacher Level of Technology Implementation (LoTi) Scores of Elementary Students in the Alamo Heights ISD in San Antonio, Texas

Reading teacher LoTi	Students N	TAKS scale score mean	Standard deviation	Standard error	95% confidence interval for mean: Lower bound	95% confidence interval for mean: Upper bound	Minimum	Maximum
2	353	2338.92	166.839	7.900	2323.39	2354.44	1602	2721
3	418	2352.13	166.729	7.376	2337.64	2366.62	1708	2721
4	51	2356.41	160.417	13.415	2329.89	2382.93	1900	2721
Total	822	2347.33	165.971	5.004	2337.51	2357.15	1602	2721

Table 4.8. Summary of Inferential Statistics Test Analysis of Variance (ANOVA) Reading Scale Scores From the Spring 2007 Administration of TAKS and Reading Teacher Level of Technology Implementation (LoTi) Scores Elementary School Students in Alamo Heights ISD in San Antonio, Texas

	Sum of Squares	Degree of Freedom	Mean Square	F	Significance*
Between groups	55152.010	2	27576.005	1.001	.368
Within groups	30218160	1097	27546.180		
Total	30273312	1099			

*Significant at the 0.05 level.

Results of Combined Grades 3,4, and 5 Math TAKS Scores and Teacher LoTi Scores

The ANOVA test compares the level of significance generated through inferential statistics to the critical level of significance (.05). For this analysis, the significance level .368 was generated in Table 4.8, which is greater than the critical value. Therefore, there was not a statistically significant difference in the three group means and the data fail to reject the null hypothesis. According to this data, there is not a relationship between teacher LoTi scores and student achievement (TAKS scores) for reading for all elementary students combined.

Grade 3, 4, and 5 Disaggregated Reading TAKS Scores and Teacher LoTi Scores

The 822 students displayed in Table 4.1 were further disaggregated by their grade level assignment in the following analysis to determine if there were any significant statistical relationships by grade level performance and teacher LoTi scores. Table 4.9 displays the descriptive statistics for this one-way ANOVA and the significance levels are recorded in Table 4.10.

Table 4.9. Descriptive Statistics for Groups by Reading Teacher Level of Technology Implementation (LoTi) Score, and by Grade Level Assignment, of Students Who Took the 2007 Spring Reading Texas Assessment of Knowledge and Skills (TAKS) Test

Grade	Math teacher LoTi	TAKS scale score mean	Standard deviation	Standard error	95% confidence interval for mean Lower bound	Upper bound	Minimum	Maximum
3	2	2371.35	143.883	16.292	2338.91	2403.79	2100	2616
	3	2361.81	165.986	13.081	2335.98	2387.65	2011	2616
	4	2413.34	173.527	28.150	2356.31	2470.38	2029	2616
Total		2371.57	161.493	9.703	2352.47	2390.67	2011	2616
4	2	2341.43	150.744	14.926	2311.82	2371.04	1915	2629
	3	2338.80	175.903	14.761	2309.62	2376.99	1708	2629
	4	2386.78	138.471	28.873	2326.90	2446.66	2039	2629
Total		2343.94	163.679	10.017	2324.22	2363.66	1708	2629
5	2	2328.44	177.888	10.907	2306.97	2349.92	1602	2721
	3	2353.74	160.997	11.163	2331.73	2375.75	1883	2721
	4	2321.51	152.102	16.797	2288..09	2354.93	1900	2721
Total		2336.88	168.312	7.138	2322.86	2350.91	1602	2721

Table 4.10. Summary of Inferential Statistics Test Analysis of Variance (ANOVA) by Reading Teacher Level of Technology Implementation (LoTi) Score, and by Grade Level Assignment, of Students Who Took the 2007 Spring Reading Texas Assessment of Knowledge and Skills (TAKS) Test

		Sum of Squares	Degree of Freedom	Mean Square	F	Sig
Gr. 3	Between Groups	81635.389	2	40817.699	1.572	.210
	Within Groups	7116399	274	25972.258		
	Total	7198034	276			
Gr.4	Between Groups	46605.630	2	23302.815	.869	.421
	Within Groups	7079719	264	26817.119		
	Total	7126325	266			
Gr. 5	Between Groups	97426.510	2	48713.255	1.724	.179
	Within Groups	15625082	553	28255.121		
	Total	15722509	555			

Results of Grades 3, 4, and 5 Disaggregated Reading TAKS Scores and Teacher LoTi Scores

The ANOVA test compares the level of significance generated through inferential statistics to the critical level of significance (.05). For this analysis, according to Table 4.10, the significance level generated for grade 3 was .210, grade 4 was .421, and grade 5 was .179. All of these values are greater than the critical value .05 and, therefore, do not show a statistically significant difference in the group means of the LoTi scores for each grade level, and the data fail to reject the null hypothesis. According to this data, there is not a relationship between teacher LoTi scores and student achievement (TAKS scores) for reading for grades 3, 4, or 5 students after disaggregating the data by grade level.

Findings for Research Question 2

Is there a relationship between teacher LoTi ratings and TAKS scores as reported for selected 3rd, 4th, and 5th grade economically disadvantaged students in the Alamo Heights Independent School District, San Antonio, Texas?

To determine whether there was a relationship between Teacher LoTi scores and student TAKS scores according to a student's socioeconomic status, demographic data regarding economically disadvantaged status were gathered for both math and reading. The steps to investigate the first research question were repeated to investigate the relationship for this research question. All student TAKS data were categorized by teacher LoTi score and an overall mean of the scale score was derived for each teacher LoTi score. The next step for this second question, however, was then to further categorize the teacher LoTi score group into two categories: low socioeconomic and non-low socioeconomic status. PEIMS data collected determined this status based on the students' free or reduced lunch eligibility and students who qualified for free or reduced lunch were categorized into the low-SES group, while students who did not qualify for free or reduced lunch were categorized into the non-low-SES group.

As in the first research question investigation, two different levels of analysis were completed for both math and reading. First, the researcher combined the results for grades 3, 4, and 5 TAKS results and Teacher LoTi scores. Then, the researcher utilized the same inferential statistical tools to analyze the data broken up into specific grade level results. Therefore, the second level of analysis shows the ANOVA results for each of the grade levels tested on the elementary level disaggregated.

Grades 3, 4, and 5 Disaggregated Reading TAKS Scores and Teacher LoTi Scores

Table 4.11 shows the categorization of the 829 students who took the math TAKS test into either non-low SES or low-SES subcategories. According to this table, the N for the LoTi score 2 category for non-low SES students was 257 and the N for low SES was 61. For the LoTi score 3 category, N for non-low SES was 334 and the N for low SES was 76. Finally, for the LoTi score 4 category, the N for non-low SES was 86 and the N for low SES was 15. There were no teachers who received a LoTi score of 1 or 5.

