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The Impact of Louisiana INTECH Professional Development on Elementary School Leaders' Perceptions of Change and Student Achievement

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The Impact of Louisiana INTECH Professional Development on Elementary School Leaders' Perceptions of Change and Student Achievement

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While this journey is completed, I realize this is only the beginning of many other journeys made possible by the completion of this degree. I look forward to the challenges and opportunities that lie ahead.

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Abstract

Each year, hundreds of Louisiana's teachers participate in state-sponsored Integration of Technology (INTECH) training. Although INTECH training and certification is acknowledged by the Louisiana Department of Education as the standard for technology-trained teachers, no research has been conducted to determine its impact on student achievement (Picard, 2000). The study's purposes were to examine perceptions of school leaders about Louisiana INTECH professional development as a change agent in schools and to determine the impact of this training on third grade mathematics and reading achievement.

This study addressed the questions: Do elementary school leaders perceive INTECH professional development as a catalyst for change in schools? Does this professional development impact student achievement in mathematics and reading? This quantitative study was an ex-post facto, causal-comparative design. Seventy-three elementary administrators were asked to respond to an 18-item Likert-type survey measuring openness to change prompted by the Louisiana INTECH professional development model. Results from the survey were reported as descriptive statistics. Additionally, the study attempted to determine if there was a significant difference in third grade student mathematics and reading achievement in the INTECH certified teachers and non-INTECH certified teachers' classes.

The *ITBS* mathematics and reading standard scores were used for comparison. Nonrandom convenience sampling was used to identify the students of INTECH certified teachers and the students of non-INTECH certified teachers with similar years of experience, education level, and school demographics. The dependent variable was student performance on the *ITBS.* The independent variable was INTECH professional development.

Using *Statistical Package for Social Sciences* (*SPSS)* software, test data were analyzed using *ANOVA* to determine if there was a difference in the means of the gain scores in mathematics and reading of students in the classrooms of INTECH trained teachers (experimental group) and non-INTECH trained teachers (control group). Distributions of student pretest scores were examined to compare mean achievement.

In a time when instructional strategies, tools and resources must be aligned to meet state and local accountability expectations, this state-sponsored technology integration professional development model must be examined. Significant resources are expended supporting INTECH training across the state. Louisiana's educational leaders need data to support decisions concerning INTECH professional development.

Keywords

Administration, Technology and Student Achievement, Technology Professional Development, Louisiana INTECH, Educational Leadership, Educational Administration

Chapter One: Introduction

Introduction

In *Millennials Rising: The Next Great Generation*, Howe and Strauss (2000) report the good news about today's youngsters: aptitude test scores have risen within every racial and ethnic group. Eight in ten teens say it is now "cool to be smart." Today's kids are fascinated with new technologies; three in four are computer-users, and their math and science scores are rising fast. These millennial students are cooperative, accept authority, and follow the rules. Additionally, they are optimistic and believe in the future. These students expect, even demand that their school learning experiences are infused with technology-based lessons. Thus, it comes as no surprise to progressive educators that in order for lessons to be engaging and interesting to students, they must include technology activities

The Pew Internet and American Life Project (Levin & Arafeh, 2002) warned that many schools and teachers have not yet recognized—much less responded to—the new ways students communicate. They reported that students repeatedly noted that the quality of their technology assignments in school were "poor and uninspiring." The Pew report concluded, "the sanctity and tradition of the four walls of the classroom quite literally is melting away" (Levin & Arafeh, 2002, p. 25). Educators can use that trend to their advantage, moving their students forward with the technology-rich environments the students seek and deserve. To ignore the trend is to cause our schools to become increasingly irrelevant.

School districts and, very specifically, school leaders must act to ensure a continual funding stream for technology; to establish refresh cycles for hardware; to support continued high quality professional development; and to help administrators in their support of the inclusion of technology in teaching and learning. Today's students from all groups, incomes, and ethnicities are technology users, regardless of whether their schools utilize or provide technology. It is critical that educators harness the enthusiasm, drive, energy, and motivation for learning that is engendered by technology use, and give students access to practice and application of 21st century skills. School districts must rise to the challenge and provide this millennial generation the learning environment they deserve if they are to truly educate and empower them to reach their highest learning potential.

If school districts are going to meet the challenges facing them, school leaders must direct the changes necessary to create a technology enriched learning environment. Possibly, the most important single factor of an effective learning environment is education leadership (Daugherty, Kelley and Thornton, 2005). Change leaders must determine the procedures and processes that create the conditions necessary for organizational improvement. Skillful leaders have a shared responsibility to provide vision for future needs and empower others to share and operationalize the vision (Daugherty, et al.).

Fullan (2002) points out that "only principals who are equipped to handle a complex, rapidly changing environment can implement the reforms that lead to sustained improvement in student achievement" (p. 16). The complex school and classroom environments of today demand that school leaders deal with multiple and varying skills and abilities of faculty members. Upon determining a deficit among faculty in integrating 21st century technology skills into lessons, it is the responsibility of the leader to assure that appropriate technology infused professional development is provided to erase these deficits.

The simultaneous renewal required to transform our schools by infusing technology into lessons must be led, and led with vigor and enthusiasm. School leaders must perceive themselves as change agents. Their roles should include coaching teams in “effective work planning; sustaining a robust flow of information; obtaining sufficient resources; orchestrating continuous feedback among departments, schools, and constituents; delineating the boundaries and interdependencies between colleges and schools; and building a strong scaffolding to support people through the changes” (Smith, 1999, p. 602).

Background

The 1980s began with public schools feeling the pressure to provide clear evidence of student achievement. Criticism of public education reached its zenith with the publication of *A Nation at Risk* by the National Commission on Excellence (1983). The report stated that “The educational foundations of the nation were being eroded by a rising tide of mediocrity” (p. 4). State governments, in response, began to implement various forms of accountability systems based predominantly on the performance of students on standardized tests (Comer, 1984). In 1999, Richard F. Elmore, professor at Harvard University’s Graduate School of Education, commented that, "Accountability for student performance is one of the two or three -if not the most- prominent issues in policy at the state and local levels right now" (Edwards, 1999, p. 8).

The 1990s ended with Louisiana’s educational system ranked near the bottom of most state rankings. Student test scores were significantly lower than the national average. Fourth grade students tied for 36th place among the 39 states where the students took the 1998 National Assessment of Educational Progress (NAEP) reading test. Additionally, the state’s eighth graders ranked 34th out of 36 in the nation. Over 50% of Louisiana eighth graders scored below basic in science on the 1996 NAEP science test. Louisiana was ranked 39th out of 40 states in this area (Public Affairs Research Council of Louisiana, Inc., 1999).

Not surprisingly, Louisiana became involved in various reform efforts. But it was only with the election of Governor Mike Foster in 1996 that educational reform gained traction, which resulted in rigorous state content standards and a testing program designed to determine how well students were meeting those standards. In 1997, the state developed subject area standards and benchmarks through a well-developed, research-based plan that included broad stakeholder input. The standards and benchmarks for English, mathematics, science, and social studies defined what students should know and be able to do in each respective content area. Two years later, the state implemented a newly designed testing program aligned with the standards. Students in grades 3, 5, 6, 7, and 9 began taking the norm-referenced Iowa Tests in 1999. These tests compared student performance to national or norm group performance. Additionally, all public schools in the state of Louisiana came to be evaluated by the state accountability plan and receive school performance scores each October (Public Affairs Research Council of Louisiana, Inc., 1999).

In Louisiana, the status of and support for educational technology as late as 1996 was dismal, with a 48:1 student to computer ratio, ranking the state 51st in the nation. Very little Internet connectivity was available in the school districts across the state. Funding for educational technology was minimal and disjointed. Technology embedded professional development was not organized, sequential, or sustained. The key to pushing the state from last place in the country, in terms of technology implementation, began with the first federal policy initiative, the Technology Innovative Challenge Grant in 1997, which awarded 5.3 million dollars to five school districts (Cage, Bienvenu, and Hoover, 1999). This initiative became the model for the development of a state technology leadership group that developed the first state technology plan, began intensive standards-based, technology-embedded professional development and declared war on technology poverty. This grant was the catalyst which began the search for a solution to the lack of technology in Louisiana's schools. Ultimately, it provided the support and funding for the development of the Louisiana INTECH professional development model (Bienvenu, Mosley, and Howerton, 2003; Cage, Bienvenu, and Hoover, 1999).

The emphasis and concern for improving Louisiana's educational system was underscored by the belief that the addition of current technologies paired with access to technology training for teachers was essential to improve student achievement (Picard, 2000). The emergence of the Louisiana Networking Infrastructure for Education (LANIE) Committee in 2000 laid the groundwork for state funding of district technology initiatives. LANIE was responsible for developing the first state technology plan (Findley, 1999). With a state plan in place, technology funds began to flow from state and federal coffers, and districts were charged with providing the technology tools and necessary technology embedded professional development to create 21st century learning environments for students in order to raise student achievement (Cage, Bienvenu & Hoover, 1999).

A plethora of research studies indicate technology is a powerful tool in the classroom when paired with a well-trained professional educator. Student achievement of content increases; students are motivated, engaged, and interested in technology-enhanced lessons; and students' learning styles and multiple intelligences are supported in ways that other teaching methodologies cannot accomplish (Means, Blando, Olson, Middleton, Morocco, Remz, & Zorfass, 1993; Wenglinsky, 1998).

In addition, technology enables special learners to accomplish otherwise impossible tasks. Kumar, White, and Helgeson (1994) reported low performing, at-risk or learning handicapped students experience difficulties doing mental operations involving several variables at one time. Science curricula posed particular challenges to these students due to the load on their working memory required to solve science problems. In a study of novice and expert high school chemistry students, novice students using computers performed at a level similar to expert students using paper and pencil

Integrated Learning Systems (ILS) are educational software packages and hardware networked to provide instructional content as well as assessment and management tools. Traditionally, the instruction is organized around specific objectives, and the software supports a mastery learning approach to instruction (North Central Regional Educational Laboratory, n.d.). These systems feature programmed instruction for teachers and students. Their purpose is to direct and coach students through the learning experience. By the early 1990s, about 20% of American elementary schools had installed integrated learning systems as a primary component of their overall curriculum (Becker & Hativa, 1994).

Integrated Learning System software has been found to increase test scores. For example, McCart (1996) found the use of an ILS consistently causes increases in mathematics test scores. McCart's study focused on supplemental mathematics instruction program for at-risk eighth graders in a New Jersey school district. Students receiving supplemental mathematics instruction from an ILS by World Institute Computer Assisted Teaching Program (WICAT) System clearly outperformed students in the control group. Effect size was 1.05, a very strong effect. With an effect size of 1.05, about 85% of the ILS students would outperform the average student in the control group.

Additionally, Writing to Read (WTR) ILS produced overall positive effects. Christopher's (1991) results were especially strong suggesting that these computer enrichment classes do increase the length and quality of student writing. This study examined the reading skills of kindergarten and special education primary-level students. WTR groups showed clear gains in reading achievement; gains of the non-WTR groups were much smaller. Overall, WTR effect size was 1.06.

Moreover, collaborative online projects, Internet research projects, and simulations increase exceptional students' abilities to use higher-order thinking skills (Center for Applied Special Technology [CAST], 1996; Coley, Cradler, & Engel, 1997). Accordingly, students who are technology-users are well-prepared to enter the twenty-first century workplace (De Leon & Borchers, 1998; Peck & Dorricott, 1994). The benefits that are available to students in a technology-rich school system are neither speculation nor wishful thinking by fans and supporters; they are real and they are supported by research.

In fact, recent studies indicate student performance increases when teachers receive professional development and utilize technology integration strategies closely aligned to curriculum standards (Bain & Ross, 2000; Bain & Smith, 2000). According to Darling-Hammond and Youngs (2002), teacher quality is the factor that matters most for student learning. John Cradler (2002), co-director of Center for Applied Research in Educational Technology (CARET), noted that there is now ample evidence to link classroom technology to student mastery of content, higher order thinking skills, and skills needed in the workplace. Therefore, professional development for teachers becomes the key issue in using technology to improve the quality of learning in the classroom (Cradler, McNabb, Freeman, & Burchett, 2002).

School leaders and decision-makers must provide these benefits to the students in their care while also providing the appropriate technology-embedded professional development to classroom educators. All stakeholders in the educational community should make every effort to provide students with access to modern computers and appropriate software; to provide professional development for teachers so that they can guide student use of the computers and software; to support and reward technology integration efforts in every classroom; and to commit to the long term support of a learning community that provides all students with technology appropriate to their learning tasks.

Statement of Problem

According to CEO Forum on Education and Technology (January, 2000):

> In the next decade, the United States will need over 2.2 million new teachers to fill the nation's classrooms—a rate of approximately 200,000 per year. Teachers of the new millennium will need a deep knowledge of their field, a thorough understanding of the learning process, a sincere commitment to nurturing a child's potential and a love of learning that is shared with their students. These attributes alone aren't enough for teachers to prepare their students to succeed in the Digital Age. Teachers must be comfortable with technology as a tool to engage students and enhance their learning. If new teachers are ill-equipped to use the instructional tools technology has made available, their professional education will be incomplete (p. 1).

The powerful statement above not only applies to new teachers but also to veteran educators serving as instructional leaders in today's classrooms.

As the world becomes more dependent on technology, students and their parents will continue to expect a public education to include the integration of computers and the Internet. Businesses are already demanding graduates who are technologically literate. Communities throughout the country are increasingly requiring effective leadership in the area of technology from insightful and forward-thinking school leaders. Given these expectations and demands, administrators who implement technology effectively in their schools and communities will contribute greatly to both education and the economy in the twenty-first century.

Forty-five states have in place or are creating state standards in the area of technology. Nine of these states require students to complete and pass a technology-related exit exam for graduation. In conjunction with these initiatives, several states have passed mandates on teachers' competency; for example, in 2001, North Carolina and Idaho required teachers to demonstrate technology competence for certification and licensure (Milken Exchange on Education and Technology, 1999). In light of the current movement toward technology standards and accountability, it is likely that other states will soon create similar mandates. Such legislation or state-level policy will force school leaders to reflect on how best to promote the integration of information technology in their districts.

The state of Louisiana, the school districts of Louisiana, and the district technology and curriculum staffs regard INTECH as an essential professional development experience (Louisiana Center for Educational Technology [LCET], n.d.). In the last eight years, over 500 prekindergarten through twelfth grade Calcasieu Parish School district teachers have been trained using the Louisiana INTECH professional development model. Although Louisiana INTECH training and certification is acknowledged as the standard for a technology trained teacher, there has been no research conducted on the impact of this professional development on student achievement (Picard, 2000). Additionally, no research is available to indicate whether school leaders perceive INTECH professional development as a catalyst for change in their schools. The present research study will seek to determine whether INTECH has resulted in positive changes in the school setting. Furthermore, the study will reveal whether this training and certification improves student learning as evidenced by student test scores on the *Iowa Tests of Basic Skills (ITBS)*.

Louisiana INTECH certification is earned by teachers who have completed Louisiana INTECH training. The training is an intense, content-rich, hands-on, 56-hour staff development program. INTECH is designed to provide teachers with concrete examples of effective technology-based strategies that support and enhance curriculum. While INTECH is designed to enhance curriculum, it should be noted that this training is a technology integration model, not a specific curriculum skill model. Furthermore, the model is designed to serve as a catalyst for fundamental change in the overall teaching and learning processes, ultimately resulting in improved student achievement. Teachers work in teams during INTECH training to learn basic technology skills while focusing on project-based activities that are aligned with the Louisiana Content Standards. Teachers are required to critically examine their own instructional practices to determine how technology can play a role in enhancing the teaching and learning process (LCET, n.d.). They are expected to implement technology projects and activities developed during the training program in their classrooms.

The state of Louisiana has promoted and adopted INTECH as the technology integration professional development model that should be implemented in every school district in the state. This implementation requires the expenditure of school district funds and the efforts of school district employees. By examining school district grant funding and financial records, it is estimated that since 1998, the Calcasieu Parish Public Schools have expended in excess of $200,000 in substitute pay and teacher stipends for INTECH professional development (Calcasieu Parish School System, 2004). With over 500 teachers participating in eight days of INTECH professional development over the last eight years, it is clear this training is seen as a district imperative. If this significant commitment of human and financial resources is to continue to be supported by school leaders, there should be a clear sense of the impact of this extensive professional development on positively impacting changes in schools and improving student performance.

While the role of the school leaders is to support staff, and to encourage the use of technology, there must be evidence the use of technology is effective (Brooks-Young, 2006). Leaders must possess a vision that empowers teachers and students to use technology in new ways. According to Cavanaugh (2001), in developing the school educational technology vision, leaders should determine the preferred future with technology. In addition, there should be a focus on aligning this technology vision with the school's mission and determining what should be seen while observing students and teachers as they learn. New frameworks should be assumed while being open to dramatically new teaching, facilities, and approaches (Cavanaugh). In Louisiana, INTECH is an example of a new framework being promoted for statewide adoption. The leadership imperative is to determine the effectiveness of this highly purported professional development program.

Purpose

Despite the fact that INTECH, a state-wide professional development program, has been in place for over eight years, virtually no research has been conducted to determine the impact of this professional development model on student achievement. The study's purposes were to examine perceptions of school leaders about Louisiana INTECH professional development as a change agent in schools and to determine the impact of this training on third grade mathematics and reading achievement.

Research Hypotheses and Question

The following hypotheses will guide the study: The subheadings, Affective Reactions to Change, Cognitive Reactions to Change, and Behavioral Reactions to Change, denote the hypotheses associated with administrators' perceptions and Louisiana INTECH. The hypotheses affiliated with student achievement and Louisiana INTECH are listed with the subheadings, Mathematics Student Achievement and Reading Student Achievement. The hypotheses are as follows:

Hypothesis 1. Affective Reactions to Change - Elementary school administrators enjoy the change in the organization as it relates to implementation of Louisiana INTECH professional development in the school.

Hypothesis 2. Cognitive Reactions to Change - Elementary school administrators recognize the occurrence of Louisiana INTECH professional development and its potential benefit to school and staff.

Hypothesis 3. Behavioral Reactions to Change - Elementary school administrators take actions to support or initiate changes related to the Louisiana INTECH professional development.

Hypothesis 4. Students of Louisiana INTECH certified teachers exhibit higher mathematics student achievement than students of non-Louisiana INTECH certified teachers as evidenced by the difference between mean pretest and mean posttest scores.

Hypothesis 5. Students of Louisiana INTECH certified teachers exhibit higher reading student achievement than students of non-Louisiana INTECH certified teachers as evidenced by the difference between mean pretest and mean posttest scores.

This study will address the following questions: Do elementary school leaders perceive INTECH professional development as a catalyst for change in their school? Does this professional development impact student achievement in mathematics and reading?

Theoretical Framework

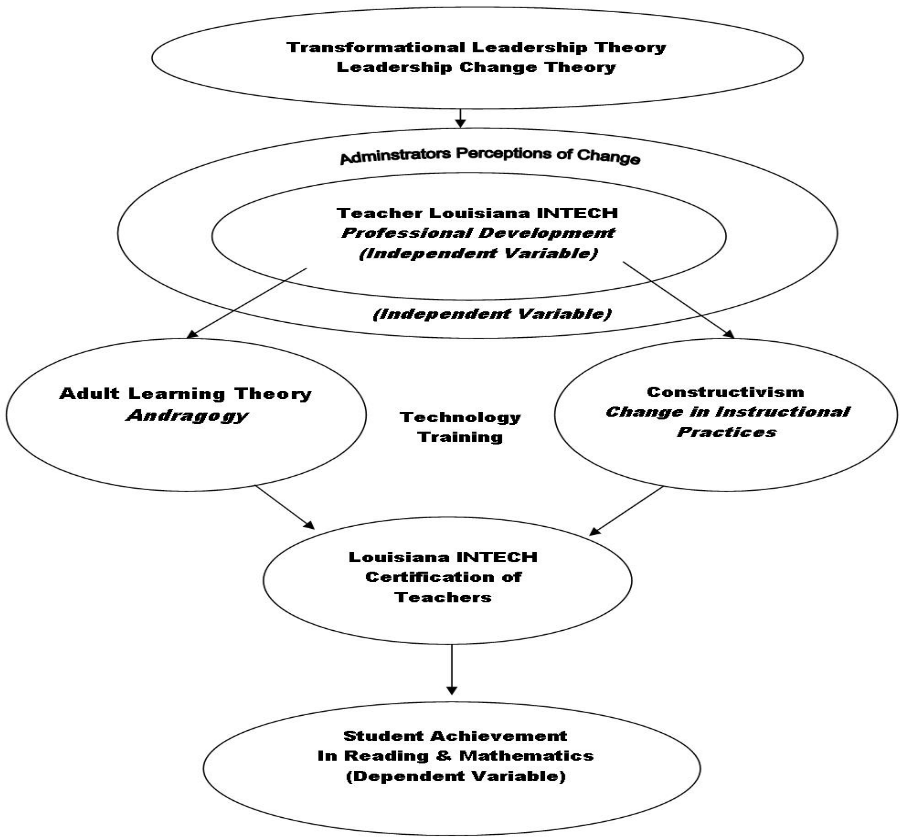
A theoretical framework is a basic conceptual structure organized around one or more theories. The theoretical framework for this study provides the basis for thinking about the study, what it means, and how it is influenced by the ideas and research of others. A conceptual map reflects a combination of theories upon which this research is founded.

This study’s theoretical framework is built upon the leadership theories of transformational leadership theory (as presented in Fullan’s change theory), and social constructivism. Both of these leadership theories are present in the study, which seeks to determine whether the perceptions of school leaders (independent variable) indicate that INTECH professional development (independent variable) is a catalyst for change and increased student achievement in mathematics and reading (dependent variable).

Furthermore, it is important to note that the postmodern leadership paradigm provides the study’s perspective, or lens. The following philosophical assumptions of this leadership paradigm, presented in the ASHE Higher Education Report article *A World Apart: New Paradigms of Leadership* (Kezar, Carducci, & Contreras-McGavin, 2006), make this choice appropriate for the present study: “it is a contingent, human construction, affected by local conditions, history, and the ambiguity and complexity of the human experience; it is a reflection of human identity shaped by history” (p. 16). Indeed, this leadership paradigm is linked with self-examination and reflection, and the need to evolve, change, and adapt operating principles to appropriately fit those of the emerging environment. Additionally, the tenets of the postmodern paradigm align with foundational elements within both transformational leadership theory, which details interest in change and the promotion of change within others (Lussier & Achua, 2007), and Fullan's change theory, which embodies the concept that change involves all stakeholders within a given educational community (Fullan, 2001a).

The conceptual map below presents a graphic representation of the study's theoretical framework. Transformational leadership theory and leadership change theory are the underpinnings of the study. These theories influence and are connected to administrators' perception of change (independent variable), which is linked to and influences teacher Louisiana INTECH professional development (independent variable). Louisiana teacher INTECH professional development is composed of two elements: adult learning theory, or andragogy, and constructivist practices. The completion of INTECH training, rich in technology professional development, leads to Louisiana teacher INTECH certification. It is hypothesized in the study that the Louisiana INTECH certification, with administrative leadership and support, leads to significant gains in elementary student achievement in reading and mathematics.

Figure 1. Conceptual Map.



The theoretical foundation for this study is rooted in the principles of Fullan's (1991) leadership change theory, which is indelibly linked with transformational leadership theory. Additionally, the study is built upon Knowles' (1980) adult learning theory andragogy - as it applies to technology professional development and specifically the Louisiana INTECH certification model. The theoretical framework for this study is meant to build a basic understanding about the relationship among elementary administrators' perceptions of Louisiana INTECH professional development (independent variable), INTECH professional development (independent variable), and third grade student mathematics and reading achievement (dependent variable). Furthermore, the study draws from the constructivist learning theory, focusing on emphasizing the learner-centered aspects of constructivism with the objective of changing instructional practices in order to improve student achievement.

Michael Fullan's (1991) leadership change theory is cast as the predominant theory on which the theoretical underpinnings of this study rest. However, it is crucial to determine the link between transformational leadership theory, its predecessor, and the evolution of Fullan's well-know and well-regarded theory.

Transformational leadership theory's foundation is Max Weber's (1922) seminal work on charismatic leaders. This theory, which is a branch of cultural theory, embodies the concept that the implementation of new ideas promotes and allows leaders to continually change themselves (Kuhnert & Lewis, 1987). Transformational leaders view themselves to be change agents (Lussier & Achua, 2007). Additionally, adoption of this theory typically translates to avoidance of the status quo, in regard to leadership paradigm. Indeed, transformational leaders remain adaptable and flexible, continuously improving and changing those individuals around them (Kuhnert & Lewis, 1987). However, in the realm of transformational leadership and change theory, Weber's work does not stand alone. The modern-day theorists most closely associated with this concept are James McGregor Burns and Bernard Bass, notable contemporary supporters of transformational leadership theory and more recently, Michael Fullan, who customized this theory and presented additional ideas in his leadership change theory. It is worth noting that Fullan's theory is most applicable to the INTECH professional development analysis. Noted leadership theorist Thomas Sergiovanni (1979) shares that Max Weber's writings promote "a pure form of idealization of an organization" (p.14), which Weber termed bureaucracy. Weber's writings specify the role of an administrator and detail the characteristics of a bureaucracy. Although still potent today, and worthy of study, his work fails to accurately portray the human elements which temper all leadership decisions. This deficiency is presented by Sergiovanni (1979): “Neither scientific management or bureaucratic thinking give adequate attention to the human side of life in educational organization” (p.15).

James McGregor Burns (1978), in his book *Leadership* , addresses this deficiency by proposing that transformational leaders work to engage followers’ higher-level needs, substituting self-interests for societal-interests. Burns contends that followers become leaders through keen interest and deliberate attention to the greater good (Lussier & Achua, 2007). By constrasting the traits of transformational and transactional leaders, Burns expounds upon the work of Weber.

Bernard Bass (1997) applied Burn’s (1978) concepts to organizational management, identifying variables in personality, which aided in differentiating transformational from transactional leaders (Kuhnert & Lewis, 1987). There remains deficiency in this explanation. However Kuhnert and Lewis (1987) contend that Bass failed to explain how certain traits might create various leadership styles. This failure leaves Bass as merely a stepping-stone to the crux of the study’s theoretical base, and presents Michael Fullan’s (1991) leadership change theory as the scaffolding for the examination of the perceptions of school leaders about INTECH as a change agent in their schools.

Michael Fullan (1992, 2001b) regards educational change as multidimensional, involving the classroom, school, and district. Stakeholders, such as administrators, teachers, students, and parents, have a substantial impact on the implementation, form and type of change. The Louisiana INTECH technology embedded professional development model engages all of these dimensions and is a potential pathway to implement the necessary instructional changes to improve classroom practices. The practice of educational innovation is also multidimensional. Fullan (2001b) tells us there are at least three components or dimensions at stake in implementing any new program or policy:

1. The possible use of new or revised materials (direct instructional resources such as curriculum materials or technologies)
2. The possible use of new teaching approaches (i.e., new teaching strategies or activities)
3. The possible alteration of beliefs (e.g., pedagogical assumptions and theories underlying particular new policies or programs).

All three aspects of change are necessary because together they represent the means of achieving a particular educational goal or set of goals (p. 39).

Fullan's (1993, 1999, 2003) multidimensional perspective incorporates a tri-level model of transformation that includes the school, the community and the district or the state. This model involves altering cultures at the school, district, and state levels so that people experience the new values and behaviors in their day-to-day actions. According to Fullan, when people learn new things in context, two powerful things happen:

1. The new learning is specific to the context in which they are working.
2. Because the learning occurs in context, people are learning with others so that the outcome is shared learning and further changes in the culture.

INTECH is a clear example of all of the systems actively engaged in tri-level reform. The measure of success is large-scale engagement and development of all three levels, with the outcome being continuous improvement through raising expectations and improving student performance.

Another applicable facet of Fullan's (1991) theory of change is the concern regarding how to institutionalize change. He represents change consisting of three phases: initiation, implementation and eventually, institutionalization. Staff development is a strategy to institutionalize the efforts of school improvement (Fullan, 1992). Sustainable system change is an imperative (Fullan, 2003), but schools and schools systems cannot be restructured while at the same time attempting to re-culture the systems (Fullan, 1993).

Fullan's (2001a) work provides a framework to make sense of the dynamic process of change. He focuses on leading in a culture of change. Technology integration professional development models, such as INTECH, can be mapped onto this general leadership framework. Fullan provides an explanation of this theoretical "fit": he notes a "remarkable convergence of theories, knowledge bases, ideas, and strategies that help us confront complex problems that do not have easy answers. This convergence creates a new mind-set—"a framework for thinking about and leading complex change more powerfully than ever before" (p. 3). He indicates that "five components of leadership represent independent but mutually reinforcing forces for positive change" (p.3). These components are: (1) *moral purpose,* which he defines as "acting with the intention of making a positive difference in the lives of employees, customers, and society as a whole" (p.3); (2) *understanding of the change process,* **"**which must be combined with moral purpose to be effective" (p.3); (3) *improvement of relationships,* the "single factor common to every successful change initiative" (p.3); (4) *knowledge creation:* "Leaders commit themselves to constantly generating and increasing knowledge inside and outside the organization" (p.3); and (5) *coherence*: "Effective leaders tolerate enough ambiguity to keep the creative juices flowing, but along the way ... they seek coherence. Along this path the leader of change seeks commitment, both internal and external" (p. 3).

As Fullan (1991) considers the roles of school administrators while analyzing educational change at the local level, he concludes that these administrators must build the capacity of their schools to handle innovation – technological innovation, the same innovation INTECH supports. The leadership change processes espoused by Fullan (2001a) are appropriate for those considering innovations in the domain of educational technology. In order to understand the change process essential to leadership it is import to recognize “The goal is not to innovate the most; it is not enough to have the best ideas; appreciate the implementation dip; redefine resistance; reculturing is the name of the game; and never a checklist, always complexity” (p. 34). INTECH, while innovative, is a professional development model that serves as a complex staff development methodology that is a significant catalyst for re-culturing classroom instruction.

In designing technology-based instruction, the principles of adult learning theory, also referred to as andragogy, can be used to make the instruction more effective. Andragogy is a set of assumptions about how adults learn. The assumptions include - the learner’s need to know, the learner’s self-concept, the role of the learner’s experience, a student’s readiness to learn, the student’s orientation to learning, and the students’ motivation to learn. Malcolm Knowles’ (1980) theory of andragogy allows professional developers to structure lessons which are part of a relevant learning environment for adult students. It appears that Louisiana INTECH certification training draws from these assumptions in an effort to provide powerful professional development for Louisiana teachers.

While Knowles (1980) is commonly accepted as the key expert on andragogy, various adult educators including Brookfield (1986), Lawler (1991), Merriam and Caffarella (1999) and Mezirow (1991) are also regarded as experts on the theory and how it can be used to facilitate adult learning. Knowles, Holton, and Swanson (1998) contend adult learning theory involves six assumptions of andragogy. The first assumption is *The Learner's Need to Know*. Adults need an understanding of why they should know a particular concept. They want to understand how the learning will benefit them. When adults learn something of their own volition, they invest significant energy in investigating the benefits to be gained from the learning and the pitfalls of not learning (Tough, 1979). As a part of Louisiana INTECH professional development, teachers are deeply involved in using standards-based instruction. These teachers are aware of the high-stakes testing environment in the state and the expectations for student performance. They are able to clearly link INTECH training to the potential impact of instruction that aligns the technology-based student learning activities with state standards.

The second assumption is *The Learner's Self-Concept*. Knowles, Holton, and Swanson (1985) report that "adults resent and resist situations in which they feel others are imposing their wills on them" (p. 65). As part of these adult learners' self concept, they feel they are responsible for their own decisions and for their own lives   In the case of technology enabled learning, the non-linear application of learning allows adult learners to create learning pathways most appropriate to their learning styles, thus creating multiple pathways to success. Louisiana INTECH training provides numerous pathways of learning for adult learners via face-to-face or online encounters and with opportunities to pace their learning based on individual teacher needs. In addition, INTECH trained teachers who know and understand how to use technology in non-linear ways in the classroom setting are able to infuse differentiated teaching strategies that support students' individual learning styles and needs.

The third assumption is *The Role of the Learner's Experience*. Most adult learners have a wealth of lifetime experiences to draw upon. In adult learning situations, the use of reflective activities that call upon the expertise of the group facilitate the use of the learners' previously acquired expertise. In developing technology-based learning experiences, Mezirow (1991) states reflective practices "involve assessment or reassessment of assumptions" (p. 6). Reflective practice is a key component of Louisiana INTECH professional development. Teachers are required to reflect on each day's learning and provide feedback to peers on their progress.

The fourth assumption is A *Student's Readiness to Learn*. Knowles (1980) believes adults become prepared for learning as "they experience a need to learn in order to cope more satisfyingly with real-life tasks or problems" (p. 44). As teachers engage in INTECH professional development, they craft lessons that provide for authentic learning tasks for students as they model constructivist best practices for their peers.

The fifth assumption is *The Student's Orientation to Learning*. Adult learners tend to be more life-, task-, or problem-centered than children in their orientation to learning. If they perceive the learning will be relevant by helping them deal with life's problems or a real-life task, they will devote energy to the learning (Knowles, 1990). INTECH professional development aligns the lessons taught with the Louisiana Comprehensive Curriculum as teachers share model lessons. Teachers routinely struggle with the alignment of lessons to this curriculum. INTECH provides a clear pathway in a consistent, relevant manner for teachers to solve the problem of curriculum and technology alignment.

The sixth and final assumption associated with adult learning theory is *The Students' Motivation to Lea*rn. Knowles (1990) reports that for adult learners, internal motivators are more important than external motivators. Job satisfaction, self-esteem, and quality of life are powerful personal incentives for adult learners. The INTECH model provides teachers an opportunity to demonstrate a highly competent use of technology with students. Such an achievement contributes to gaining status not only with their teaching peers, but also with their students.

Knowles' theory of andragogy outlines the effective methodologies for adult learning. By integrating this theory into the design of technology-based learning environments, lessons are created that provide opportunities for teachers to use the latest technology while meeting their needs as an adults. With andragogy including the key constructs for an adult's readiness to learn, the role of the learner's experiences, the teacher as a facilitator of learning, an adult's orientation to learning, and the learner's self concept, adult learning theory is the logical theoretical framework that creates the scaffolding for the Louisiana INTECH professional development model.