Table 4.11. Descriptive Statistics for Groups, by Math Teacher Level of Technology Implementation (LoTi) Score and Student Economic Status, of Students Who Took the Math Texas Assessment of Knowledge and Skills (TAKS) Test in Grades 3, 4, and 5 in the Spring 2007 Administration in the Alamo Heights ISD in San Antonio, Texas

Math Teacher LoTi	Economic Status	TAKS Mean Scale Score	Standard Deviation	Students N
2	Not economically disadvantaged	2393.44	196.206	257
	Economically disadvantaged	2339.30	198.747	61
	Total	2363.87	205.573	318
3	Not economically disadvantaged	2364.25	182.738	334
	Economically disadvantaged	2221.32	191.244	76
	Total	2337.75	192.321	410
4	Not economically disadvantaged	2384.87	174.661	86
	Economically disadvantaged	2155.53	175.273	15
	Total	2350.81	192.222	101

Results for Combined Grades 3, 4, 5 Math TAKS Scores, Teacher LoTi Score, and Student Socio-Economic Status

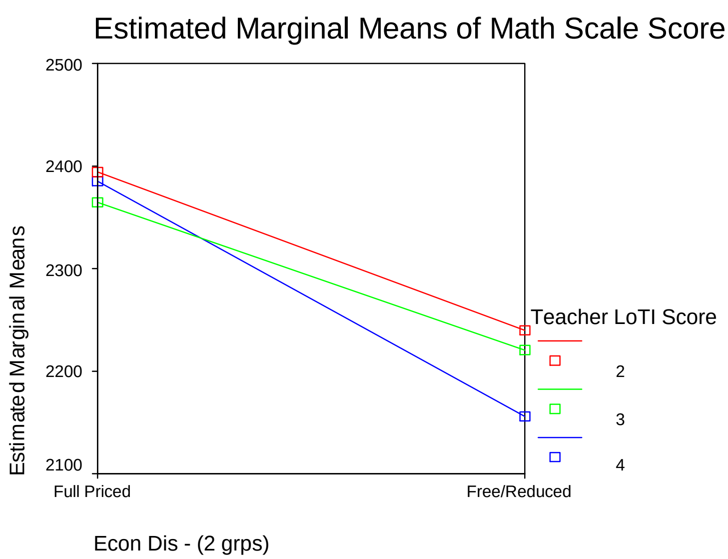
An ANOVA test was used to investigate the second research question and to determine whether the relationship between teacher LoTi scores and student TAKS scores differed according to a student's socioeconomic status. Table 4.12 demonstrates that due to a .209 significance score, there is not a statistically significant difference between the math TAKS of students in varying LoTi score groups. However, in the next row, a significance level of .000 signifies that there is a statistically significant difference between the mean scale scores of students who were categorized as non-low SES and those categorized as low SES. Finally, the .326 significance level recorded in the math teacher LoTi by economically disadvantaged row determines that again, there is not a statistically significant relationship between teacher LoTi scores, a student's achievement, and their economic status. Because .326 is greater than the critical value, we fail to reject the null hypothesis. No relationship may be inferred between mean student scores on math TAKS, math teacher LoTi scores, and student socio-economic status. This is further illustrated in Figure 4.1.

Table 4.12. Summary of Analysis of Variance (ANOVA) Test by Math Teacher Level of Technology Implementation (LoTi) Score and Student Socio-Economic Status of Students Who Took the Math Texas Assessment of Knowledge and Skills (TAKS) Test in the Spring 2007 in the Alamo Heights ISD in San Antonio, Texas

Source	Degree of Freedom	F	Significance*
Math teacher LoTi	2	1.570	.209
Economically Disadvantaged	1	68.282	.000
Math teacher LoTi by Economically Disadvantaged	2	1.123	.326

*Significant at the 0.05 level.

Figure 4.1. Results of Analysis of Variance (ANOVA) Test for Interaction Between Math Teacher Level of Technology Implementation (LoTi) Score, Combined Student Math TAKS Score Means, and Student Socio-Economic Status, for Students Who Took the Math Texas Assessment of Knowledge and Skills (TAKS) Tests in the Spring 2007 Administration in Grades 3, 4, and 5 in the Alamo Heights Independent School District.



Grades 3, 4, and 5 Math TAKS Scores Disaggregated by Grade, Teacher LoTi Scores, and Student Socio-Economic Status

The 829 students displayed in Table 4.10 were further disaggregated by their grade level assignment in the following analysis to determine if there were any significant statistical relationships by grade level performance and teacher LoTi scores. Table 4.13 displays the descriptive statistics for this one-way ANOVA and the significance levels are recorded in Table 4.14.

Table 4.13. Descriptive Statistics by Math Teacher Level of Technology Implementation (LoTi) Score, Student Economic Status, and Grade Levels of Students Who Took the Math Texas Assessment of Knowledge and Skills (TAKS) Test in the Spring 2007 Administration in the Alamo Heights ISD in San Antonio, Texas

Grade 3 Teacher LoTi	Economic Status	TAKS Mean Scale Score	Standard Deviation	Students N
2	Not economically disadvantaged	2326.50	164.716	66
	Economically disadvantaged	2200.42	129.183	12
	Total	2307.10	165.480	78
3	Not economically disadvantaged	2301.10	166.182	125
	Economically disadvantaged	2188.55	194.348	38
	Total	2274.87	179.008	163
4	Not economically disadvantaged	2387.76	139.615	29
	Economically disadvantaged	2163.25	186.722	8
	Total	2339.22	175.269	37
Total	Not economically disadvantaged	2320.15	164.335	220
	Economically disadvantaged	2187.52	179.273	58
	Total	2292.47	175.726	278

Table 4.13 (continued)

Grade 4 Teacher LoTi	Economic Status	TAKS Mean Scale Score	Standard Deviation	Students N
2	Not economically disadvantaged	2378.86	182.858	86
	Economically disadvantaged	2273.53	210.786	17
	Total	2361.48	190.729	103
3	Not economically disadvantaged	2388.48	175.114	112
	Economically disadvantaged	2240.93	174.372	30
	Total	2357.31	184.520	142
4	Not economically disadvantaged	2431.14	95.270	22
	Economically disadvantaged	2400.00		1
	Total	2429.78	93.306	23
Total	Not economically disadvantaged	2388.99	172.074	220
	Economically disadvantaged	2255.79	185.966	48
	Total	2365.13	181.638	268

Grade 5 Teacher LoTi	Economic Status	TAKS Mean Scale Score	Standard Deviation	Students N
2	Not economically disadvantaged	2447.45	210.977	105
	Economically disadvantaged	2235.69	215.308	32
	Total	2397.99	229.546	137
3	Not economically disadvantaged	2417.64	189.600	97
	Economically disadvantaged	2303.38	226.011	8
	Total	2408.93	193.775	105
4	Not economically disadvantaged	2353.40	228.465	35
	Economically disadvantaged	2104.50	148.436	6
	Total	2316.98	234.635	41
Total	Not economically disadvantaged	2421.36	206.764	237
	Economically disadvantaged	2230.35	213.095	46
	Total	2390.31	219.107	283

Table 4.14. Summary of Inferential Statistics Test Analysis of Variance (ANOVA) by Math Teacher Level of Technology Implementation (LoTi) Score, Economically Disadvantaged Student Status, and by Grade Level Assignment of Students Who Took the 2007 Spring Math Texas Assessment of Knowledge and Skills (TAKS) Test

Source	Degree of Freedom	F	Significance* N
Grade 3			
Teacher LoTi	2	.448	.639
Economically Disadvantaged	1	26.408	.000
Teacher LoTi by Economically Disadvantaged	2	1.169	.312
Grade 4 Teacher LoTi	2	.644	.526
Economically Disadvantaged	1	2.273	.133
Teacher LoTi by Economically Disadvantaged	2	.412	.663
Grade 5			
Teacher LoTi	2	2.942	.054
Economically Disadvantaged	1	20.968	.000
Teacher LoTi by Economically Disadvantaged	2	.821	.441

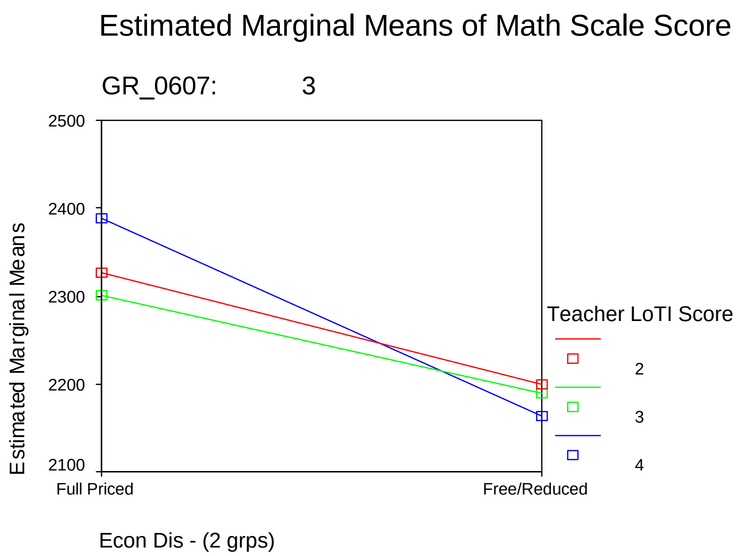
*Significant at the 0.05 level.

Results of Grades 3, 4, and 5 Math TAKS Scores Disaggregated by Grade, Teacher LoTi Scores, and Student Socio-Economic Status

Data for each grade level were disaggregated and tested through an ANOVA test to determine whether the relationship between teacher LoTi scores and student TAKS scores differed according to students socio-economic status by grade level. The ANOVA test compares the level of significance derived through inferential procedures to the critical value of significance (.05). Table 4.14 outlines the significance levels for each of the three grade levels being investigated.

According to Table 4.14, for grade 3 students, there was no statistically significant relationship between means of student TAKS scores according to their math teacher LoTi Score as noted in row MATHLOTI with the significance value of .639. According to the ECDIS row (significance value= .000), there is a statistically significant difference between the student means of the math TAKS test for those in the low SES category versus those not in the low SES category. The final row addresses the second research question regarding whether there is a relationship between teacher LoTi score and student TAKS scores depending on the students' socio-economic status. In this case, for grade 3 students, a significance value of .312 is determined and thus fails to reject the null hypothesis that there is no relationship between those variables. Therefore, no relationship may be inferred at grade 3 for mean student scores on the math TAKS, math teacher LoTi scores, and student socio-economic status. This is further demonstrated in Figure 4.2.

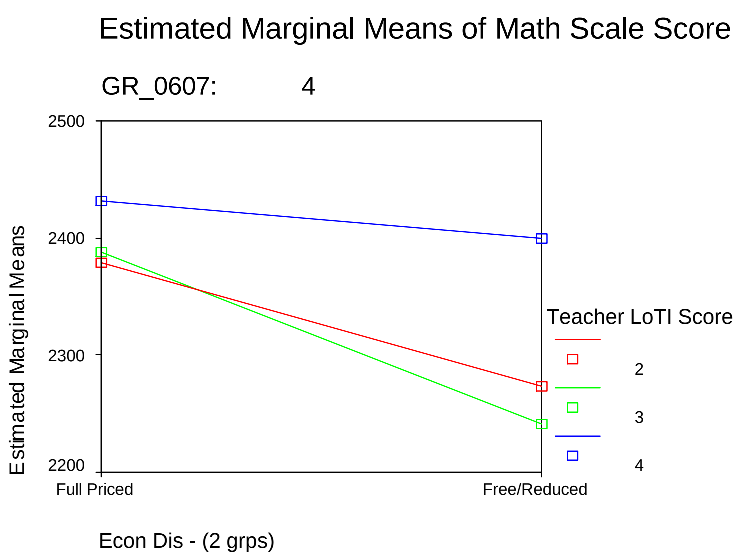
Figure 4.2. Results of Analysis of Variance (ANOVA) Test for Interaction Between Math Teacher Level of Technology Implementation (LoTi) Score, Grade 3 Student Math TAKS Score Means, and Student Socio-Economic Status, for Students Who Took the Math Texas Assessment of Knowledge and Skills (TAKS) Tests in the Spring 2007 Administration in the Alamo Heights Independent School District.



According to Table 4.14, for grade 4 students, there was no statistically significant relationship between means of student TAKS scores according to their math teacher LoTi Score as noted in row MATHLOTI with the significance value of .526. According to the ECDIS row (significance value= .123), there is not a statistically significant difference between the student means on the math TAKS test for those in the low SES category versus those not in the low SES category. The final row addresses the second research question regarding whether there is a relationship between teacher LoTi score and student TAKS scores depending on the students' socio-economic status. In this case, for grade 4 students, a significance value of .663 is determined and thus fails to reject the null hypothesis that there is no relationship between those variables.

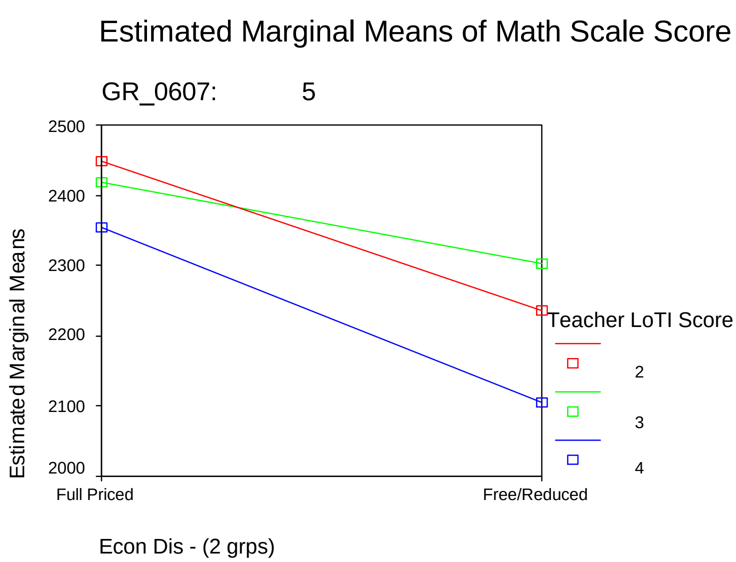
Therefore, no relationship may be inferred at grade 4 for mean student scores on the math TAKS, math teacher LoTi scores, and student socio-economic status. This is further demonstrated in Figure 4.3.