Constructivist theory provides the final critical component of the framework for Louisiana INTECH technology embedded professional development offerings. Constructivist concepts are woven throughout the entire INTECH experience. Constructivist theory is the basis for the methodologies taught during INTECH professional development. According to Bruner (1961) and von Glaserfeld (1989), knowledge is not transmitted from one learner to another, but instead is constructed by the learner. In INTECH professional development sessions, the instructor's role in a constructivist learning environment is to provide opportunities for learners to use various materials while discovering or constructing new knowledge.

Research relating that experience is a major factor in the learning process abounds (Bandura, 1976; Brown, Collins, & Duguid, 1989; Bruner, 1961; Dewey, 1938; von Glaserfeld, 1987). The pursuit of knowledge and learning is viewed by many constructivists as a social process referred to as "social constructivism." Knowledge is considered a human product and is socially and culturally constructed (Ernest, 1998; Gredler, 1997; Prawat & Floden, 1994).

Essentially, the belief is that as individuals, we interact with each other and our environment, thus creating meaning. Fundamentally, learning and knowledge acquisition are both affected by experiential and social processes.

McMahon (1997) asserts that learning as a social process does not take place primarily within a person, nor is it a passive development of behaviors shaped by external forces; rather, it occurs when individuals are engaged in social activities. Additionally, knowledge is constructed in the mind and in social communities (Richardson, 1999). When the social perspective of constructivism is incorporated into professional development activities, teachers are able to interact, reflect and discuss various concepts with their peers.

Within the constructivist learning environment, both the social and psychological contexts for professional development are addressed (Tobin, Kahle, & Fraser, 1990). Constructivism maintains that knowledge is constructed by the learner while exploring pedagogy in an inquiry-based and active learning environment using constructivism as a referent (Hassard, 1992; Tobin & Fraser, 1990). Collaborative learning is grounded in social constructivism and has at its roots the work of Vygotsky (1978). While social constructivism holds the belief that individuals construct their own knowledge, ultimately knowledge construction must take place in a sociocultural context (Reagan, 1999). Thus, a social environment is established where critical discourse is valued and where students and teachers are encouraged "to develop theories and ideas of their own which challenge and test the limits of traditional sources of knowledge" (Brody, 1995, p.38). In professional development environments that address the social perspective of constructivism, participants are provided with opportunities to interact and discuss various situations with others in the professional development setting. The collegial, reflective

INTECH training environment is indicative of the strong tenets of the social perspective of constructivism.

Moreover, constructivist perspectives on learning have been essential to much of the empirical and theoretical work in mathematics education since the early 1980s (Steffe & Gale, 1995; von Glasersfeld, 1991). As teachers understand students' prior knowledge, they are able to create learning experiences that build on the existing understandings (Steffe & D'Ambrosio, 1995). The real process of understanding begins when students are exposed to new knowledge,

Constructivism should not be viewed as a single theoretical position; rather, it should be considered to exist along a theoretical continuum. The assumptions underlying the continuum vary along several dimensions. Along this continuum, cognitive constructivism provides the basis for this study on Louisiana INTECH professional development. Cognitive constructivist theories focus on both what students learn and the process by which they do so (Fosnot, 1996). Fosnot summarizes these theories and outlines constructivist teaching practice as four epistemological assumptions that comprise what we refer to as "constructivist learning."

1. Knowledge is physically constructed by learners who are involved in active learning.
2. Knowledge is symbolically constructed by learners who are making their own representations of action;
3. Knowledge is socially constructed by learners who convey their meaning making to others;
4. Knowledge is theoretically constructed by learners who try to explain things they don't completely understand.

According to cognitive constructive theory, the interactions with the social or physical environment during the knowledge construction process are of paramount importance. As young learners assimilate past experiences and knowledge with new experiences and knowledge, they construct their new view of their world (Piaget & Inhelder, 1973). Correspondingly, as teachers participate in professional development activities, they participate in comparable experiences that serve as a catalyst for a change in their conceptions (Radford, 1998; Tobin, 1993).

The theoretical foundation for the design of many technology enhanced learning environments is based on the constructivist paradigm; as is the case with the Louisiana INTECH professional development model. INTECH trained teachers' practices include activities that support technology engaged, project based learning focusing on students' constructing knowledge in meaningful and relevant ways. Cognitive constructivism is directly aligned with the construction of many different technology enhanced environments (Burton, Moore, & Holmes, 1995; Duffy & Jonassen, 1991). Teachers assume new roles as guides and facilitators in the instructional process as a precept of cognitive constructivist theory (Piaget, 1970; Vygotsky, 1978). It follows that the use of various technologies can also facilitate the learning process. Constructivism and cognitive constructivism theory, paired with the Louisiana INTECH professional development model and technology, provide the theoretical underpinnings for this study.

Importance of the Study

With the current emphasis on state and federal requirements for school accountability, expense for substitute teachers, and time away from classroom instruction; state, district, and local stakeholders have expressed concerns about the impact of technology integration professional development initiatives on student performance. School administrators are pressured to maintain professional development programs that clearly demonstrate improved student achievement. Those programs not aligned with school vision and accountability expectations are revised and/or removed. Therefore, clear documentation of student gains is essential to continuing technology integration professional development initiatives.

Each year, in the state of Louisiana, hundreds of kindergarten through twelfth grade teachers are absent from their classrooms to participate in INTECH training. In fact, some Louisiana school districts routinely require all new teachers to complete INTECH training. While some qualitative research has been conducted concerning INTECH trained teachers use of technology, no research exists concerning the impact of INTECH training on student achievement (DiBenedetto, 2005; Bennett, 2004; Redish, 1997; Sheumaker, Slate, & Onwuegbuzie, 2001). This present research study is unique and critical since no effort has been expended to align the INTECH professional development model with state accountability results. This study is some of the earliests research in the area and contributes to informing the research base. If a significant commitment of human and financial resources is to continue to be supported, there should be a clear sense of the impact of this extensive professional development on student performance.

Scope of the Study

Participation in this study was confined to only elementary school administrators and third grade INTECH certified teachers in the Calcasieu Parish schools that completed 56 hours of focused INTECH professional development. Additionally, these teachers finished all requirements of the certification. As a result of district technology initiatives, they had at least one computer in the classroom connected to a high speed Internet connection. The professional development model to be researched was restricted to Louisiana INTECH. The INTECH certified and non-INTECH certified teachers were selected according to years of teaching experience, levels of education, and selected school characteristics. Calcasieu Parish Public

Schools 2005 third grade mathematics and reading scores for students of 27 INTECH certified and 27 non-INTECH certified third grade teachers were examined for comparison in mathematics and reading achievement growth. Over 800 students' test scores were examined.

Definition of Terms

For this study, the following terms and definitions are provided to clarify meaning and promote a clearer understanding. Terms are listed alphabetically and operationally defined for the purpose of this research.

Affective Change. Refers to a dimension of attitude toward change which deals with the feelings people have about change.

Andragogy. Is the art and science of helping adults learn.

Analysis of Covariance (ANCOVA). Is a more sophisticated method of analysis of variance. It is based on inclusion of supplementary variables (covariates) into the model. Allows for inter-group variation associated not with the treatment itself, but with covariate(s).

Analysis of Variance(ANOVA). Is a statistical technique used to compare two or more independent groups on the dependent variable. Sample means are compared in order to infer whether the means of the corresponding population distributions also differ.

Behavioral Change. Refers to the degree to which a person is likely to support change and is likely to initiate change.

Center for Applied Research in Educational Technology (CARET). Is a project of the International Society for Technology in Education in collaboration with Education Support Systems and the Sacramento County Office of Education. CARET is funded with a grant from the Bill & Melinda Gates Foundation.

Classroom Based Technology (CBT). Refers to a Calcasieu Parish School Board program that provides each classroom teacher with a computer, printer, and software as part of a technology refresh cycle every three to five years. Each teacher participates in three full days of basic technology integration training specifically designed for their grade level and subject area.

Cognitive Change. Is a component of attitude towards change that focuses on the degree to which a person believes that change tends to produce positive effects for the organization, for co-workers, and for him/herself.

Constructivism. Refers to the idea that learners construct knowledge for themselves by reflecting upon their own experiences, and that each learner individually and socially constructs meaning as he or she learns.

Enjoy Change. To enjoy change is to take pleasure or gain satisfaction in the experience of change; to feel or perceive with pleasure with change or to be delighted with change.

Gain Score. Is the difference between two test scores.

Higher-order Thinking Skills (*HOTS*). Is a term introduced by Stanley Pogrow (2005) over twenty-five years ago. This concept uses Socratic teaching methods combined with the use of technology thereby increasing students' interest and gives students the opportunity to hypothesize and test new ideas.

INTECH Certified Teacher. Is a teacher who has successfully completed the 56-hour state-approved Louisiana INTECH professional development program.

Integrated Learning Systems (*ILS*). Is defined as packages of networked hardware and software used for education. Such systems provide instructional content as well as assessment and management tools. Integrated learning systems feature programmed instruction for teacher and student, and their purpose is to direct and coach the student through the learning experience.

Iowa Tests of Basic Skills (ITBS). Is a norm-referenced standardized test given to students in the Calcasieu Parish Schools, as well as across the nation. This test is annually given to students beginning in kindergarten progressing until grade 8 to assess educational development.

Louisiana INTECH. Is defined as a well-known, accepted, state-approved model of intense, content-rich, hands-on, 56-hour staff development that is designed to provide teachers with concrete examples of effective technology-based strategies that support and enhance curriculum.

Masters Plus 30. Is recognition of achievement of 30 graduate hours beyond the Masters Degree.

Pearson's r Correlation. Indicates the magnitude and direction of the association between two variables that are on an interval or ratio scale.

Pedagogy. Is the art and science of teaching children.

Professional Development. Is defined as organized content delivered to classroom teachers and specifically designed to improve the job performance in the classroom. Professional development encompasses a variety of opportunities afforded to educators with the purpose of developing teaching approaches, dispositions, and knowledge skills in an effort to improve the effectiveness of classroom teaching (Loucks-Horsley, 1996).

Recognize the Occurrence of Louisiana INTECH Professional Development. Is to be knowledgeable concerning the components of INTECH professional development and how it might be implemented in a school setting.

School Performance Score (SPS). Refers to scores that are calculated based on the school's one-year standardized testing data, attendance, and dropout rates.

Standard Scores (SS). Are produced from a single, equal-interval scale of scores that is continuous from kindergarten through twelfth grade. The Iowa Tests range from 80 for kindergarten through 400 for grade 12. The average standard score for second grade is 166 and for third grade is 184.

Statistical Package for Social Sciences (*SPSS).* Is a software package used for statistical calculations.

Student Achievement. Is measured utilizing the 2004 and 2005 Calcasieu Parish student *ITBS* mathematics and reading total Standard Scores.

Take Action to Support or Initiate Change in Relationship to Louisiana INTECH Professional Development. Is to encourage participation in INTECH professional development and support that participation with funding and guidance with the purpose of institutionalizing change in the school setting.

Technology Professional Development. Is organized content delivered to teachers and specifically designed to improve the integration of technology in classroom curriculum.

Limitations and Delimitations

Two parameters for a research study establish the boundaries, exceptions, reservations, and qualifications inherent in every study: delimitations and limitations. The delimitations narrow the scope of a study, while the limitations serve to identify potential weaknesses of the study and yet they cannot be controlled (Cresswell, 2003). The delimitations refer to limitations deliberately imposed on the research design. These delimitations allow the researcher to focus the study and narrow the area to be studied. Moreover, the delimitations provide a description of the focus of the study and identify what will and will not be accomplished by this research. Conversely, the limitations describe the aspects of the study that the researcher knows may negatively affect the results or generalizability of the results, but over which the researcher has no control. These limitations are natural conditions that restrict the scope of a study and may affect its outcomes. (Rudestarm & Newton 2001; Gay & Airasian, 2003).

There were several limitations in this study over which the researcher had no control and which could have impacted the results. Due to disparate funding and inconsistent leadership at various school sites, the amount of technology available in each INTECH third grade classroom was varied. Minimally, as a result of a 2004 district-wide technology professional development program, Classroom-Based Technology (CBT), each third grade teacher had a new multi-media computer, printer and software in his or her classroom. CBT is a three-day technology proficiency training focusing on the Louisiana standards and benchmarks. The CBT training focuses on the technology proficiency skills teachers need in order to properly operate various technologies and software in the classroom, while providing limited technology integration strategies. In contrast, the eight-day INTECH professional development includes no technology proficiency training and provides teachers with intensive training on the integration of technology into the curriculum

In addition, the use of technology in the classrooms was varied and implementation of various technology strategies was diverse. Although, all third grade teachers participated in Classroom-Based Technology (CBT) district technology professional development training, there was no definitive method to determine the exact technology prowess of each teacher. However, each teacher demonstrated basic computer literacy skills after completion of the INTECH professional development model.

Another limitation of this study was the use of a causal-comparative design. Since there was no control over student placement in classes, the placement was non-random. Due to the non-random placement of students in classes, there may have been other variables that had an effect on the dependent variable, third grade student achievement in mathematics and reading. The researcher used matched groups as an attempt to control for the effect of any extraneous variables. Analysis of Variance (*ANOVA*) determined the variation within and between the groups. A further limitation of the causal-comparative design was that it described a relationship, but did not explain the cause and effect of the relationship (Gravetter & Wallnau, 2004).

The lack of specificity in the *Iowa Tests of Basic Skills (ITBS)* norm referenced test scores was the concluding limitation. These tests did not specify what a student knew or did not know. They only compared students to others in the norming group (University of Iowa, 2006).

The delimitations for this study, while providing focus and identifying what will and will not be accomplished by this research, also provided critical data to drive decisions for Calcasieu Parish School Board (CPSB) administrators. Elementary student achievement in mathematics and reading was an area of great concern in the district due to the weighting of the mathematics and reading scores in determining the School Performance Scores (SPS). CPSB has 36 elementary school campuses. These schools contain a large majority of the total student population for the district. In order to focus the study and provide the data needed on the impact of technology professional development on mathematics and reading, only 3rd grade mathematics and reading scores were examined. Additionally, only administrators from schools with elementary students were surveyed.

A further delimitation was determined by the fact that there were no examinations of the effects of the INTECH professional development over time. While 2004 pretest and 2005 posttest measures were investigated, no other measures were investigated to examine the sustained effectiveness of the professional development. Further research will be necessary to examine the sustained effects of the INTECH professional development over time.

The final delimitation in the study was that only 2004 mathematics and reading composite *ITBS* test scores (pre-test) and 2005 mathematics and reading *ITBS* test scores (post-test) were analyzed. All second and third grade students in the Calcasieu Parish School District were tested using the *ITBS* in March of 2004 and 2005. This provided district wide data to easily compare gain scores. Since the state of Louisiana was transitioning into a new testing program beginning in 2006, it was reasonable to use the most recent test data available, March 2004 and 2005.

Finally, delimiting this research study, was intended to provide a clear focus and lens for the research. This allowed the investigator to study the issue more acutely. These delimitations were important for interpreting the results that ultimately answered the following research questions: Do elementary school leaders perceive INTECH professional development as a catalyst for change in their school? Does this professional development impact student achievement in mathematics and reading?

Organization of Study

The study is organized into five chapters. Chapter One is the introduction to the study and provides the context for the study. The study examines the perceptions of school leaders about Louisiana INTECH professional development as a change agent in schools and determines the impact of this training on third grade mathematics and reading achievement. Additionally, Chapter One includes the statement of the problem, the purpose, the research question, and implications for the study. The basic theoretical framework for the study is introduced and discussed. The scope of the study, definitions, and delimitations and limitations also are included in this chapter.

Chapter Two reviews the literature pertinent to the study. Areas of review include: technology professional development, the Georgia and Louisiana INTECH models, technology and student achievement in mathematics and reading, and technology professional development and student achievement. A summary of current findings about technology professional development, Louisiana INTECH, and student achievement are provided.

Chapter Three focuses on the research design and methodology. The sampling methods, instrumentation and methods of data collection are defined. In addition, an analysis of data is provided. The statistical procedures to be employed to evaluate the data are also provided.

Chapter Four details the results and findings of the study. The findings from the analysis of the data are provided. Additionally, the limitations of the study are discussed.

Finally, a summary of the study is provided in Chapter 5. This chapter includes a summary of the findings and presents conclusions as well as recommendations for further study and practice. The implications for the study are also highlighted.

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Chapter Two: Review of Literature

Introduction

Educational technology has been prominent in America's schools since the mid-1980s, but the documented advantages of such technology have been elusive and difficult to interpret. In the last decade a sizable body of research connecting technology integration to student learning, attitudes, and behaviors has begun to emerge, validating what technology proponents have always suspected. When properly used with well-trained and knowledgeable teachers, technology integration affords many benefits. In Louisiana, "well-trained and knowledgeable" is recognized as the 56-hour Integrating Technology (INTECH) training. This program has been adopted and recommended as the premiere Louisiana technology integration professional development model for K-12 staff (Louisiana Center for Educational Technology, n.d.). However, the positive impact of this highly-touted professional development model remains largely undocumented.