Figure 4.3. Results of Analysis of Variance (ANOVA) Test for Interaction Between Math Teacher Level of Technology Implementation (LoTi) Score, Grade 4 Student Math TAKS Score Means, and Student Socio-Economic Status, for Students Who Took the Math Texas Assessment of Knowledge and Skills (TAKS) Tests in the Spring 2007 Administration in the Alamo Heights Independent School District.



According to Table 4.14, for grade 5 students, there was no statistically significant relationship between means of student TAKS scores according to their math teacher LoTi Score as noted in row MATHLOTI with the significance value of .054. According to the ECDIS row (significance value= .000), there is a statistically significant difference between the student score means on the math TAKS test for those in the low SES category versus those not in the low SES category. The final row addresses the second research question regarding whether there is a relationship between teacher LoTi score and student TAKS scores depending on the students' socio-economic status. In this case, for grade 5 students, a significance value of .441 is determined and thus fails to reject the null hypothesis that there is no relationship between those variables. Therefore, no relationship may be inferred at grade 5 for mean student scores on the Math TAKS, math teacher LoTi scores, and student socio-economic status. This is further demonstrated in Figure 4.4.

Figure 4.4. Results of Analysis of Variance (ANOVA) Test for Interaction Between Math Teacher Level of Technology Implementation (LoTi) Score, Grade 5 Student Math TAKS Score Means, and Student Socio-Economic Status, for Students Who Took the Math Texas Assessment of Knowledge and Skills (TAKS) Tests in the Spring 2007 Administration in the Alamo Heights Independent School District.



Grades 3, 4, and 5 Combined Reading TAKS Scores, Teacher LoTi Score, and Student Socio-Economic Status

Table 4.15 below shows the categorization of the 822 students who took the reading TAKS test into either non-low SES or low-SES subcategories.

Table 4.15. Descriptive Statistics for Groups, by Reading Teacher Level of Technology Implementation (LoTi) Score and Student Economic Status, of Students Who Took the Reading Texas Assessment of Knowledge and Skills (TAKS) Test in the Spring 2007 Administration in Grades 3, 4, 5 in the Alamo Heights ISD

Reading Teacher LoTi	Economic Status	TAKS Mean Scale Score	Standard Deviation
2	Not economically disadvantaged	2369.56	150.472
	Economically disadvantaged	225.69	176.088
	Total	2338.92	166.839
3	Not economically disadvantaged	2372.87	154.981
	Economically disadvantaged	2246.73	184.597
	Total	2352.13	166.729
4	Not economically disadvantaged	2380.65	146.494
	Economically disadvantaged	2207.35	165.327
	Total	2356.41	160.417

Results for Grades 3, 4, and 5 Combined Reading TAKS Scores, Teacher LoTi Score, and Student Socio-Economic Status

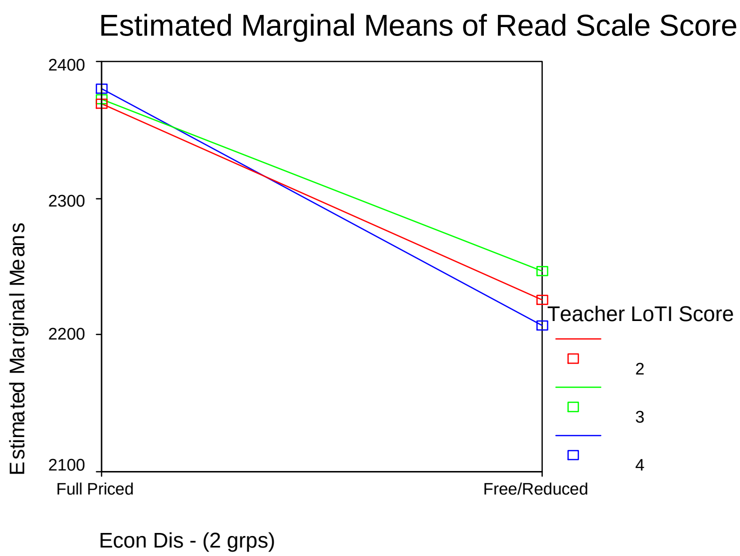
An ANOVA test was used to investigate the second research question and to determine whether the relationship between teacher LoTi scores and student TAKS scores differed according to a student's socioeconomic status. Table 4.16 demonstrates that due to a .579 significance score, there is not a statistically significant difference between the reading TAKS of students in varying LoTi score groups. However, in the next row, a significance level of .000 signifies that there is a statistically significant difference between the mean scale scores of students who were categorized as non-low SES and those categorized as low SES. Finally, the .507 significance level recorded in the teacher LoTi by economically disadvantaged row determines that again, there is not a statistically significant relationship between teacher LoTi scores, a student's achievement on the reading TAKS test, and their economic status. Because .507 is greater than the critical value, we fail to reject the null hypothesis. No relationship may be inferred between mean student scores on the reading TAKS, reading teacher LoTi scores, and student socio-economic status. This is further illustrated in Figure 4.5.

Table 4.16. Summary of Analysis of Variance (ANOVA) Test, by Reading Teacher Level of Technology Implementation (LoTi) Score and Student Socio-Economic Status, of Grades 3, 4, and 5 Students Who Took the Math Texas Assessment of Knowledge and Skills (TAKS) Test in the Spring 2007 in the Alamo Heights ISD

Source	Degree of Freedom	F	Significance*
Reading teacher LoTi	2	.547	.579
Economically Disadvantaged	1	92.731	.000
Reading teacher LoTi by Economically Disadvantaged	2	.680	.507

*Significant at the 0.05 level.

Figure 4.5. Results of Analysis of Variance (ANOVA) Test for Interaction Between Reading Teacher Level of Technology Implementation (LoTi) Score, Grades 3, 4, and 5 Student Reading TAKS Score Means, and Student Socio-Economic Status, for Students Who Took the Reading Texas Assessment of Knowledge and Skills (TAKS) Tests in the Spring 2007 Administration in the Alamo Heights Independent School District.



Results of Grades 3, 4, and 5 Disaggregated Reading TAKS Scores, Teacher LoTi Scores, and Student Socio-Economic Status

Data for each grade level were disaggregated and tested through an ANOVA test to determine whether the relationship between teacher LoTi scores and student TAKS scores differed according to student socio-economic status by grade level. The ANOVA test compares the level of significance derived through inferential procedures to the critical value of significance (.05). Table 4.17 outlines the significance levels for each of the three grade levels being investigated.