Hundreds of Louisiana's elementary teachers receive release time and/or stipends ranging from $50 to $200 per day to participate in the eight days of INTECH training. This has proven to be a very expensive endeavor for the state's K-12 school systems. The researcher explored the impact of this professional development model on third grade student achievement in mathematics and reading in an effort to determine if the funds appropriated and professional efforts are justified.

Furthermore, while the objectives of the study were to examine the perceptions of school leaders about Louisiana INTECH professional development as a change agent in their schools and to determine the relationship between INTECH professional development and mathematics and reading achievement, the researcher acknowledges that the overarching concept of transformational leadership and leadership change theory guides the framework for this study. Teacher professional development simply provides the vehicle to re-culturing the teaching profession.

Indeed, Fullan (2002) and Hammond (2002) believe the profession is yet to come of age. “This new professionalism will be collaborative not autonomous; open rather than closed; outward looking rather than insular; and authoritative but not controlling. More than anything, the new professionalism will make huge demands on teachers' own learning to learn about: learning styles, multiple intelligences, how to integrate technology; how to interact with adults 'out there' and how to get more support for their teaching” (p. 1). Additionally, the very concept of change and leadership propels the notion that school leaders must embrace the concepts of adult learning theory and constructivsm in order to transform and re-culture the profession.

Components of adult learning theory, specifically Malcolm Knowles’ (1980) andragogy are the underpinnings of the INTECH professional development model. This research and practice of andragogy provides guidance to facilitators of adult learning. When the adult learning provider is seen as a facilitator rather than a teacher of adults by allowing the adult learners’ input into the learning process, including the formation of objectives, the learning activities themselves, and the methods of evaluation, this creates a powerful learning environment which is truly learner-centered (Knowles, 1980).

Furthermore, constructivist theory provides a foundation for the INTECH professional development model. This concept details the learning strategies that are employed as students of the teachers build new content knowledge through higher order thinking and problem solving in mathematics and technology as they participate in INTECH teacher developed lessons.

Therefore, the theoretical framework for the literature review is built upon the learning theories of andragogy and constuctivism, and driven by transformational leadership and leadership change theory.

In conclusion, in an effort to understand the research surrounding classroom technology use and technology's potential impact on student mathematics and reading achievement, this literature review has been organized into several topics. INTECH technology professional development, the independent variable of the study, is the first topic and provides an overview of technology professional development findings. The second topic area will focus on current practices in mathematics and reading instruction as they relate to student achievement. Technology professional development and student achievement will be examined next. This topic examines current research and literature relative to the independent and dependent variables addressed in this study. Finally, the summary will provide an overview of the major areas covered and discuss the implications of and need for further research in the area of technology integration, professional development, and the relationship to student achievement.

Technology Professional Development

Professional development is the method by which teachers' pedagogical practices can best be enhanced. It offers an opportunity for construction of a different perception of teaching, while developing a pedagogical practice to deliver this new or revised perception (Fullan, 2001b; Glenn Commission Report, 2000; Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003; National Science Resources Center [NSRC], 1997). Nearly every proposal to reform, restructure, or transform schools emphasizes professional development as the primary vehicle to bring about needed change (Guskey, 1994).

However, it is important to recognize that the professional development opportunity be one which gives teachers adequate resources to implement the initiative, technology-based or otherwise, on a long-term basis within the classroom. Unfortunately, this is not always the situation. Regarding adequate educator training, in a 2003 (Ravitz) study, it was presented that singular professional development workshops generate an “enthusiasm effect” concerning its participants. Educators excitedly return to their classrooms, ripe with new ideas and techniques to share and implement with students. Often times, however, a “reality effect” emerges following the professional development experience. This is typically brought about through lack of support, and daily constraints placed upon educators.

Futhermore, it is worth nothing that numerous studies indicate that teachers are not well-trained to use technology in schools (Commerce, 2002; McCannon & Crews, 2000; Smerdon & Cronen, 2000). According to a National Center for Education Statistics report, only about one-third of teachers reported confidence in using technology proficiently in their classrooms; roughly two-thirds felt they were not well-prepared to use technology in an instructional setting. The report also found teachers felt they had little opportunity to develop technology implementation skills. Additionally, lack of adequate training also results in teachers’ limited technology use. As a result, teachers are not effectively using computers and other technologies in the classroom (NCES, 2000).

Indeed, the journey to endow teachers with the skills and abilities to effectively integrate technology into classroom lessons is a lengthy one. It requires not only time, but significant professional development for teachers to move through the stages from early technology adoption to high-level implementation aligned with curriculum goals (Dwyer, Ringstaff, & Sandholtz, 1990; Martin, Hupert, Culp, Kanaya, & Light, 2003; O’Dwyer, Russell, & Bebell, 2004). As teachers advance through these stages, they begin to use technology more frequently and in a more sophisticated, creative manner (Ertmer, Addison, Lane, Ross, and Woods, 1999). Ertmer, Ottenbreit-Leftwich, and York (2005) report that teachers rated professional development as one of the most influential extrinsic factors for changing their professional practices and utilizing technology in the classroom.

According to Rodriguez (2000), technology-enhanced professional development initiatives should contain specific components that have been deemed critical in achieving successful implementation. These components include:

> a connection to student learning, hands-on technology use, various learning experiences, curriculum-specific applications, new roles for teachers, collegial learning, active teacher participation, ongoing process, sufficient time, technical assistance and support, administrative support, adequate resources, continuous funding and built-in evaluation (p.3).

Moreover, in order to use technology effectively and efficiently in classroom instruction, teachers must change traditional classroom practices. King (2005) indicates there is a positive relationship between technology-focused professional development and secondary teachers' technology utilization and implementation of new methodologies in the classroom. Hughes and Ooms (2004) note that a major factor contributing to teachers' minimal use of technology is the lack of ongoing, focused professional development. There is no doubt that instructional time will be wasted if teachers are not well-trained in technology uses to support instruction (Byrom & Bingham, 2001; Coppola, 2004).

Furthermore, teachers are much more likely to use technology to deliver instruction and to provide opportunities for student use of technology when they teach in schools and districts that emphasize professional development to support technology integration, pressure teachers to use technology, ensure availability of and access to technology, and limit the amount of restrictive policies relating to technology use (O'Dwyer, Russell, and Bebell, 2004). In a survey of over 4,000 teachers, Becker and Riel (2000) found that teachers who attend and make presentations at professional conferences are stronger computer users and use computers to create more complex learning environments.

Technology integration strategies are rooted in numerous professional development offerings in an effort to enhance learning. The transformation that occurs when technology is embedded in learning experiences demands teachers that are skilled in the integration of technology into curriculum. In fact, studies indicate that educational technology must be an integral part of both content and instructional strategies (Glenn, 1997; McCannon & Crews, 2000).). Eisenberg and Johnson (1996) espoused the idea that the competent use of technology skills must connect to content, and the skills must fit together in a systematic instructional model such as a professional development setting. Teachers must not only actively engage in promoting students' technology use, but also help the students learn with and about the technology.

Additionally, teachers must play a fundamental role in any plan to integrate computers into the curriculum. It is essential that teachers have the opportunity to construct pedagogical knowledge in a supportive climate (Dexter, Anderson, & Becker, 1999). The learning environment should also engage students in active inquiry and problem solving. When technology integration is successful, students learn "through computers, not about them" (Dockstader, 1999, p. 3). And although arguments abound that technology does not always improve or enhance student achievement, research has shown that it can increase students' motivation to learn (Apple 1995; Lowther, Ross, & Morrison, 2001).

The importance of the work of Apple Computer, over two decades ago, is a clear example of technology use creating an engaged and motivational learning environment. During the mid-1980s, enthusiasm for using technology was gaining traction in schools around the country. Educators at Apple Computer began an extensive research project by creating environments in which technology was used as routinely as paper and books. They began a comprehensive study under the title of Apple Classrooms of Tomorrow (ACOT) to observe the effects on teaching and learning with technology (Apple, 1995).

They selected schools and classrooms, and gave two computers to each student and teacher—one for school and one for home. The initial investigation team was composed of university-based researchers, ACOT staff members, and teachers—who played an important role in describing classroom changes. With electronic mail and audiotape for communication, and encouragement to reflect on their experiences, the teachers inundated the ACOT staff at Apple with their observations. As the volume of communication grew, the ACOT researchers developed a database for the anecdotal data and began investigating themes relating to technology and change. Researchers from other institutions also began to conduct investigations in the ACOT settings (Apple, 1995).

By the end of the first year, students' behavior and attendance improved, along with their attitude toward themselves and toward learning. Performance also improved in several ways:

1. Test scores indicated that, despite time spent learning to use the technology, students were performing well—and some were clearly performing better.
2. The students wrote more, more effectively, and with greater fluidity.
3. Some classes finished whole units of study far more quickly than in past years.

Additionally, over time, independent researchers found that students in ACOT classrooms not only continued to perform well on standardized tests but were also developing a variety of competencies not usually measured. ACOT students did the following:

1. Explored and represented information dynamically and in many forms.
2. Became socially aware and more confident.
3. Communicated effectively about complex processes.
4. Used technology routinely and appropriately.
5. Became independent learners and self-starters.
6. Knew their areas of expertise and shared that expertise spontaneously.
7. Worked well collaboratively.
8. Developed a positive orientation to the future (Apple, 1995).

Indeed, dispelling widespread myths, the researchers found that instead of isolating students, access to technology actually encouraged them to collaborate more than in traditional classrooms. Instead of becoming boring with use, technology was even more interesting to students as they began using it for creating and communicating. Clearly, the Apple Computer experiment was a success, yielding powerful research into the importance of technology integration within the public schools and adequate technology-based educator professional development.

Furthermore, a study by Levin and Arafeh (2002) revealed insight into middle and high school students' opinions from thirty-six schools in the greater metropolitan areas of Washington, D.C.; Detroit, Michigan; and San Diego, California about the use of technology and the Internet. The students reported frustration with the ineffective teacher use of technology and the Internet in their classrooms. Moreover, the students believed that professional development for the teachers and timely technical assistance was critical if technology was to be effectively integrated into the curriculum.

Researchers agree that teachers are the key to effective classroom learning (Mergendoller, 1997; Padgett, H. & Buss, R. 2004; Soloway, 1996; Wenglinsky, 1998). Wells and Kuhn, (2003) found that long-term, sustained professional development helped teachers with more enduring technology implementation. Likewise, Becker (1994) and Cradler (1996) indicate that technology integration into classroom instruction cannot occur without systematic staff development. This staff development is essential to the acquisition of the appropriate skills and knowledge needed to effectively instruct students.

Constructivism and Technology Professional Development

Recent instructional theories draw on a constructivist view of learning and teaching as opposed to a transmission mode of acquiring knowledge. To understand the potential of technology implementation in enhancing the teaching-learning process, the impact of constructivism on classroom practices has been studied by many researchers (Black & McClintock, 1995; Brush & Saye, 2000; Richards, 1998;). A complementary relationship appears to exist between computer technologies and constructivism, the implementation of each one benefiting the other. Other researchers have suggested that constructivist strategies exploit technologies for the greatest impact in learning (Duffy & Cunningham, 1996).

Living and learning in the information age demands that classroom instruction provide for 21st century skill acquisition. Technology proficiency is essential (Partnership for 21st Century Skills, 2005). Therefore, it is critical that the instruction provided by teachers is appropriate and provides students with the ability to construct their own knowledge and think at increasingly higher levels. A number of studies indicate that professional development strategies for technology integration include a focus on constructivist theory and higher order thinking skills (Kent & McNergney, 1999; Padgett & Buss, 2004).

Constructivism is a learning theory that purports each learner "constructs" his or her knowledge. Given the fact that a teacher cannot put knowledge into a student's mind, it is expected that learners make their own "constructions" of information using their senses. Current learning experiences are combined with previously learned content to create new understanding. As the integration of technology into the curriculum and computer use becomes more commonplace, constructivism is gaining momentum (Driscoll, 1994). Teachers who understand how to use technology in an integrated learning environment believe that students must be actively engaged in constructing their own knowledge rather than passively receiving it (Bracey 1994; Ertma, Gopalakrishnan, & Ross, 2001).

In the constructivist view, teachers are facilitators of knowledge and students are encouraged to construct their own knowledge through problem-solving tasks. Vannatta (2000) and Vrasidas (2001) report that savvy technology-using educators regard the entire integration process as a constructivist venture which incorporates collaboration, reflection and negotiation within the context of authentic tasks. Collins (1991) contends, “Using computers entails active learning and this change in practice will eventually foster a shift in society's beliefs toward a more constructivist view of education" (p.3).

According to Mann (1994), the use of new technologies in an educational setting has caused constructivism to receive increased attention. Additionally, students become empowered by gaining access to real data and working on authentic problems. Lundeberg, Coballes-Vega, Standiford, Langer, and Dibble (1997) found that teachers who were committed to project-based learning in a technology-rich environment believed students could use technology to build concepts from existing knowledge to obtain information from a variety of sources. In addition, Bitter and Pierson (2002) reported that constructivist theory leads to the conclusion that sharing technology integration ideas in a professional learning environment could deepen teacher knowledge over time. Based on this constructivist view, the presence of computers in the classroom is not as important as the manner in which they are used (Strommen & Lincoln, 1992). Not surprisingly, under favorable circumstances, sustained use of computers was found to be related to increased use of constructivist teaching practices (Becker and Ravitz, 1999).

Georgia framework for technology integration model. The Georgia InTech model is a technology professional development program designed, implemented, and tested by the Educational Technology Center at Kennesaw State University (KSU). Realizing a need for the effective use of technology within the K-12 curriculum, Dr. Traci Redish and Linda Whitacre pioneered the InTech program in 1996 with 75 classroom teachers (KSU, 2006). Georgia Framework for Integrating Technology (InTech) is designed to support and enhance the existing classroom curriculum and to provide a catalyst for fundamental change in the teaching and learning process. InTech is designed with a spiral scope and sequence of courses to serve the needs of educators as they progress from novice to proficient with instructional technologies (Instructional Technology Atlanta Public Schools, 2006).

The Georgia legislature recognized Georgia's InTech professional development program as the foremost technology integration training solution for Georgia’s educators. The InTech course objectives are correlated to the Georgia Technology Standards for Educators, a state adoption of the International Society for Technology in Education's National Education Technology Standards (ISTE NETS). In addition, InTech meets and exceeds the National Council for Accreditation of Teacher Education (NCATE) standards for pre-service educators.

InTech has been integrated into pre-service education in colleges and universities throughout Georgia via a train-the-trainer model based upon the constructivist theory. The program has proven to be an effective approach for delivering technology staff development that focuses on successful technology integration into the K-12 curriculum. (KSU, 2006).

The overwhelming success of the InTech model resulted in the Georgia Department of Education's adopting InTech as a solution for Georgia educators to meet the mandatory technology requirement in the *A+ Education Reform Act of 2000* (House Bill 1187, 2000). The technology legislation reads as follows:

> The *A + Education Reform Act of 2000* mandates that holders of a renewable certificate must pass a computer skills competency test before they can receive certification renewal. Successful completion of the Phase One InTech model training at a state educational technology training center or a State Board of Education approved redelivery team shall be acceptable for certificate renewal purposes (House Bill1187, 2000).

Research related to the Georgia InTech model supports the claim that teacher participation in the staff development program improves the use of technology integration in the classroom (Bennett, 2004; Redish, 1997; Sheumaker, Slate, & Onwuegbuzie, 2001). Rhonda Bennett (2004) at the University of West Georgia conducted a causal-comparative study to examine three research questions: (1) How does InTech affect teachers' personal computer use? (2) How does InTech affect teachers' level of technology implementation? (3) How does InTech affect teachers' current instructional practice?

According to Bennett's (2004) study teachers expanded their use of instructional technology following InTech professional development participation. The study provided no indication of any impact on student achievement. Research by Sheumaker, Slate, and

Onwuegbuzie (2001) analyzed survey data from InTech and non-InTech middle school teachers. While there was no analysis of student achievement, the results of the study similarly indicated increases in teachers' classroom technology use. Redish (1997) used teacher self-assessments and observations to conclude that InTech teachers show a gain in classroom technology integration strategies. The study does not reference any improvement in student achievement as a result of InTech professional development.

Louisiana INTECH. Almost a decade ago, Louisiana Department of Education (LDOE) technology specialists conducted an intense examination of the Georgia INTECH model. In 1998, the Department of Education's Louisiana Center for Educational Technology (LCET) delved into the ways in which technology, teaching, and learning could be integrated to support student achievement. It was determined that the Georgia model could feasibly be modified and implemented as the Louisiana K-12 technology integration model. As a result of that examination, the Louisiana INTECH professional development model, based upon the Georgia Framework for Integrating Technology model, was developed and adopted for use in the Louisiana school districts and schools. The five areas which characterize the integrated training approach as specified by the LDOE website are: (1) classroom management techniques, (2) new designs for learning, (3) best pedagogical practices, (4) curriculum standards, and (5) modern technologies (Louisiana INTECH, 2006).

State Superintendent Cecil J. Picard believed Louisiana INTECH and other statewide professional development initiatives played a critical role in Louisiana's accountability efforts. In order to effect change in the Louisiana schools, he stressed that it was essential that teachers have opportunities to explore and develop classroom management techniques, new designs for learning, research-based pedagogy, curriculum standards, and technical skills. It was his vision and his hope that through Louisiana INTECH teachers would grow in their understanding of how technology can be used to support and enhance the existing curriculum, as well as drive change in teaching and learning (Picard, 2000).