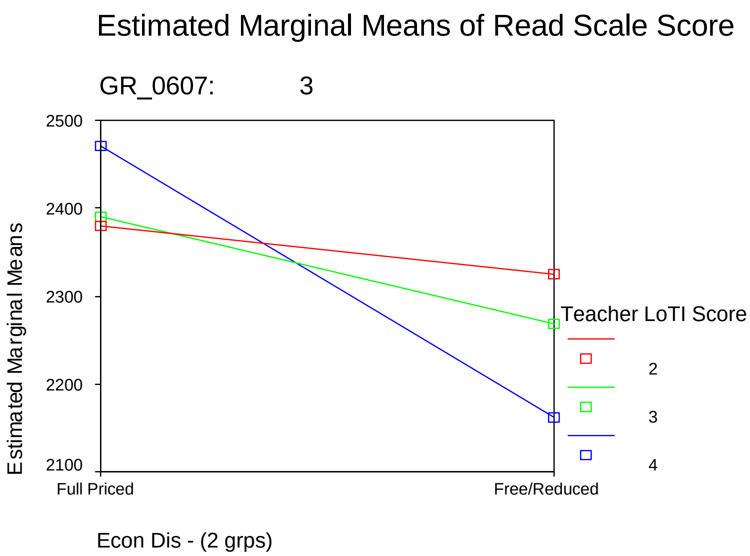
Table 4.17. Summary of Inferential Statistics Test Analysis of Variance (ANOVA) by Reading Teacher Level of Technology Implementation (LoTi) Score, Student Economically Disadvantaged Status, and by Grade Level Assignment, of Students Who Took the 2007 Spring Reading Texas Assessment of Knowledge and Skills (TAKS) Test

Source	Degree of Freedom	F	Significance* N
Grade 3			
Teacher LoTi	2	.516	.598
Economically Disadvantaged	1	33.620	.000
Teacher LoTi by Economically Disadvantaged	2	5.317	.005
Grade 4 Teacher LoTi	2	3.903	.021
Economically Disadvantaged	1	.011	.917
Teacher LoTi by Economically Disadvantaged	2	5.118	.007
Grade 5			
Teacher LoTi	2	1.503	.223
Economically Disadvantaged	1	36.382	.000
Teacher LoTi by Economically Disadvantaged	2	2.328	.098

*Significant at the 0.05 level.

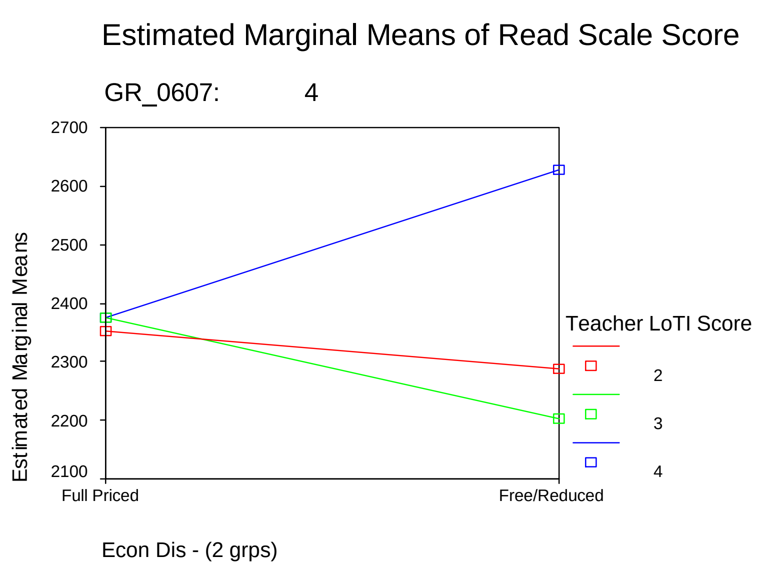
According to Table 4.17, for grade 3 students, there was no statistically significant relationship between means of student TAKS scores according to their reading teacher LoTi Score as noted in row reading teacher LoTi with the significance value of .598. According to the ECDIS row (significance value= .000), there is a statistically significant difference between the student means on the reading TAKS test for those in the low SES category versus those not in the low SES category. The final row addresses the second research question regarding whether there is a relationship between teacher LoTi score and student TAKS scores depending on the students' socio-economic status. In this case, for grade 3 students, a significance value of .005 is determined, which is less than the critical value of .05. This means that there is a statistically significant difference between reading TAKS score means for students in the low SES group whose reading teacher had a LoTi score of 2, 3 compared to those who had a teacher with a LoTi score of 4. The null hypothesis for this second research question is that there is no relationship between mean student scores on reading TAKS, reading teacher LoTi scores, and student socio-economic status. Because this ANOVA test demonstrates an interaction between the three variables at the .005 level, the null hypothesis is rejected. A relationship can be inferred between mean student scores, teacher LoTi scores, and student socioeconomic status for grade 3. This relationship is illustrated in Figure 4.6.

Figure 4.6. Results of Analysis of Variance (ANOVA) Test for Interaction Between Reading Teacher Level of Technology Implementation (LoTi) Score, Grade 3 Student Reading TAKS Score Means, and Student Socio-Economic Status, for Students Who Took the Reading Texas Assessment of Knowledge and Skills (TAKS) Tests in the Spring 2007 Administration in the Alamo Heights Independent School District.



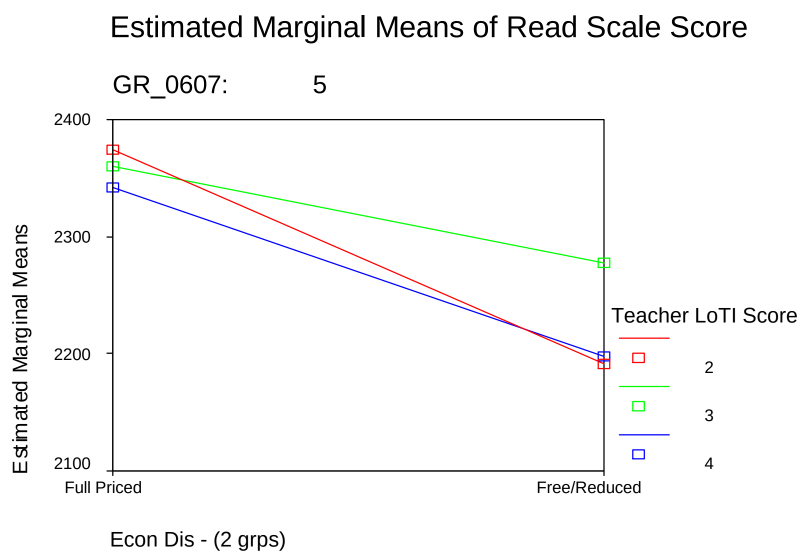
According to Table 4.16 for grade 4 students, there was no statistically significant relationship between means of student TAKS scores according to their reading teacher LoTi Score as noted in row MATHLOTI with the significance value of .210. According to the ECDIS row (significance value= .917), there is not a statistically significant difference between the student means on the reading TAKS test for those in the low SES category versus those not in the low SES category. The final row addresses the second research question regarding whether there is a relationship between teacher LoTi score and student TAKS scores depending on the students socio-economic status. In this case, for grade 4 students, a significance value of .007 is determined, which is less than the critical value of .05. This means that there is a statistically significant difference between reading TAKS score means for students in the low SES group whose reading teacher had a LoTi score of 2, 3 compared to those who had a teacher with a LoTi score of 4. The null hypothesis for this second research questions is that there is no relationship between mean student scores on reading TAKS, reading teacher LoTi scores, and student socio-economic status. Because this ANOVA test demonstrates an interaction between the three variables at the .007 level, the null hypothesis is rejected. A relationship can be inferred between mean student scores, teacher LoTi scores, and student socioeconomic status for grade 4. This relationship is illustrated in Figure 4.7.