INTECH certification is earned by teachers who have completed Louisiana INTECH training. The training is an intense, content-rich, hands-on, 56-hour staff development program designed to provide teachers with concrete examples of effective technology integration strategies that support and enhance curriculum and can serve as a catalyst for fundamental change in overall teaching and learning processes. INTECH teams of teachers learn basic technology skills while focusing on project-based activities that are aligned with the Louisiana Content Standards. Teachers are required to critically examine their own instructional practices to determine how technology can play a role in enhancing the teaching and learning process (LCET, n.d.). INTECH-certified teachers are expected to implement technology projects and activities developed during the training program in their classroom.

Virtually no research has been conducted in relationship to the Louisiana INTECH professional development model. After an extensive and exhaustive literature review, the researcher located only one study related to the Louisiana INTECH model. DiBenedetto (2005) surveyed 200 INTECH and 200 non-INTECH trained teachers using a survey tool developed and validated by the University of West Georgia. The survey topics included use of student-centered learning, utilization of a variety of technology skills, teaching pedagogy, and attitudes toward technology use in the classroom. The following hypotheses were proposed:

1. There is no statistically significant difference between INTECH and non-INTECH trained teachers with respect to student-centered learning, utilization of a variety of

technology skills, teaching pedagogy, and attitudes toward technology use in the classroom.

2. There is no statistically significant difference between INTECH and non-INTECH trained teachers with respect to utilization of a variety of technology skills.
3. There is no statistically significant difference between INTECH and non-INTECH trained teachers with respect to teaching pedagogy.
4. There is no statistically significant difference between INTECH and non-INTECH trained teaches with respect to their attitudes toward technology use in the classroom (p. 5).

The results indicated statistically significant differences in the areas of teaching pedagogy and attitudes toward technology use in the classroom. There was no statistically significant difference in student-centered learning and utilization of a variety of technology skills. DiBenedetto (2005) suggested future studies should have more balanced participant samples because twice as many INTECH trained teachers responded to the survey as non-INTECH trained respondents. As similarly reported in the Georgia INTECH research, there was no mention of the impact of Louisiana INTECH professional development on student achievement.

Technology and Student Achievement in Mathematics

Over the years there have been numerous calls for educational reform that use professional development as a central feature to improve science and mathematics education (Elmore, 1996; National Commission on Mathematics and Science Teaching, 2000). A study of Title I schools conducted by the U.S. Department of Education determined that students made greater gains in mathematics when teachers highly rated their professional development in mathematics and said that it matched their school's reform plan, focused on standards and assessments, and added to their confidence in using new approaches. This correlation between teachers' ratings of their professional development and student learning underscores the positive effect of quality professional development on the classroom (Tramontana, 2002). Furthermore, Crawford and Snider (2000) reported that investigations of best practices in the area of mathematics indicate a variety of approaches are used from strictly traditional to constructivist. While the approaches are on opposite ends of the continuum, they are nevertheless used in classrooms around the country.

The use of calculators and technology rather than traditional pencil and paper techniques has been extensively researched. Findings indicate that calculator-using students perform at high levels. Moreover, working in small and whole group settings which employ inquiry techniques to problem-solve is highly encouraged (Cauthen, 2003; Dion, Harvey, Jackson, Klay, Jinghua, & Wright, 2001; Heid, 1988; Pippenger, 2003).

Additionally, Briars and Resnick (2000) researched the impact of a mathematics reform model in Pittsburgh, Pennsylvania. After examining fourth grade test scores on the *Iowa Tests of Basic Skills*, the results indicated a significant difference in the test score gains of students who participated in the constructivist, National Council of Teachers of Mathematics (NCTM) endorsed program. The NCTM is the world's largest organization dedicated to improving the teaching and learning of mathematics from prekindergarten through high school. NCTM is a nonprofit, nonpartisan education association with nearly 100,000 members and 250 affiliates in the United States and Canada. Since the organization's founding in 1920, the NCTM's mission has been to ensure the highest-quality mathematics education for all students (National Council of Teachers of Mathematics [NCTM], 2006).

Kloosterman, Raymond & Emenaker (1996), spent three years studying the impact of teacher messaging about mathematics. The researchers determined that whether positive or negative, teacher messages about mathematics impact students' beliefs about mathematics. Reyes (1984) investigated quantitative studies conducted during the 1970's. His research indicated a correlation between self-confidence and student achievement in math. High achievers had moderate to high confidence and low achievers had, at most, moderate confidence (Kloosterman & Cougan, 1994).

In 2000, the Glenn Commission issued a report with the goal of improving the quality of math and science instruction. One pivotal goal is based upon the belief that professional development in mathematics improves student achievement (Glenn Commission, 2000). The report urges the use of technology in mathematics education: "to keep its edge, high-quality teaching must be continually reshaped by the institutional structures that support it, i.e., by professional development, continuing education, the effective use of technology, and recognition and rewards" (p.6). In addition, the Commission stresses that teachers must be given the time they need within the school day to keep up with new developments in their fields, specifically, technology.

Norman (2000) revealed a link between students' higher mathematics test scores and teachers who had participated in technology and computers professional development. A quantitative research study by Peterson and Fennema (1985) indicated classroom mathematics activities, when engaging, improved student achievement. Additionally, the researchers championed the cause of equity in mathematics instruction for males and females. Schiefele & Csikszentmihalyi (1995) provide evidence that interest in mathematics and motivation greatly impacts student achievement; thus teacher knowledge, skills, and instructional practices are crucial to student success. While researching the use of the Jasper video software, researchers at the Cognition and Technology Group at Vanderbilt (1992) found interactive video programs demonstrated an increase in student problem-solving skills. Students across nine states who used Jasper video software as a centerpiece for mathematics instruction for three to four weeks were compared with students who did not. The comparative research demonstrated that the students in classrooms that used the Jasper video programs were better at complex problem solving.

Technology and Student Achievement in Reading

Educational technology is nudging literacy instruction beyond its oral and print-based tradition to embrace technology solutions, online and electronic texts as well as multimedia. Computers are creating new opportunities for writing and collaborating. The Internet is constructing global bridges for students to communicate, underscoring the need for rock-solid reading and writing skills. By changing the way that information is absorbed, processed, and used, technology is influencing how people read, write, listen, and communicate.

Leiker (1993) examined effects of supplemental ILS instruction on reading and mathematics performance of third graders in two Texas school districts. A total of 72 students in one district served as the experimental group and received instruction using Jostens Learning Corporation reading software; 259 students in another district served as controls. Metropolitan Achievement Test served as pretest; scores from the Texas Assessment of Academic Skills served as posttest. An analysis of covariance revealed that mean scores in reading were higher for the experimental than for the control students. The effect size was 0.28 in reading.

Moreover, Reinking and Watkins (2000) reported on an instructional intervention involving fourth and fifth grade students and their teachers in creating multimedia book reviews related to their independent reading as an alternative to the conventional required book report. The researchers were interested in systematically examining how elementary school students and their teachers could be engaged in creating multimedia book reviews with the goal of increasing the amount and diversity of the students' independent reading.

Reinking and Watkins (2000) believed that multimedia book reviews, as an alternative to conventional required book reports, had potential for increasing the amount and diversity of students' independent reading by engaging them in personally meaningful responses to what they read, by sharing those responses through their multimedia presentations, and by capitalizing on the intrinsic motivation of using a computer to share information about what one has been reading. They reported on an instructional intervention involving fourth and fifth grade students and their teachers in creating multimedia book reviews related to their independent reading as an alternative to the conventional required book report. The researchers were interested in systematically examining how elementary school students and their teachers could be engaged in creating multimedia book reviews with the goal of increasing the amount and diversity of the students' independent reading.

Furthermore, the researchers believed that multimedia book reviews, as an alternative to conventional required book reports, had potential for increasing the amount and diversity of students' independent reading by engaging them in personally meaningful responses to what they read, by sharing those responses through their multimedia presentations, and by capitalizing on the intrinsic motivation of using a computer to share information about what one has been reading.

The experiment was conducted in two Georgia elementary schools during the 1992-93 school year and in one elementary school during the 1993-94 school year. Analysis of the field notes and videotapes of students and teachers in the computer lab documented consistently that peer interaction was greater during times devoted to the multimedia book review activity than during times devoted to other academic activities. The data collected in various ways and across various contexts contained repeated examples indicating that students were more engaged in learning and using the technology related to creating multimedia book reviews than in other academic activities in the classroom. The data suggested that students attitudes toward academic and recreational reading tend to increase (or at least not to decrease at expected levels) more in the classes involved in the multimedia book review activities than in two classes using an alternative computer-based activity aimed at increasing independent reading. Both the quantitative and qualitative data indicate that the multimedia book review activity contributed to achieving the pedagogical goal of increasing the amount of children's reading (Reinking & Watkins, 2000).

The introduction of the multimedia book review activities represented a novel intrusion into normal classroom routines, which was greeted with much enthusiasm by teachers and students as well as administrators and parents. That climate combined with a change in the social dynamics of instruction and the increased engagement of students and teachers led to increased interactions about and enthusiasm for books, which in turn led to more independent reading (Reinking & Watkins, 2000).

Chun & Plass (1996) investigated how reading comprehension can be facilitated with a multimedia application for language learning. They studied the effects of a dynamic visual advance organizer on the macro level and the effects of multimedia annotations for single vocabulary items on the micro level. Furthermore, they examined the relationship between vocabulary acquisition and reading comprehension. The results of their study indicated that the visual advance organizer does aid in overall comprehension and that annotations of vocabulary items consisting of both visual and verbal information help more than verbal information only. Also, a moderate correlation between vocabulary knowledge and reading comprehension was found.

Indeed, computers in the classroom have proven to be beneficial in increasing reading comprehension. David Reinking (1987, 1988) has researched the use of the computer as an electronic text. While describing reading as an interaction between a reader and a text, he points out that readers and printed texts cannot literally interact. In the process of reading, Freebody and Anderson (1983) found that it was necessary to replace many words in a passage with low-frequency synonyms before comprehension decreased appreciably. They suggested that readers may be using a minimum effort principle when confronted with difficult vocabulary in a text. In other words, readers may find it easier to rely on other elements of the text for meaning than to deal directly with an unfamiliar word. Such a strategy may be explained by the fact that it is often inconvenient or impractical to seek out the meaning of unfamiliar words while reading independently.

Electronic texts, on the other hand, can effect a literal interaction between texts and readers (Daniel & Reinking, 1987; Duchastel, 1988; Reinking, 1987). Given the capabilities of the computer, reading electronic texts can take on the characteristics of a dialogue. Electronic texts can be programmed to adapt to an individual reader's needs and interests during reading, which may in turn affect the strategies readers use to read and comprehend texts. For example, in a 1990 study Reinking and Rickman, tried to determine what would happen if an electronic text enabled readers to request a context-specific definition of difficult words in a text during reading. They compared the effects of reading under such conditions to reading printed texts accompanied by conventional resources such as a dictionary or glossary. The results suggest that when reading two short passages adapted from a science text, middle-grade students reading the interactive computer texts investigated more word meanings, recalled the meanings of more words, and comprehended more of the experimental text. Additionally comprehension can be increased by using electronic texts that provide a variety of options for readers and texts to interact during reading (Blohm, 1982, 1987; MacGregor, 1988a, 1988b; Reinking, 1988; Reinking & Schreiner, 1985).

In a 1998 study by Hiebert and Raphael, it was found that electronic trade books and other types of software programs for early reading are useful when they incorporate audio clips associated with words on the screen, speech to text, and oral feedback. The e-learning resources may help readers understand connections between their prior knowledge of oral language and written language skills. Additionally, Mayer (2001) found learners retained more information when:

1. they receive words and corresponding pictures rather than words alone
2. corresponding words and pictures are near rather than far from each other
3. extraneous words, sounds, and pictures are excluded and
4. words are presented as narration rather than as text on the screen. (p.185).

Video technology is an effective tool for facilitating vocabulary acquisition. In a comparative study of 4th, 5th and 6th grade students with learning disabilities, students were randomly assigned to a video instruction group and to a non-video group for reading vocabulary and comprehension lessons. Analysis of pre, post and follow-up tests two weeks after the completion of the lessons indicated that students in the video instruction had statistically higher word acquisition scores than those in the non-video group (Xin & Rieth, 2001). Various other types of tool software can help teachers committed to wholistic education to engage students in writing and reading their own stories and in other authentic literacy activities (Miller & Olson, 1994).

Pinkard (1999) found that software with imbedded multimedia literacy activities designed to support early literacy among young African-American students helped at-risk students with early reading skills. Furthermore, students with poor phonological awareness were found to be helped with the use of whole-word feedback via computer-based software. The combination of intensive training in phonological awareness and practice reading with speech feedback was most effective for developing phonological awareness and decoding skills (Wise, Olson, Ring, & Johnson, 1998). A review of 15 years of research on the use of technology to teach or support literacy among students with mild disabilities indicates cautious optimism (MacArthur, Ferretti, Okolo & Cavalier, 2001). Additionally, computer-assisted instruction (CAI) has been found to improve phonological awareness and word identification with these students (MacArthur, Graham, & Swartz, 1991a, 1991b; MacArthur, Graham, Schwartz, & Schafer, 1995).

Computers, combined with drama and Socratic dialogue, build thinking skills, specifically in the areas of reading and math. The Higher Order Thinking Skills (HOTS) pull-out program, developed in the early 1980s to build the thinking skills of students through exposure to a combination of computers, drama, and Socratic dialogue, enabled disadvantaged fourth through seventh graders to achieve:

1. twice the national average gains on reading and math test scores,
2. honor roll status for 10 to 15 percent of the students in 1994, suggesting a transfer of the students' cognitive development to learning specific content and

3. increased performance on measures of reading comprehension, metacognition, writing, components of IQ, transfer to novel tasks, and grade point average (Coley, Cradler, & Engel, 1997; Pogrow, 1996).

Technology Professional Development and Student Achievement

The ultimate goal of technology use in teaching should be to advance student learning (Cooper & Bull, 1997). According to Kirkpatrick and Cuban (1998), the human factor, the teacher, seems to determine the success or failure of integrating technology into instruction. They reported that with computer-enhanced instruction, teachers play a far greater role in how the technology is used, thereby affecting the outcomes for the students. A key to achieving improvement in student learning is to empower teachers through technology utilization (Romano, 2003). Guskey and Sparks (2002) noted that there is a complex but not chaotic or random relationship between professional development and student learning.

During the past decade more than $40 billion dollars of local, state, and federal funds have been committed to purchasing computers and infrastructure required to get schools connected to the Internet (Benton Foundation, 2003). As classroom technology spending soars, technology advocates say wiring schools, buying hardware and software, distributing equipment, and providing professional development leads to abundant classroom use by teachers and students and improves teaching and learning (Cuban, Kirkpatrick, & Craig, 2001). Critics argue that schools should use less technology because teachers struggle with technological changes, funds for equipment supersede other program needs, and the digital divide is widening (Levin & Arafeh, 2002; Oppenhimer, 2003; Weglinsky, 1998). Observations made by Cuban (2001) determined that in the schools studied, there was no clear and substantial evidence of students increasing their academic achievement as a result of using information technologies.

However, other studies indicate gains such as those measured through the alignment of curriculum standards, software, teaching instruction, and tests. John Cradler (2002), co-director of Center for Applied Research in Technology (CARET), noted that there is now ample evidence to link classroom technology to student mastery of content, higher-order thinking skills, and skills needed in the workplace. Further exploration of the literature yields interesting information regarding the impact of technology upon special kinds of learners and upon student attitudes, motivation, and collaboration skills (Cradler et al., 2002). When technology directly supports content standards, student achievement increases. The CEO Forum on Education and Technology, a five-year program created in 1996 to support President Clinton's technology literacy challenge, concluded that technology can have the greatest impact when integrated into the curriculum to achieve clear, measurable educational objectives (CEO Forum on Education and Technology, 2001).

Bain and Ross (2000) and Bain and Smith (2000) and reported on an eight-year longitudinal study of the impact of technology upon student test scores on the *Stanford Achievement Test* (*SAT*) *I.* Students who participated in the study showed a 94 point increase in *SAT I* performance over students who had a traditional school experience. Students in the study were a part of a systemic reform effort referred to as the Brewster Academy's School Design Model. Faculty and students carried laptops, connected to a robust campus-wide network, and were part of a carefully crafted curriculum redesign effort that provided support and evaluation of faculty. The study concluded that student achievement increases when technology is integrated into the curriculum and when the faculty is supported with professional development.

In West Virginia, an Integrated Learning System delivered curriculum software in reading and mathematics. The software was appropriately aligned with state tests. Additionally, teachers were given training in the appropriate use of the software. As a result of this technology-enhanced program, fifth grade students in 18 elementary schools showed gains on the *SAT-9*. The $7 million per year study indicates that regular, long-term use of software correlated to tests and supported by a teacher trained in using the technology will contribute to increased scores. West Virginia began implementing computer technology one grade at a time, starting with first grade. Each year, the state added a grade until reaching sixth grade. Extensive teacher training was an integral part of the project. Schools had the option of placing computers in classrooms or in a lab. In addition, the schools were required to select from suites of software that matched West Virginia's content standards. The researchers followed students from first grade to sixth grade for eight years (Mann, Shakeshaft, Becker, & Kottkamp, 1999). The following results were reported:

1. On statewide tests, students who learned from computers showed consistently higher gains. The researchers were able to determine that 11% of the gain was due to the use of technology.
2. Students did better when the computers were in the classroom rather than a lab.
3. The advantages of computer use extended through high school, where students learning from computers had better grades, took more advanced placement courses, and were more likely to graduate than those who did not use computers. (Mann et al., 1999).

An equally significant study is Project CHILD in Florida (Butzin, 2000). Project CHILD's goal was to place computers in classrooms. Like the West Virginia project, the Florida project provided extensive teacher training and had students use software that was aligned with the state's content standards. Project CHILD researchers found that when students used computers as tutors to receive information:

1. Computers contributed to higher scores for students in both low- and high- achieving schools.
2. Students had better discipline.
3. The boost that technology gave students was sustained over time.

The studies in West Virginia and Florida confirm that the positive impact of technology-enhanced learning is sustainable. Furthermore, the results demonstrate that students can gain an advantage when technology is deployed to bolster and complement the traditional work of teachers.

When the teacher is prepared and taught to use technology effectively, student achievement is positively impacted. In the area of mathematics, Wenglinsky (1998) conducted a landmark study that investigated the relationship between educational technology and student achievement. He used data from the 1996 National Assessment of Educational Progress (NAEP) for fourth and eighth grade students. Wenglinsky found the use of computers increased student achievement in mathematics, especially when used by teachers trained in the use of the equipment and software and when the software utilized higher-order concepts. The students of teachers who used technology primarily for drill and practice scored lower on the NAEP. In a study of technology use in reading and mathematics, a significant difference was found in student learning between students whose teachers were strong technology users and students whose teachers used technology poorly or not at all. (Mann et al, 1999; Middleton & Murray, 1999). Kulik (2003) concluded that professional development for teachers causes them to use classroom technology more effectively.

In some cases, the use of technology may make a larger difference in achievement for certain subgroups. Chung (2002) analyzed math and reading scores of fifth graders from 1,381 Pennsylvania school data files. He found a higher ratio of computers and Internet connections per student was especially effective in increasing learning outcomes in both math and reading for socioeconomically disadvantaged students as measured by the Pennsylvania System of School Assessment (PSSA).

Numerous studies have revealed that students tend to spend more time on task in classrooms where technology is used even moderately as opposed to rarely or not at all (Cradler et al., 2002; Waxman, Connell, & Gray, 2002). Nevertheless, today's educators and administrators continue to seek evidence that implementing technology holds the potential to increase standardized test scores. However, the biggest gains from classroom technology use are realized when the application directly addresses the curriculum standards (Cradler et al., 2002).

Reading management programs, such as Accelerated Reader (AR), that help guide and track students' reading have long been associated with higher standardized test scores. Accelerated Reader is a computer based, reading management and motivational system designed to complement existing classroom literacy programs for grades K-12. AR's goal is to motivate students to read using an individualized goal/point system (Florida Center for Education Research, 2006). Kulik (2003) uses the example of Shelby Oaks Elementary School in Memphis, Tennessee. The fourth through sixth graders who used AR at the school scored 95% higher than the national average gain on the Tennessee Value-Added Assessment System. This was equivalent to two years' worth of growth in just one year. Interestingly, the students also made significant gains in the subjects of math (28% higher than the national gain) and language (67% higher than the national gain). The meta-analysis conducted by Kulik determined that reading scores are higher at schools that own AR and lower at schools that do not own the program.

Indeed, technology has the ability to impact learning in more subtle ways than just directly contributing to a rise in content area test scores. Porter (2003) concurred with other researchers that there are certain factors, which in combination, can create an environment in which technology is a tool used to support complex and inventive thinking of students in such a way that it raises their basic skills by helping them become better thinkers. Those factors are:

1. instructional vision and a rationale linking the vision to technology use,
2. technology access and technical support,
3. critical mass of teachers in technology activities,
4. high degree of collaboration among teachers,
5. strong leaders, and
6. support for teacher-time for planning, collaborating, and reporting technology use.

As early as 1996, Cradler and Bridgeforth found that for students, effective integration of technology can improve problem solving skills, writing skills, and collaboration, as well as attitudes toward writing. The researchers also found that when used effectively by teachers, technology can improve productivity, communication, and interest in teaching (Cradler & Bridgforth, 1996). Siegle & Foster, (2000) reported that the student learning increased in an anatomy and physiology class that used laptop computers, software, and presentation program. Sandoltz, Ringstaff, & Dwyer, (1997) suggested in their report in the Apple Classroom of Tomorrow (ACOT) study that this extensive research provides strong evidence that a one-to-one computer ratio, substantial staff development, and empowering teachers to make changes in curriculum and instruction can lead to major improvements in student retention, attendance, and student learning. Furthermore, in the content area of social studies, Lipscomb (2003) provided anecdotal data that indicates technology use improves student achievement. From his interviews with teachers, he determined that by integrating technology into the curriculum, students' motivation was improved and different learning styles were addressed.

Additionally, high-quality professional development helps increase Internet and computer use by teachers. In order to be effective, technology professional development should be linked to classroom practice and target student achievement (Hawley & Valli, 1999; NCTM, 2000). Research indicates that the level of a teacher's computer and Internet self-efficacy effects student achievement and self-efficacy (Watson, 2006).

When teachers are well-trained in technology integration strategies and technology is embedded in the schools' daily routines, student learning increases (Adams, 2004; Fisk, B. & Sloan, K. 2004). Kulik (2003) found Integrated Learning Systems to be most effective when the ILS software supported what the teacher was presenting in the classroom and when students had ample time to work through the lessons presented. Use of technology in the classroom, rather than in separate labs, yields superior results; teacher-led, standards-based lessons are more effective in promoting student learning than lessons delivered by computer alone (Mann et al., 1999).

The concept of Higher-Order Thinking Skills (HOTS) was first conceptualized by Stanley Pogrow over 25 years ago (Pogrow, 2005). His premise was that by using the Socratic teaching methods, combined with technology use, students' interest increased. Additionally, the students were given the opportunity to hypothesize and test new ideas. Both Klieman (2004) and Pogrow (2005) believe that when teachers receive intensive training in HOTS, curriculum content, and technology-integration, student achievement improves. Additionally, when technology is used to perform tasks applying higher-order concepts and when teachers are proficient at directing students toward productive uses, technology is associated with significant learning (Coley, 1997; Glennan & Melmed, 1996; Kimble, 1999; Penuel, Kim, Michalchik, Lewis, Means, Murphy, Korbak, Whaley, & Allen, 2002; Reksten, 2000; Schlechty,1997). Furthermore, teachers who create a rich educational environment encourage students to be in charge of their own learning, develop higher-order/critical thinking skills, and routinely perform above grade level (Patton, 2004). Moreover, the National Research Council (NRC) book, *How People Learn*, reports that standards-based instruction demands teachers instruct using higher-order thinking skills to solve complex problems in situations similar to real classroom experiences (NRC, 2000).

In order for teachers to effectively implement new teaching strategies to improve student achievement, ongoing support is critical. Soloman (2002) contends that leaders should have a clear vision about how technology can make a difference in student learning and provide ongoing, broad-based support. An examination by Lilly (2004) of student and teacher technology survey data in Tennessee found little correlation between the two in third, fifth and eight grades on both criterion and norm-referenced tests. However, Lilly (2004) suggests administrators must provide support and vision for using technology integration strategies that focus on higher-order thinking and problem solving in an effort to impact student achievement and use of technology. This is a consistent finding with Pogrow (2005), Klieman (2004), and Soloman (2002).

When teachers, students, parents, school and district administrators support technology use, student performance increases. Project Explore, in Union City, New Jersey (Honey, Culp, & Carrigg, 1999) combined classroom technology integration, teacher professional development, and student access to computers both at school and at home. School leadership was supportive, school improvement plans included technology, student creativity was valued, and multiple entry points into assignments were encouraged for students of varying ability. As a result of these combined efforts, student performance improved on standardized tests of reading and mathematics (Honey et al., 1999).

The use of digital video clips to enhance instruction results in increased student achievement (Boster, Meyer, Roberto, & Inge, 2002; Boster, Meyer, Roberto, Lindsey, Smith, Strom, & Inge, 2004). Two experimental studies, one in Virginia and the other in California, examined the impact of UnitedStreaming video segments aligned with standards in science, social studies, and math. The pre- and post-assessments examined third and eighth graders' knowledge of standards related to specific content. The results indicated the experimental group gained as much as 12.6% over the control group in several areas. In a report by Boster et al. (2002), 913 students and 38 teachers from 13 schools in Virginia participated in a study designed to measure the effects of videosteaming applications on standardized test scores in the subjects of science and social studies. The experimental group that received instruction in conjunction with the streaming videos performed substantially better in both subjects at the third grade level than did those children in the control group.

Clearly, research has shown that computers can make a difference in student learning. Moreover, research indicates the use of computers in learning environments increases student interest and motivation. Recent data indicates technology can improve education under certain conditions (Kulik, 2002; Waxman et al., 2002). In addition, technology implemented with high instructional expectations and clear learning objectives incorporating higher-order skills contributes to greater student achievement (Coppolla, E.M., 2004; Kulik, 2003; Mann et al., 1999).

Summary

A review of the literature indicates technology integration, with sound pedagogy, improves student achievement and student performance growth is often based on the classroom teacher's skills, knowledge, and linkage to curriculum. Constructivist theory, endorsed by researchers in technology and mathematics, appears to positively impact technology integration and reading and mathematics student achievement. While technology has not transformed teaching practices in every classroom, current research tells us with the appropriate leadership, technology integration has the potential to positively impact student learning.

The accountability movement in the United States has also placed increased pressure on schools and districts and educational leaders to provide targeted professional development that will clearly help improve student achievement. With these current accountability expectations, technology professional development must be high quality and warrant the time and funding for implementation. An examination of research studies revealed both the Georgia Framework for Technology Integration - InTech model and the Louisiana INTECH model improve the use of technology in the classroom (Bennett, 2004; DiBenedetto, 2005; Redish, 1997; Sheumaker, Slate, & Onwuegbuzie, 2001). There is no quantitative data, however, to indicate how the technology professional development models impact student achievement.

Unfortunately, research regarding the impact of professional development on student achievement is limited. The majority of research on professional development has, instead, examined changes in instructional practices, teachers' knowledge, teachers' beliefs, and other important variables that may be indirectly linked to student achievement (Loucks-Horsley & Matsumoto, 1999). More research is needed that examines the relationship between professional development and student achievement, specifically technology professional development.

There are few quantitative studies published concerning technology professional development and student achievement in the last five years that include relevant data to permit a meta-analysis and calculation of effect sizes. “Scientific journals that use independent peer review in deciding what research merits publication are generally considered to be the high standard of research, yet much of the work in the field of teaching and learning with technology does not meet that standard. The lack of quality, refereed quantitative studies in this area points to a serious deficiency of research in the field” (Waxman et al., 2002, p. 12).

There is evidence the Louisiana INTECH model changes technology integration practice, beliefs, and attitudes. However, at a time when school leaders are pressured to produce better learning outcomes and perform at higher levels; instructional strategies, tools and resources must be aligned to meet state and local accountability expectations. Clearly, there is a need to examine technology integration professional development and student performance as it relates to the Louisiana INTECH model. This causal-comparative study examines the impact of Louisiana INTECH professional development in Calcasieu Parish classrooms on third grade student achievement as determined by student performance on the *Iowa Test of Basic Skills (ITBS)* in mathematics and reading. This study addresses the questions: Do elementary school leaders perceive INTECH professional development as a catalyst for change in their school? Does this professional development impact student achievement in mathematics and reading?

Chapter Three: Methodology

Introduction

The purpose of this study was to reveal the perceptions of school leaders about Louisiana INTECH professional development as a change agent in their schools. Additionally, the study investigated the impact of Louisiana INTECH professional development and certification on elementary third grade students' mathematics and reading achievement. Chapter 3 describes the methodology and procedures used to conduct a perceptions survey with elementary school administrators concerning INTECH professional development as a change agent. This chapter also describes the methodology and procedures that were used to determine the relationship between teachers' INTECH professional development and certification and students' achievement in mathematics and reading. The chapter is organized into the following sections: research design, site, participants, instrumentation, data analysis, research procedures, limitations of the study, and summary.

Research Design

The questions to be considered were: Do elementary school leaders perceive INTECH professional development as a catalyst for change in their school? Does this professional development impact student achievement in mathematics and reading? In order to answer these questions, the study utilized quantitative research methodologies. Quantitative research methods utilize quantitative data in order to study and compare sources of variation and to make decisions and draw inference from empirical observations. Many times the focus of quantitative methods is on average or group effects (Rudestam & Newton, 2001).

This quantitative study utilized an ex-post facto, causal-comparative design. The design included an 18-item survey designed to determine whether school administrators perceive Louisiana INTECH professional development as a catalyst for change in their school. The study utilized convenience sampling to select the elementary school administrators in the Calcasieu Parish Public Schools in Lake Charles, Louisiana. The target population was the 73 elementary level school administrators. All 73 elementary principals and assistant principals in the Calcasieu Parish Schools were surveyed. The response rate was 100%; all 73 elementary leaders responded. The survey was an 18-item, Likert-type survey that asked the elementary principals and assistant principals to respond to questions that measured their openness to change, specifically, change in their school prompted by the Louisiana INTECH professional development model. The survey was originally validated by Huang (1993) and then by Klecker and Loadman (1999). Permission to utilize this survey was obtained from the authors (see Appendix A). Additionally, the survey is now in public domain. The survey, constructed for this study was entitled *Perceptions of Louisiana INTECH Professional Development* (see Appendix B). Descriptive statistics were used to report on the demographic findings of the survey and to report the findings on the principals' perception of change survey with respect to Louisiana INTECH professional development as a catalyst for change in the school. Specifically, descriptive statistics were used to describe the data and findings in the study by providing simple summaries about the sample and the measures (Gay & Airasian, 2003).

Furthermore, the study measured the difference in students' achievement as determined by comparing the mean pretest and mean posttest scores on the *ITBS* in mathematics and reading in INTECH certified teachers' classrooms and non-INTECH certified teachers' classrooms. Since the students were already assigned to groups (classrooms) and not randomly assigned, a quasi-experimental design was employed. A quasi-experimental design is employed when random sampling or random assignment of treatments is not possible (Rudestam & Newton, 2001). Using a quasi-experimental design is a recommended and a commonly employed methodology in the evaluation of educational programs when random assignment is not possible or practical (Gribbons & Herman, 1997).

The *ITBS* mathematics and reading total standard scores were used for comparison. The teachers of interest in this study were the third grade INTECH certified teachers located in the elementary level schools in the Calcasieu Parish Schools in Louisiana. INTECH certified teachers and non-INTECH certified teachers were grouped by similar characteristics: years of experience, educational attainment, and similar school mean achievement as defined by the School Performance Score (SPS). By grouping teachers with similar characteristics, the researcher was able to control for extraneous variables and ensure that the control group and the experimental group were as similar as possible.

The independent variable was INTECH professional development. The dependent variables in this study were student performance gains on the third grade *ITBS* mathematics test, and student performance gains on third grade *ITBS* reading test. Student achievement gains on the *ITBS* mathematics and reading total standard scores were calculated by using the difference between scores earned on the 2nd grade 2004 *ITBS* (pre-test) and scores earned on the 3rd grade 2005 *ITBS* (posttest). A pretest-posttest treatment control group design was utilized. A control group was utilized to control for threats to internal validity. This method was employed since it indicates whether a change occurs after a treatment has occurred (Leedy & Ormrod, 2005). Many experimental or quasi-experimental designs are treatment/control group designs which allow for causal relationships to be explored. A causal comparative model provides a way of comparing a treatment group to a control group and thereby examining a causal relationship between groups or determining a causal effect of a treatment. In this study, the relationship between the variables could only be linked, not established, because the researcher could not control or manipulate the independent variable (Gay, Mills, & Airasian, 2006; Leedy & Ormrod, 2005).

The teachers in the experimental sample had already completed INTECH professional development and were already Louisiana INTECH certified. The treatment (Louisiana INTECH professional development) was not randomly assigned. Each INTECH certified teacher participated in seven days of professional development experiencing the same the content, format, and similar instructional experience. All twenty-seven Louisiana INTECH trained third grade teachers who were trained during the timeframe from June 2000 – June 2003 participated in the study.

All students in CPSB third grade classrooms participated in classroom instruction that followed the Louisiana standards and benchmarks. School administrators and CPSB Curriculum Consultants regularly observed in district classrooms to assure that classroom instruction was aligned with the appropriate Louisiana standards and benchmarks. Students were instructed using exactly the same textbooks and curriculum adopted by the Calcasieu Parish School System. Additionally, all of their teachers participated in identical Classroom Based Technology (CBT) training in the fall of 2004, which provided three days of intense technology professional development focusing on the Louisiana standards and benchmarks and technology proficiences. Twenty-seven of the third grade teachers that participated in this CBT training had previously participated in INTECH during the time period June 2000 – June 2003.