Figure 4.7. Results of Analysis of Variance (ANOVA) Test for Interaction Between Reading Teacher Level of Technology Implementation (LoTi) Score, Grade 4 Student Reading TAKS Score Means, and Student Socio-Economic Status, for Students Who Took the Reading Texas Assessment of Knowledge and Skills (TAKS) Tests in the Spring 2007 Administration in the Alamo Heights Independent School District.



According to Table 4.16, for grade 5 students, there was no statistically significant relationship between means of student TAKS scores according to their reading teacher LoTi Score as noted in row reading LoTi with the significance value of .223. According to the ECDIS row (significance value= .000), there is a statistically significant difference between the student score means on the math TAKS test for those in the low SES category versus those not in the low SES category. The final row addresses the second research question regarding whether there is a relationship between teacher LoTi score and student TAKS scores depending on the students' socio-economic status. In this case, for grade 5 students, a significance value of .098 is determined. The null hypothesis for the research question states that there is no relationship between the variables of LoTi teacher score, TAKS score, and socio-economic status. In this case, we fail to reject the null hypothesis that there is no relationship between those variables. Therefore, no relationship may be inferred at grade 5 for mean student scores on the reading TAKS, reading teacher LoTi scores, and student socio-economic status. This is further demonstrated in Figure 4.8.

Figure 4.8. Results of Analysis of Variance (ANOVA) Test for Interaction Between Reading Teacher Level of Technology Implementation (LoTi) Score, Grade 5 Student Reading TAKS Score Means, and Student Socio-Economic Status, for Students Who Took the Reading Texas Assessment of Knowledge and Skills (TAKS) Tests in the Spring 2007 Administration at Alamo Heights Independent School District.



Summary of Findings

The intent of the research was to answer two questions regarding teacher LoTi scores and student TAKS scores. The following research questions were posed:

1. Is there a relationship between teacher LoTi ratings and TAKS scores as reported in student records for 3rd, 4th, and 5th graders at Alamo Heights Independent School District, San Antonio, Texas?
2. Is there a relationship between teacher LoTi ratings and TAKS scores as reported for 3rd, 4th, and 5th grade economically disadvantaged students in the Alamo Heights Independent School District, San Antonio, Texas?

The findings of the study in regard to research question 1 led the researcher to fail to reject the null hypothesis in reading and math content areas for both combined grade level analysis as well as disaggregated grade level analysis. For both reading and math, a relationship may not be inferred between teacher LoTi ratings and student TAKS scores at grade levels 3, 4, and 5. The level of technology implementation used by a teacher at the elementary level did not prove to have a significant impact on student achievement on TAKS.

The findings of the study in the case of research question 2 yield data that led the researcher to fail to reject the null hypothesis in reading and math for the combined grade level analysis for reading and math. However, when the grade levels were disaggregated, the researcher was able to reject the null hypothesis for reading grade 4 student achievement. Low socio-economic grade 4 students assigned to a teacher with a LoTi score of 4 significantly outperformed their non-low socioeconomic peers. Therefore, in grade 4 reading, the relationship between teacher LoTi scores and student TAKS scores did appear to vary according to student's economically disadvantaged status.

Conclusions drawn from the research findings, recommendations for educators, and recommendations for further study will be discussed in Chapter V.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The following chapter contains the summary, conclusions, and recommendations of the researcher organized into three sections. Section One contains the summary of the study and the procedures taken by the researcher to investigate the research questions. Section Two presents the conclusions of the researcher based on the data analysis. Finally, Section Three outlines implications and recommendations for future study for educational leaders based on the conclusions.

Overview of the Study

The goal of the study was to determine whether there was a relationship between teacher Levels of Technology Implementation (LoTi) scores and student achievement scores on the Texas Assessment of Knowledge and Skills (TAKS) exams at the elementary level. The following two research questions were analyzed in an attempt to determine whether there was a correlation between technology implementation and student achievement:

1. Is there a relationship between teacher LoTi ratings and reading and math TAKS scores as reported in student records for 3^{rd}, 4^{th}, and 5^{th} graders in the Alamo Heights Independent School District, San Antonio, Texas?
2. Is there a relationship between teacher LoTi ratings and TAKS scores as reported for 3^{rd}, 4^{th}, and 5^{th} grade economically disadvantaged students in the Alamo Heights Independent School District, San Antonio, Texas?

The population of teachers and students who comprised the study were from Cambridge and Woodridge Elementary schools in Alamo Heights Independent School District (AHISD) in San Antonio, Texas. Specifically, the study investigated whether a relationship existed between teacher LoTi scores and student achievement scores in reading and math for grades 3, 4 and 5 students in these two elementary schools.

Data were first organized and collected by subject according first to the assigned teacher LoTi score. For example, all reading students who had a reading teacher with a LoTi score of 2 were grouped together in one group. The mean of their TAKS score was calculated and compared to the other groups through inferential statistical analysis to determine whether there was any significance in the relationship between the LoTi score and the students' TAKS achievement score. Next, the analysis was further broken down into specific grade levels within the content areas. For example, all reading students in grade 3 who had a teacher with a LoTi score of 2 were grouped together in one group.

The second part of the study specifically identified student demographic data to determine whether teacher LoTi scores affect student achievement data for economically disadvantaged students differently than the achievement data for students in the non-economically disadvantaged group. This analysis was completed first through content area assignment for all students and then was disaggregated by grade level as noted above.

Data were collected from AHISD and was compiled into an Excel spreadsheet to be used for statistical analysis. Student achievement data from the TAKS exams were entered as well as assigned teacher LoTi scores for math and reading. All data were compiled from existing records in the district. The Public Education Information Management System (PEIMS) database was used to gather demographic data relevant to the student's economically disadvantaged status.

Data were collected from 829 3rd, 4th, and 5th grade math students and 822 3rd, 4th, and 5th grade reading students. There were a total of 49 elementary teachers from the Cambridge and Woodridge Elementary campuses who further made up the population under study. The sample was determined as a sample of convenience. Utilizing version 11/5/01 Statistical Package for Social Studies (SPSS), Analysis of Variance (ANOVA) tests were run to determine statistical comparison anslysis.

Findings

Research Question 1

Is there a relationship between teacher LoTi ratings and TAKS scores as reported in student records for 3rd, 4th, and 5th graders in the Alamo Heights Independent School District, San Antonio, Texas?