This INTECH professional development model was designed to enable teachers to skillfully integrate technology into the curriculum. The model espouses the use of technology to support interactive, engaged learning environment. It was expected that students in classrooms with INTECH certified teachers were engaged learners and would achieve at higher levels.

The following research hypotheses guided the study: The subheadings, Affective Reactions to Change, Cognitive Reactions to Change, and Behavioral Reactions to Change, denoted the hypotheses associated with administrators' perceptions and Louisiana INTECH. The hypotheses affiliated with student achievement and Louisiana INTECH relate to mathematics student achievement and reading student achievement.

The hypotheses were as follows:

Hypothesis 1. Affective Reactions to Change - Elementary school administrators enjoy the change in the organization as it relates to implementation of Louisiana INTECH professional development in the school.

Hypothesis 2. Cognitive Reactions to Change - Elementary school administrators recognize the occurrence of Louisiana INTECH professional development and its potential benefit to school and staff.

Hypothesis 3. Behavioral Reactions to Change - Elementary school administrators take actions to support or initiate changes related to the Louisiana INTECH professional development.

Hypothesis 4. Students of Louisiana INTECH certified teachers exhibit higher mathematics student achievement than students of non-Louisiana INTECH certified teachers as evidenced by the difference between mean pretest and mean posttest scores.

Hypothesis 5. Students of Louisiana INTECH certified teachers exhibit higher reading student achievement than students of non-Louisiana INTECH certified teachers as evidenced by the difference between mean pretest and mean posttest scores.

Site

This study was conducted in the Calcasieu Parish Public Schools. The district is the fifth largest public school system in the state of Louisiana with an enrollment of over 32,000 students. Of those students, 48.7% are female and 51.3% male. The student demographic make-up is 33.5% black, 65.2% white, and 1.3% represent other ethnicities. Forty-four percent of those students are on free or reduced lunches, identifying many students as an at-risk population. Of the total enrollment, 13.2% are in special education services and 0.1% are considered limited English proficient.

The Calcasieu Parish School System (CPSS) is the largest employer in the parish and employs over 5,100 full and part-time employees. The district provides employment for 2,858 teachers. The teaching population is comprised mostly of females, 85.8%, while males represent only 14.2% of the classroom instructional staff. The ethnic composition of the CPSS classroom instructional staff is as follows: .06% Asian, 12.94% Black, .27% Hispanic, .03% Indian, and 86.7% White. Additionally, the district employs 142 school-based administrators with 54% of this population being females and 48% represented by males. Furthermore, the ethnicity of the school administrative population is 23.9% Black and 76.1% White (CPSS, 2007).

The school district covers a 1,086 square mile area in Southwest Louisiana and is home to over 185,00 residents. The parish is comprised of six cities: Lake Charles, Sulphur, Westlake, DeQuincy, Vinton, and Iowa. Almost half of the parish population, 80,000 is located in Lake Charles, the site of the Calcasieu Parish School Board Office and Facilities. There are five outlying areas of the parish that are considered rural, farming communities (Kurth & Burchkel, 2007).

For several decades the chemical and refining industries and the jobs they support have been the backbone of the parish's economy. Additionally, the Chennault Industrial Airpark in Lake Charles houses a major aircraft refurbishment and maintenance facility, thus becoming a growing and important component of the local economy. With the approval of gaming in Louisiana in the mid 1990s, Calcasieu Parish has witnessed the development of a major new industry within its borders. Multiple riverboat casinos exist in the parish, and have significantly impacted the local economy in terms of employment and revenues for local government. However, the parish continues to seek diversified employment opportunities to meet current employment concerns of the residents (Kurth & Burchkel, 2007).

A recent report by the Southwest Louisiana Economic Development Alliance (2007) outlines the current employment concerns of the community. Data from this report indicate a surplus of employment opportunities for mid-level jobs and administrative positions. However, there exists a serious shortage of skilled workers to fill technical and industrial positions in the oil, gas, petrochemical, and construction industries (Kurth & Burchkel, 2007). In order to provide the skilled workforce needed to promote economic growth and development in the region, educational leaders from higher education and the Calcasieu Parish School Board are engaged in strategic planning. This planning is designed to create educational systems and programs that will ensure an adequate workforce while providing for the educational needs of students in the prekindergarten through grade sixteen system (Southwest Louisiana Economic Development Alliance, 2007).

All fifty-nine schools in the district are accredited by the Southern Association of Colleges and Schools and approved by the Louisiana Department of Education. There are thirty-three elementary schools, grades prekindergarten through fifth grade; eleven middle schools, grades six through eight; ten high schools, grades nine through twelve, two kindergarten through twelfth grade schools, two kindergarten through eighth grade schools and an alternative school. With regard to the selection criteria used, all schools with elementary students were considered.

Participants

The target population in this study consisted of CPSB elementary principals and assistant principals who had third grade teachers in their schools and the students of these teachers. Convenience sampling was used to select the 73 elementary administrators that were survey participants. The population consisted of 22 males and 51 female elementary school level administrators. All elementary principals and assistant principals were surveyed and all 73 completed the survey. The elementary administrators had administrative experience levels of one year to over 25 years of experience. All school administrators had a master's degree or higher in terms of educational attainment. These schools had School Performance Scores (SPS) ranging from a high of 142.6 to a low of 62.3. Additionally, these 36 schools with elementary age students had student populations ranging from 853 students to 209 students with free and reduced school lunch statistics from 98% to 26% (CPSS, 2007).

The target population was the students of teachers who have successfully completed the Louisiana INTECH certification process. The 408 students of 27 third grade teachers who had completed a state-sponsored, 56 hour prescribed Louisiana INTECH professional development program resulting in INTECH certification were studied. The third grade Louisiana INTECH certified teachers were employed in elementary schools in the Calcasieu Parish Public Schools during the 2004-2005 school years. An attempt was made to include all third grade teachers who are INTECH certified. The student population studied included both males and females between the ages of seven to ten, from diverse ethnic backgrounds, and with varying academic ability.

All 111 CPSB third grade teachers received three days of basic technology integration professional development as part of the Classroom Based Technology (CBT) program, during the 2004 –2005 school year. As a result of that training each teacher received a new computer, printer and software, in conjunction with the three days of technology integration professional development. This technology integration training involved each teacher developing interdisciplinary, technology-connected lessons aligned to the Louisiana model curriculum frameworks. Teachers developed lessons in the area of English/language arts, mathematics, social studies and science. These specific subject areas are aligned with the same subject areas tested using the *ITBS*. Additionally, some of these teachers chose to participate in the 56-hour Louisiana INTECH professional development program between 2000 and 2003 in order to increase to increase their skills in integrating technology into the curriculum.

The 27 INTECH certified teachers and 27 non-INTECH certified teachers were matched based on teachers' characteristics – years of experience and educational attainment. In addition, they were grouped by similar school mean achievement as defined by the Louisiana School Performance Score (SPS). This teacher grouping controlled for extraneous variables and bias. Descriptive statistics were used to assess the equivalency of the teacher groups and the students within those groups.

A power analysis was used in order to determine the appropriate sample size for this study. Approximately 400 students were needed per group to achieve a power level of .8 with $\alpha = .05$ to detect a small effect size, 70 students to show a medium effect size, and 25 students to show a large effect size (Rudestam & Newton, 2001). With 27 INTECH certified teachers and 408 students in the experimental group and 27 non-INTECH certified teachers and 444 students in the control group, this sample was large enough to determine a small effect size. Obtaining a sample size as large as possible reduced the probability of failing to reject the null hypothesis when it was actually false. However, the final sample size was decided by the number of third grade INTECH certified teachers available.

Instrumentation

Two instruments were employed as part of this study. First, a survey was administered to examine the perceptions of elementary school principals and assistant principals concerning INTECH professional development. Additionally, the *ITBS* was used to determine the impact of this professional development on student achievement in mathematics and reading.

Survey research frequently uses questionnaires for data collection to learn about people's behaviors, characteristics, attitudes, and opinions with the intent of generalizing from a sample to a population (Babbie, 1990; Leedy & Ormrod, 2005). A checklist or rating scale is often used to quantify behaviors or perceptions of a topic. Checklists allow the participant to simply check whether each behavior or perception is present or true. A rating scale is suitable when a behavior, attitude, or other phenomenon of interest is to be evaluated on a continuum (Leedy & Ormrod, 2005). The survey utilized in this research used a Likert-type rating scale with responses ranging from strongly disagree, disagree, agree, and strongly agree. This scale measures the extent to which the participant agrees or disagrees with the question or comment and is the most widely used scale in survey research (Likert, 1932).

The survey instrument in this study was obtained from a research study conducted by Klecker and Loadman (1999) entitled *Measuring Principals' Openness to Change on Three Dimensions: Affective, Cognitive and Behavioral*. The context of the Klecker and Loadman's study was 307 schools funded by Ohio's legislature to implement self-designed restructuring plans. The researchers measured principals' openness to change on three dimensions: 1) affective, 2) cognitive and 3) behavioral. Klecker and Loadman (1999) used a Dunham, Grube, Gardner, Cummings and Pierce (1989) originally developed 18-item Change in Organizational Culture instrument entitled *Inventory of Change in Organizational Culture* and a scenario describing changes in school culture located in the literature (Huang, 1993). Klecker and Loadman's definition of attitude, the same used for this study, was derived from Dunham, et al. (1989). Dunham, et al. defined attitude toward change as, "Attitude toward change in general consists of a person's cognitions about change, affective reactions to change, and behavioral tendency toward change. Attitude toward a specific change consists of a person's cognitions about that change, affective reactions to that change, and behavioral tendency toward that change" (p. 4). As a result of the Dunham research, three factors with six items each were developed for the survey which resulted in 18 survey items.

Huang (1993) further modified the instrument and entitled it the *Inventory of Change for Organizational Culture*, for use with public school principals. In his revision, a scenario describing changes advocated in the school restructuring literature was added to precede the 18-item instrument. The Cronbach's alpha coefficient for the instrument in Huang's study was .98 for the total scale. Huang addressed the content validity of the revised instrument for use with public school principals and found the following: "The item discriminative index, obtained from subtracting the mean from of the high score group (33%) to that of the low score group (33%) of each item, ranged from .89 to 2.78, indicating that each of the items had a positive function in distinguishing different attitude responses" (p. 62). Additionally, the pilot study "yielded an internal consistency of coefficient of .88 for the cognitive scale, .78 for the affective scale, .86 for the behavioral scale, and .92 for the total scale" (p. 62). Hung found that "the item discriminative index, obtained from subtracting the mean of high score group (33%) to that of low score group (33%) of each item ranged from .89 to 2.78, indicating that each of the items had a positive function in distinguishing different attitude responses among elementary school principals" (p. 62). Thus, the survey items and subscales validated in Klecker and Loadman and further validated by Huang were used in this research study. Permission to utilize this survey was obtained from the authors, Dr. Donald Gardner and Dr. Randall B. Dunham, through personal communication (see Appendix A). Additionally, the survey is now in public domain. In the Klecker and Loadman survey revision, a scenario describing changes advocated in the school restructuring literature was added to precede the 18-item instrument.The survey was modified by creating a scenario to precede the survey items

This present study modified the survey instrument by adding a survey overview and an overview of Louisiana INTECH before the survey questions. Additionally, the survey for this study used a four-point Likert-type item scale: 1) strongly disagree, 2) disagree, 3) agree, 4) strongly agree, rather than a five-point Likert-type item scale. The modified survey, used for this study was entitled *Perceptions of Louisiana INTECH Professional Development.* The author of the *Perceptions of Louisiana INTECH Professional Development* survey collaborated with Diane R. Mason in order to create the survey. Mason (2007) used the survey to gather data concerning middle school administrators' perception of INTECH while the present author used the survey to gather data concerning elementary administrators' perceptions of INTECH. The survey was reviewed by colleagues in order to determine if the survey questions and survey overview scenario were understandable.

The *Iowa Tests of Basic Skills* (*ITBS*), published by Riverside Publishing, were used to measure the difference in students' achievement as determined by comparing the mean pretest and mean posttest scores in mathematics and reading. The *ITBS* was developed by the University of Iowa, College of Education and is nationally recognized as a valid and reliable norm-referenced achievement test. The reliability coefficient is between .00 and .99, and generally for standardized tests the range is between .60 and .95 using an internal-consistency Kuder-Richardson Formula 20 (Hoover, Dunbar, & Frisbie, 2003). The second and third grade *ITBS* battery has a mean Kuder-Richardson Formula 20 score of .892 and .934 for mathematics, and .939 and .946 for reading (Hoover, Dunbar, & Frisbie, 2003). These scores fall within the excellent range (Data Recognition Corporation, 2003).

Rudestam and Newton (2001) determined the validity of a test must be judged in relation to the purpose for using the test. In order to determine the validity of the *ITBS*, procedures for developing and revising test materials along with interpretive information have been in place for over 60 years. The *ITBS* has been under continuous by various researchers and professionals with expertise from numerous educational content areas during this time period. Moreover, numerous pilots were conducted to ensure the items were constructed to correlate with nationally accepted instructional goals (Hoover, Dunbar, & Frisbie, 2003).

The *ITBS* was standardized, given using scripted directions and under specific conditions to assure the tests were administered similarly with each group. These specific testing conditions contributed to the validity of the test scores. The tests are standardized nationally to allow comparison of local student performance with the performance of other students of the same grade level across the nation (Louisiana Department of Education, 2005). Additionally, the *ITBS* authors recommend that school systems carefully examine the results to be certain the tests are interpreted appropriately (Hoover, Dunbar, & Frisbie, 2003).

The *ITBS* was developed primarily for the purpose of supporting instruction. The information derived from administering this test is best used by teachers to help them make instructional decisions about their classes or individual students in them. The two main uses of the scores are to check year-to-year progress in the various skills areas and to determine areas of relative strength and weakness. Some educators believe that the *ITBS* measures only basic skills. However, the *ITBS* does not proclaim to measure the common public definition of basic skills - reading, writing, and arithmetic. Instead, the *ITBS* authors consider basic skills to be the entire range of skills a student needs to progress satisfactorily through school. This includes higher-order thinking skills, interpretation, classification, comparison, analysis, and inference. The *ITBS* is well regarded and recognized as a reliable and appropriate measure of student mathematics and reading ability and achievement (Hoover, Hieronymous, Frisbie, & Dunbar,1996).

The Louisiana Statewide Norm-Referenced Testing Program was begun in 1986 and is a component of the Louisiana Educational Assessment Program (*LEAP*). *LEAP* uses *ITBS* to measure student performance in grades three, five, six, and seven during the school years encompassing 1998-2005. These tests are used to determine School Performance Scores (SPS), are the cornerstone of the Louisiana school accountability program, and a significant component of the total SPS (Louisiana Department of Education [LDE], 2005).

The SPS is an index score developed by the state of Louisiana to report total school growth. As a result of the Louisiana Educational Assessment Program (LEAP) using the ITBS to determine student performance in grades three, five, six, and seven, school leaders consider these test “high-stakes” and of essential importance in determining the stature and public standing of the school. These tests are a major component in the calculation of the School Performance Scores (SPS) and are widely regarded as the foundation of the Louisiana school accountability program. To ensure the School Performance Scores were as reliable as possible, guidelines were developed. The current guidelines include the following: 1) The use of an index rather than pass/fail is implemented; 2) The use of tests at every grade between 3 and 11 are included in the SPS; 3) Schools are required to meet a goal from a combination of the tests rather than from individual tests; 4) Schools are required to meet goals for several subgroups; and 5) The data is averaged over two years (United States Department of Education, 2003).

In today's high stakes, Louisiana school accountability environment, the School Performance Score (SPS) is widely regarded as the measure of the worth and value of a school and its instructional program. Every educational leader in the state relies on the SPS to provide guidance in the formulation of district and school improvement plans (LDE, 2005). In turn, school leaders expect that classroom instructors and curriculum staff utilize *ITBS* data to inform and guide instructional practice. With this intense focus on student achievement and the alignment of district and school resources to improvement plans, there exists a grave need to determine the impact of the Louisiana INTECH professional development program on student achievement.

Third grade student test scores were deliberately selected for several reasons. The *ITBS* are typically administered in first, second, third and fifth grades. The third grade *ITBS* test scores are considered "high stakes" because these scores are used to calculate the School Performance Score (SPS) and determine whether a school is deemed academically acceptable or failing. All second and third grade students in the Calcasieu Parish School District were tested using the *ITBS* in March of 2004 and 2005. This provided district-wide data necessary for comparing gain scores.

Since the state of Louisiana was transitioning into a new testing program beginning in 2006, it was reasonable to use the most recent test data available, data collected during March 2004 and 2005. Beginning in March 2006, first and second grade students were tested using the

ITBS. However, third, fourth and fifth grade students were administered the new *i*LEAP test. Prior to March 2006, elementary students took the *ITBS* in grades, one, two three and five and the LEAP in grade four. In order to properly analyze data concerning the impact on Louisiana INTECH certification on third grade mathematics and reading achievement, 2004 and 2005 *ITBS* student test data were used.

The second and third grade *ITBS* mathematics battery includes three tests, Math Concepts, Math Problems and Math Computation. The second and third grade *ITBS* reading battery includes two tests, Vocabulary and Reading Comprehension. In this study, the mathematics and reading total standard scores were used to compare the difference in achievement gains of students in INTECH certified teachers' classrooms and non-INTECH certified teachers' classrooms. The mathematics total score was computed by averaging the Math Concepts, Math Problems and Math Computation scores, while the reading total score was computed by averaging the Vocabulary and Reading Comprehension scores.