The results of this study determined that there was no significant relationship at the elementary level between teacher LoTi ratings and TAKS scores. According to the LoTi instrument, level of technology implementation in the classroom is indicated on a scale of 0-6 (0=Nonuse, 1=Awareness, 2=Exploration, 3=Infusion, 4= Mechanical Integration, 5=Expansion, 6=Refinement). The instrument further characterizes levels 0-3 as teacher-centered levels and levels 4-6 as student-centered levels and an increase in levels indicates an increase in the utilization of higher order thinking in the classroom (citation from LoTi). By analyzing the overall mean of the TAKS achievement scores for each teacher LoTi level, it is apparent that the highest mean scores do not correlate with the highest teacher Loti level at the elementary level. Based on the data presented, students assigned to a reading or math teacher at the 4= Integration level were not more likely to outperform students assigned to a reading or math teacher at the 2=Exploration level of technology implementation.

Research Question 2

Is there a relationship between teacher LoTi ratings and TAKS scores as reported for 3rd, 4th, and 5th grade economically disadvantaged students in the Alamo Heights Independent School District, San Antonio, Texas?

First, the researcher analyzed the overall effect of a teacher's LoTi score, a student's socioeconomic status, and the student's TAKS achievement score to determine if higher LoTi scores yielded higher achievement scores in the students. For both math and reading, there was no significance demonstrated through a data analysis of variance.

Additionally, the researcher disaggregated the data as performed in research question 1 in order to analyze the data separately by grade level performance. This would answer the question: Do teacher LoTi scores impact student achievement for low-socioeconomic students at different grade levels? According to the data, there was no significance in the relationship between teacher LoTi scores, student socio-economic status, and TAKS achievement scores in either the 3rd, 4th, or 5th grade for math.

Similarly, there was no significance found in the analysis of the 5th grade scores for reading. In the analysis of 3rd grade reading scores, however, a significant difference was found. A value of .005 indicates a significant relationship between the LoTi scores and a student's achievement score for low-socioeconomic students. As shown in Figure 4.6, it is obvious that there is a difference in achievement noted between low-socioeconomic students and their non-low socioeconomic peers who were assigned a teacher with a LoTi score of 4.

In the analysis of 4^{th} grade reading scores, a significance value of .007 indicated a significant relationship between the LoTi scores, and a student's achievement score for low socioeconomic students in a very different way. By reviewing Figure 4.7, it is obvious that not only did low-socio economic students who were assigned a teacher with a LoTi score of 4 outperform their peers in the low-socio economic group with LoTi teacher scores of 2 and 3, they outperformed their peers in the non-low-socioeconomic status group as well.

This grade 4 reading analysis is the only analysis that is consistent with the research findings in the literature showing that the use of technology integration by at-risk students improved learning motivation and higher levels of achievement due to the acceptance of higher order thinking opportunities and more authentic learning opportunities (Day, 2002; Means & Olson, 1995).

Recommendations and Implications for Practice

Intended as a research tool for Alamo Heights Independent School District to determine the effects of technology integration on student achievement at the elementary level, findings from the data analysis present conflicting results. According to the findings from the first research question, at the elementary level, there does not seem to be a relationship between student achievement in classrooms where the teachers perceive themselves utilizing high levels of technology implementation as an instructional tool. Findings from the second research question present minimal evidence that teachers using high levels of technology integration impact student learning for at-risk students.

The following are recommendations offered for consideration based upon findings and conclusions of the study:

1. The LoTi survey instrument, according to the review of literature, is based on constructivist learning that promotes high levels of student achievement through student-centered learning opportunities as well as the promotion of higher order thinking through technology integration. Although this study did not provide significant results in regard to the implementation of technology on student achievement, it is recommended that the elementary campus leaders continue to utilize the LoTi framework to align best practices of instruction for the campus. This framework provides a tool through which to learn about technology as a teaching tool.
2. While there was no statistically significant relationship between a teacher's LoTi score and student achievement, further investigation might determine that the actual classroom practices of a teacher did not match their reported score. One of the ambiguities of the survey instrument is the utilization of a teacher's own perception of their technology integration in the classroom. Perhaps further training in regards to specific instructional practices

associated with the varying levels of technology implementation might yield differing results and new perceptions and understandings by the teachers as they rate themselves. Additionally, this comprehensive training could alter classroom instructional practices according to the LoTi framework in the areas of (a) increasing technology use, (b) utilizing student-centered instruction, and (c) promoting higher order thinking.

3. A repetition of the study and data analysis should be completed to determine whether a duration of time could impact the levels of technology integration as a teaching tool. At the point of the study, AHISD teachers were in an introductory phase of utilizing technology integration as a tool for instruction. With continued efforts in staff development and inservice, a possible change in outcome might be attained.
4. Finally, an analysis of the impact of a teacher's LoTi scores and student achievement on both the middle school and high school levels would provide additional information about technology integration and student achievement for the district. Perhaps student achievement is impacted as students are exposed to these teaching methods year-after-year versus just introductory exposure in the elementary years.

Recommendations for Further Study

The following are recommendations for further research related to this topic:

1. Research is needed to determine and define appropriate technology implementation in the classroom.

2. Research is needed to investigate at what level appropriate technology implementation does affect student achievement in the classrooms.
3. Research is needed to examine how staff development on the LoTi instrument affected classroom practice and teacher responses on the LoTi survey.
4. Research is needed to investigate at what level appropriate technology implementation affects student performance for economically disadvantaged students.
5. Research is needed to examine how technology is specifically implemented in both reading and math classrooms at the elementary level.

Conclusions

The focus of this study was to investigate whether or not there was a relationship between teacher Levels of Technology Implementation (LoTi) scores and student achievement scores on the Texas Assessment of Knowledge and Skills (TAKS) tests. According to the findings for both reading and math, there is not a significant relationship between these two variables for students in grades 3, 4, and 5 at Alamo Heights Independent School District.

Findings did suggest, however, that economically disadvantaged students on one grade level might be impacted by high levels of technology implementation in reading. These findings coordinate with the research regarding the benefits of using technology integration as a tool for at-risk learners (Day, 2002; Dunkel, 1990; Merino et. al, 1990; Queener, 2007; Warchauer et al., 2004). These studies support the use of technology to achieve greater learning outcomes for at-risk students (in this case, economically disadvantaged students) due to increased motivation and a greater acceptance of the responsibility to learn. Due to the nature of the results, it is important to continue researching the ways technology implementation benefits students at the elementary level in an effort to refine teaching strategies and attain high levels of student achievement.

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APPENDIX A

LEVEL OF TECHNOLOGY IMPLEMENTATION QUESTIONNAIRE

Level of Technology Implementation (LoTi) Questionnaire

Version 5.0

Inservice Teachers

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

THIS IS NOT A TEST!

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

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

Name of State*: ______________________________

Name of Intermediate Unit *: ______________________________

Name of School District*: ______________________________

Name of School*: ______________________________

Subject/Specialty: ______________________ **Grade Level:** __________

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.

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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 frequently engage students in learning activities that require them to analyze information, think creatively, make predictions, and/or draw conclusions using the classroom technology resources.

2 Score ________
I frequently present information to students using multimedia presentations or electronic "slideshows" to reinforce the content standards that I am teaching and better prepare students to take standardized tests.

3 Score ________
I have trouble managing a student-centered classroom using the available technology resources and would welcome the help of a peer coach or mentor.

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 frequently assign web-based projects to my students as a means of emphasizing specific complex thinking skill strategies aligned to the content standards.

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 aligned to the content standards.

7 Score ________
Using the most current and complete technology infrastructure available, I have maximized the use of the learning technologies in my classroom and at my school.

8 Score ________
Problem-based learning is common in my classroom because it allows students to use the classroom technology resources as a tool for higher-order thinking and personal inquiry.

9 Score ________
I use the classroom technology resources exclusively to take attendance, record grades, present content to students, and/or communicate with parents via email.

10 Score ________
My students identify important school/community issues or problems, then use multiple technology resources as well as human resources beyond the school building (e.g., partnerships with business professionals, community groups) to solve them.

11 Score ________
My students use the classroom technology resources most frequently to improve their basic math and literacy skills via practice testing software, integrated learning systems (ILS), or tutorial programs.

12 Score ________
Constant technical problems prevent me and/or my students from using the classroom technology resources during the instructional day.

13 Score ________
I am proficient with basic software applications such as word processing tools, internet browsers, spreadsheet programs, and multimedia presentations.

14 Score ________
My students frequently discover innovative ways to use our school's advanced learning technologies to make a real difference in their lives, in their school, and in their community.

15 Score ________
I can solve most technical problems with our classroom's technology resources during the instructional day without calling for technical assistance.

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

17 Score ________
Though I may use technology for teacher preparation, I am not comfortable using my classroom technology resources as part of my instructional day.

18 Score ________
I am comfortable training others in using basic software applications, browsing/searching the Internet, and using specialized technologies unique to my grade level or content area.

19 Score ________
Computers and related technology resources in my classroom are not used during the instructional day, nor are there any plans to include them at this time.

20 Score ________
I consistently provide alternative assessment opportunities that encourage students to "showcase" their understanding of the content standards in nontraditional ways.

21 Score ________
My students use the Internet for (1) collaboration with others, (2) publishing, (3) communication, and (4) research to solve issues and problems of personal interest that address specific content standards.

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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	

22 Score ___________
My students participate in online collaborative projects (not including email exchanges) with other students, government agencies, or business professionals to solve their self-selected problems or issues.

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

24 Score ___________
I use the classroom technology resources most frequently to locate lesson plans I can use in class that are appropriate to my grade level and are aligned with our content standards.

25 Score ___________
My current instructional program is effective without the use of technology; therefore, I have no current plans to change it to include any technology resources.

26 Score ___________
I use our technology resources daily to access the Internet, send email, and/or plan classroom activities.

27 Score ___________
Due to time constraints and/or lack of experience, I prefer using instructional units recommended by my colleagues that emphasize complex thinking skills, student technology use, content standards, and student relevancy to the real world.

28 Score ___________
My students' creative thinking and authentic problem-solving opportunities are supported by the most advanced and complete technology infrastructure available.

29 Score ___________
My personal professional development involves investigating and implementing the newest innovations in instructional design and learning technologies that take full advantage of my school's most current and complete technology infrastructure.

30 Score ___________
I can locate and implement instructional units that emphasize students using the classroom technology resources to solve "real-world" problems or issues, but I don't usually create them myself.

31 Score ___________
I have an immediate need for some outside help with designing student-centered performance assessments using the available technology that involve students applying what they have learned to make a difference in their school/community.

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 ___________
My instructional use of our classroom technology resources is frequently altered according to the latest innovations and research in the areas of instructional technology, teaching strategies, and/or learning theory.

34 Score ___________
I regularly implement a student-centered approach to teaching that takes advantage of our classroom technology resources to engage students in their own learning.

35 Score ___________
I frequently consider (1) my students' interests, experiences, and desire to solve relevant problems and (2) the available human resources outside of the school when planning student-centered learning activities that include technology.

36 Score ___________
Students taking meaningful action at school or in the community relating to the content standards learned in class is an essential part of my approach to using the classroom technology resources.

37 Score ___________
I have an immediate need for professional development opportunities that place greater emphasis on using my classroom technology resources with challenging and differentiated learning experiences rather than using specific software applications to support my current lesson plans.

38 Score ___________
My students create their own web pages or multimedia presentations to showcase what they have learned in class rather than preparing traditional reports.

39 Score ___________
The types of professional development offered through our school system does not satisfy my need for more engaging and relevant experiences for my students that take full advantage of both my "technology" expertise and personal interest in developing learner-based curriculum units.

40 Score ___________
My students frequently use the classroom technology resources 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.

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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	

42 Score ___________
Curriculum demands, scheduling, and/or budget constraints at our school have prevented me from using any of the available technology resources during the instructional day.

43 Score ___________
I am skilled in merging the classroom technology resources with relevant and challenging, student-directed learning experiences that address the content standards.

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 technology resources.

45 Score ___________
My immediate professional development need is to learn how my students can use our classroom technology resources to achieve specific outcomes aligned to the content standards.

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

47 Score ___________
My students have immediate access to all forms of the most advanced and complete technology infrastructure available 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 begin using the available technology resources as part of my instructional day.

49 Score ___________
I regularly use different technology resources for personal or professional communication and planning.

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

PERMISSION TO USE THE LEVEL OF TECHNOLOGY IMPLEMENTATION QUESTIONNAIRE

National Business Education Alliance

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Assistant Director

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January 14, 2008

To: Texas A & M University
Dissertation Review Boards

Please accept this letter as notification that Dr. Christopher Moersch informed me that Dana Bashara will be using the LoTi Questionnaire to collect data for her doctoral dissertation study. Ms. Bashara has the permission of Dr. Moersch and the NBEA to use the LoTi Questionnaire and the LoTi Framework for purposes of the study only. Ms. Bashara also has permission to review all available results on the individuals taking place in her study.

For your reference, the LoTi Framework is posted at the LoTi Connection web site at:

http://www.loticonnection.com/lotilevels.html

Congratulations Dana!

Sincerely,

Dennee Saunders

Dennee Saunders
Assistant Director

VITA

Dana M. Bashara
1341 River Way
Spring Branch, Texas 78070

EDUCATION

2008	Doctor of Education, Educational Administration Texas A&M University, College Station, Texas
1999	Master of Arts, Educational Leadership The University of Texas at San Antonio, San Antonio, Texas
1996	Bachelor of Science, Psychology Allegheny College, Meadville, Pennsylvania

CERTIFICATIONS

Standard Principal, Grades EC-12
Provisional Elementary Grades K-8 (life)

EXPERIENCE

2003-2006	Principal, Cambridge Elementary Alamo Heights Independent School District San Antonio, Texas
2001-2003	Assistant Principal, Cambridge Elementary Alamo Heights Independent School District San Antonio, Texas
1999-2001	Assistant Principal Alamo Heights Independent School District San Antonio, Texas
1996-1999	Teacher, 5th Grade, Woodridge Elementary Alamo Heights Independent School District San Antonio, Texas

This record of study was typed and edited by Marilyn M. Oliva at Action Ink, Inc.