The pretest used was the second grade *ITBS* (Level 8) mathematics total standard score and the second grade *ITBS* (LEVEL 8) reading total standard score taken in March of 2004. The posttest was the third grade *ITBS* (Level 9) mathematics total standard score and the third grade *ITBS* (LEVEL 9) reading total standard score taken in March of 2005. Standard scores were used because they are designed to measure the gain in achievement of students or groups of students from year to year. The standard score by itself has no real meaning. It has meaning when it is compared to some referent such as the appropriate standard score for the grade level. The average standard score for second grade is 166, with an expected gain in standard score of 18 resulting in an average standard score of 184 for third grade (Louisiana Department of Education, 2005b).

Data Analysis

The data for this study were analyzed using survey research and a nonrandomized, control group pretest-posttest design to address the questions:

1. Do school leaders perceive Louisiana INTECH professional development as a catalyst for change in the school?
2. Does the Louisiana INTECH professional development model contribute to increased student achievement of third grade students as demonstrated by gains in mathematics scores on the *ITBS*?
3. Does the Louisiana INTECH professional development model contribute to increased student achievement of third grade students as demonstrated by gains in reading scores on the *ITBS*?

Descriptive statistics and *ANOVA* (with post hoc tests when appropriate) and Pearson's *r* Correlation were used to report on the demographics of the survey and to report the findings on the principals' perception of change survey with respect to Louisiana INTECH professional development as a catalyst for change in the school. Statistical software, *Statistical Package for Social Sciences* (*SPSS*), was used to generate descriptive statistics for the research questions. With regard to the survey of 73 elementary administrators, single factor, independent measures analysis of variance (*ANOVA*) with appropriate Post Hoc tests and Pearson's *r* Correlation were used to evaluate mean differences between the three subscales – affective domain, cognitive domain, and behavioral domain by gender, administrative role – principal or assistant principal, level of education, years of experience as an administrator, years of experience as an administrator in the present school and number of INTECH teachers in the school. *ANOVA* is a hypothesis-testing procedure that is used to evaluate mean differences between two or more treatments or populations. *ANOVA* was appropriate for evaluating the mean differences between groups, including those using repeated measures. Like the *t* statistic, in the *F*-ratio used in the *ANOVA*, the numerator of the ratio measures the actual difference obtained from the groups, while the denominator measures the difference that would be expected by chance (Gravetter & Wallnau, 2003).

Cronbach's alpha is a common means of establishing reliability or internal consistency of survey items. In order to establish the reliability of the instrument, Cronbach's alpha should be positive and greater than .70 (Morgan, Leech, Gloeckner, & Barrett, 2004). Therefore, Cronbach's alpha was used to address the reliability of the *Perceptions of Louisiana INTECH Professional Development.* This study examined the frequency distribution of the survey responses. Frequency distribution is a summary of the frequency of individual responses for a particular variable (Web Center for Social Research Methods, 2006). The results of the *Perceptions of Louisiana INTECH Professional Development* were reported using the frequency distributions of the responses to each item.

The common statistical data analysis techniques employed to compare means with quantitative data are the *t* test and the analysis of variance. The independent sample *t* test compares the means of two independent samples. The analysis of variance (*ANOVA*) is used when comparing two or more group means. In fact, when only two groups are used, the single factor analysis of variance is mathematically equivalent to the independent samples *t* test. (Gravetter & Wallnau, 2004).

An *ANOVA* was used to address the null hypotheses that there are no significant differences between the mean mathematics and reading achievement of the students whose teachers are Louisiana INTECH certified and those who teachers are not Louisiana INTECH certified (Winer, Brown, & Michels, 1991). *ANOVA* is an appropriate procedure for this comparison because of the use of gain scores, which rely on repeated measures of individual students.

No clear causal relationship could be established from this study. This relationship was more suggestive than proven as the researcher did not have complete control over the independent variable – Louisiana INTECH professional development. (Leedy & Ormrod, 2005). However, the data that were examined may suggest important connections between Louisiana INTECH certification and student achievement in mathematics and reading and the support for INTECH as an impetus for change by elementary administrators.

Test scores were obtained from the Calcasieu Parish School System for students of 54 paired third grade teachers (27 Louisiana INTECH certified teachers and 27 non-Louisiana INTECH certified teachers) for comparison in growth in math and reading achievement. Student anonymity was assured by using unique student identification numbers. Data were examined from the spring 2004, grade two test administration and spring 2005, grade three test administration using *SPSS*. An independent sampling method of comparison was made between the gain scores of third grade students of Louisiana INTECH certified teachers and third grade students of non-Louisiana INTECH certified teachers. To calculate gain scores, the pretest score (*ITBS* mathematics and reading test scores 2004) prior to having a Louisiana INTECH certified teacher were compared to the posttest score (*ITBS* mathematics and reading test scores 2005) for students with a Louisiana INTECH certified teacher (experimental group) and students with non-Louisiana INTECH certified teacher (control group).

Table 1

Nonrandomized Control Group Pretest-Posttest Design

	Pretest	Treatment	Posttest
Group 1 (INTECH/experimental)	✓	✓	✓
Group 2 (Non-INTECH/control)	✓		✓

The data were analyzed using a nonrandomized control group pretest-posttest design because this method indicates change that occurs following the particular treatment, INTECH. This design differs from a true experimental design because the test group and the control group are not totally equivalent. Equivalence on pretest gives evidence of equivalence only for the variables that have been specifically measured (Leedy & Ormrod, 2005).

Louisiana INTECH certified teachers and non- Louisiana INTECH certified teachers were paired according to years of teaching experience, levels of education, and school characteristics to control for extraneous variability. *ANOVA* using SPSS was used to analyze and compare the student gain scores (the difference between second and third grade *ITBS* mathematics and reading composite standard scores) (Bluman, 2004). When looking at the differences between scores for two groups, it is necessary to judge the difference between their means relative to the spread or variability of their scores. As stated earlier, *ANOVA* is equivalent to an independent sample *t*-test when only two groups are used.

Additionally, frequency distributions were calculated for each of the two groups of teachers (INTECH and non-INTECH) in order to validate the equality of the groups of teachers according to years of experience, degrees earned and SPS of the schools. A frequency distribution is an organized tabulation of the number of individuals located in each category on the scale of measurement (Gravetter & Wallnau, 2004).

Research Procedures

Initial approval to conduct the study was sought from the University of New Orleans (UNO) graduate dissertation committee. Additionally, permission was sought from the UNO Institutional Review Board (IRB) to conduct the study. It was considered for expedited review because it meets Category B, section H and I of the Expedited Review Categories: " H) The study of existing data, documents, records, pathological specimens, or specimens; I) Research on individual or group behavior or characteristics of individuals, such as studies of perception, cognition, game theory, or test development, where the research investigator does not manipulate subjects' behavior and the research will not involve stress to subjects" (University of New Orleans Office of Research and Sponsored Programs, 2006). After completing the required IRB Human Participants Protection Education for Research Teams online course, the appropriate UNO IRB forms were submitted seeking approval for the study (see Appendix C).

Permission was also secured from the Calcasieu Parish Assessment, Research and Special Services Department and the CPSB Superintendent of Schools. The Calcasieu Parish School System required submission of a Graduate Study Application outlining the purpose of the study (see Appendix D). In addition, a copy of the research prospectus was submitted. The researcher contacted the Administrative Director for Assessment, Research and Special Services in order to survey elementary school administrators and obtain the appropriate student scores.

Teacher matches were performed by the Calcasieu Parish School Board (CPSB) Testing and Accountability Department and the CPSB Management and Information System (MIS) Department. The CPSB Testing and Accountability and MIS Departments provided the archived test records. The matches were determined according to the following criteria: demographic data about third grade teachers – years of experience, degrees earned and district school accountability SPS records. The CPSB Testing and Accountability Department and the CPSB MIS Department provided the data in a digital format with no identifying information about teachers or students.

Ethical considerations were considered as part of the data collection for this study. Participants were not at risk. Vulnerable populations, such as minors under the age of 19, were respected. The privacy of the research participants was assured by maintaining confidentiality and extending the principle of anonymity whenever possible. No participants were placed in a situation where they might be at risk of harm as a result of their involvement. In addition, any procedures conducted as part of the data collection process had the approval of all gatekeepers at the district and school level (Creswell, 2003).

After receiving approval from the Calcasieu Parish School Board to conduct the study, the *Perceptions of Louisiana INTECH Professional Development Survey* was administered to the CPSB elementary school principals and assistant principals. The survey was distributed to the selected administrators during a monthly school board principals' meeting. Each of the 73 elementary administrators was asked to complete the survey and return it to the Administrative Director of Elementary Schools at the end of the meeting. All 73 elementary leaders completed and returned the entire survey at the end of the meeting. The Administrative Director then provided the surveys to the researcher. All the surveys were anonymous and were voluntarily filled out by the elementary administrators.

The population to be studied in the experimental group, Louisiana INTECH certified teachers, was identified by contacting the CPSB Technology Training department to obtain a list of all third grade INTECH certified teachers teaching in the Calcasieu Parish Pubic Schools during the 2004 – 2005 school year. The Calcasieu Parish Technology Department provided a list of all third grade teachers trained in the CBT program that year who were also INTECH certified. A letter was sent to the CPSB Assessment Department requesting a release of the *ITBS* mathematics and reading total standard scores for each student in the targeted classrooms for spring 2004 and spring 2005 (see Appendix E). Only students with pre- and post-test (2004 and 2005) scores were included in the sample.

Limitations of the Study

According to Cresswell (2003), the delimitations in a study narrow the scope, whereas the limitations outline potential weaknesses of the study. These limitations are circumstances that cannot be controlled. The delimitations are deliberately imposed and provide an opportunity for the researcher to narrow the area to be studied in order to give focus to the study. Furthermore, the delimitations identify what will and will not be accomplished by this research. In contrast, the limitations, which the researcher cannot control, describe the aspects of the study that may negatively affect the results or generalizability of the results. These limitations are natural conditions that restrict the scope of a study and may affect its outcomes. (Rudestarm & Newton, 2001; Gay & Airasian, 2003).

Within the study, there are numerous limitations which could have altered the outcome and were beyond the researcher's realm of control. Since elementary administrators responded to the perception survey questions individually during a principals' meeting, they may not have been in the most positive environment for completing this activity. Additionally, the survey questionnaire only captured responses during a single point in time.

As a result of pared funding and varied leadership at elementary school sites, the technology for each third grade INTECH classroom was multifarious. Additionally, due to Classroom-Based Technology (CBT) training, a 2004 district-wide technology professional development program, each third grade educator had a multi-media computer, printer and software, for classroom use.

Another limitation involved the use of technology in third grade classrooms. The utilization and implementation of classroom technology were varied, as was the employment of technology strategies. Although participation in the district technology professional development training, or Classroom-Based Technology (CBT), was mandatory, there was no standard by which to determine the adeptness of each participant. Each participant, however, possessed a basic standard of computer literacy competency following INTECH professional development model completion.

Causal-comparative design was an additional limitation of this study. As a result of non-random student placement in classes, there were effective unknown variables that had ramifications upon the dependent variable, mathematics and reading achievement in third grade. Matched groups were utilized in an endeavor to control for the effect of any extraneous variables. The use of statistical analyses, including Analysis of Variance (*ANOVA*) presented the variation between and within the respective groups. Regarding further limitations, the causal-comparative design depicts a relationship, but lacks in explanation for the relationship's resulting cause and effect (Gravetter & Wallnau, 2004).

Indeed, the scarcity of specificity in the norm referenced *Iowa Tests of Basic Skills (ITBS)* test scores was the concluding limitation. This exam fails to adequately specify the depth and breadth of a student's specific knowledge base. Specifically, this exam only compares students to others in the norming group (University of Iowa, 2006).

The delimitations for this study served to narrow the scope of the study. Additionally, the delimitations provided focus for study and identified what would and would not be accomplished by this research.

Calcasieu Parish School Board (CPSB) administrators utilized *ITBS*-derived data to aid in decision-making. Mathematics and reading student achievement at the elementary level were of eminent concern district-wide due to the weighting of the mathematics and reading scores in determining the School Performance Scores (SPS). CPSB has 36 elementary school campuses which contain the majority of the combined district student population. The focus of the study was 3rd grade students. This delimitation in the study only provided data regarding the impact of INTECH technology professional development on 3rd graders mathematics and reading standardized test scores.

A further delimitation of the study is the fact that there were no cumulative compilations of the effects of the INTECH professional development over time. While the study investigated both pre- and post- test measures, analysis of the sustained effectiveness of the professional development did not occur. Additional and separate research will be required to examine the sustained effects of the INTECH professional development.

Another delimitation of the study was that examination only involved the 2004 (pre-test) mathematics and reading composite *ITBS* test scores and 2005 (post-test) mathematics and reading *ITBS* test scores. Second and third grade students in the Calcasieu Parish School District were tested using the *ITBS* in March of 2004 and 2005. Examination of this data provided district-wide data for comparison of gain scores. Furthermore, because of the 2006 state-wide transition into a new testing program, it was sensible to use the most recent test results available, which were derived from the March 2004 and 2005 test administrations.

Lastly, by delimiting this research study, acute investigation was enabled through the provision of a clear focus and lens for the research. Such clarity of focus allowed the investigator to study the issue more closely. Indeed, these delimitations were the crux for interpretation of the results that ultimately responded to the research questions:

Do elementary school administrators perceive INTECH professional development as a catalyst for change in their school and does this professional development impact student achievement in mathematics and reading as demonstrated by gains in mathematics and reading on the *Iowa Tests of Basic Skills (ITBS)*?

Summary

The research methodology employed in this study determined how elementary school administrators' perceive Louisiana professional development as a catalyst for change in the school. Additionally, the methodology permitted the researcher to determine if a significant difference exists in third grade student gains in mathematics and reading in Louisiana INTECH certified teachers' classrooms.

This study added to the body of research for stakeholders to make informed decisions about current and future technology professional development initiatives, specifically Louisiana INTECH certification. In a thorough review of literature, existing research indicated technology-integration improves student achievement; professional development improves student achievement in mathematics and reading; thus technology-integration professional development improves student achievement. While there was evidence in DiBendetto (2005) that Louisiana INTECH has a positive impact on teaching pedagogy and attitudes toward technology, there was no evidence of any impact on student achievement. Additionally, there were no data to indicate how school leaders regard INTECH professional development as a change initiative. School leaders and decision makers needed data to inform their planning in regard to professional development. In order to continue the significant commitment of human and financial resources needed for Louisiana INTECH certification, there should be a clear sense of the impact of this extensive professional development on student performance.

Chapter Four: Results

Introduction

The Louisiana INTECH professional development program is well-regarded as a significant initiative across the school districts in the state. Prior to this present study, minimal research had been conducted to determine if this professional development program had any impact on the schools, school leaders, and students. The study's purpose was to provide data concerning INTECH. This study examined perceptions of school leaders about Louisiana INTECH professional development as a change agent in schools. Additionally, the study sought to determine the impact of this training on third grade mathematics and reading achievement.

The questions to be considered for the study were: Do elementary school leaders perceive INTECH professional development as a catalyst for change in their school? Does this professional development impact student achievement in mathematics and reading? The study utilized quantitative research methodologies in order to answer these questions. The design of the study included an 18-item survey designed to determine whether school administrators perceive Louisiana INTECH professional development as a catalyst for change in their school. To measure the difference in students' achievement in INTECH certified teachers' classrooms and non-INTECH certified teachers' classrooms, the study compared the mean pretest and mean posttest scores on the *ITBS* in mathematics and reading. Participation in this study was limited to elementary school administrators and third grade INTECH certified teachers in the Calcasieu Parish schools.

In the following, a complete description of the study sample is offered, and the research questions and their corresponding hypothesis are analyzed. As noted in Chapter 3, descriptive statistics, correlations, and one-way *ANOVA* were used to analyze the data.

Description of the Sample

This study utilized a sample of elementary school administrators in the Calcasieu Parish Public Schools in Lake Charles, Louisiana. In addition, data on student achievement was provided by the school district for a matched group of fifty-four INTECH and non INTECH certified 3rd grade teachers in the Calcasieu elementary schools. INTECH certified teachers and non-INTECH certified teachers were grouped by similar characteristics: years of experience, educational attainment, and similar school mean achievement as defined by the School Performance Score (SPS) to control for extraneous variables and ensure that the control group and the experimental group were as similar as possible.

The sample consisted of a target population of 73 elementary administrators in the Calcasieu Parish Public Schools who had third grade classrooms in their schools, which represented all such principals and assistant principals in the district. All 73 respondents completed the *Perceptions of Louisiana INTECH Professional Development* survey. The survey consisted of subscales measuring the openness to change on three dimensions, including Affective, Cognitive, and Behavioral, which were highly and significantly correlated with each other, which supports that these latent constructs are positively related to each other (Klecker & Loadman,1999) (see Table 2).

Table 2

Pearson's r Correlation of Subscales on the Perceptions of Louisiana INTECH Professional Development Survey

	Affective Subscale	Cognitive Subscale	Behavioral Subscale	Total Scale Score
Affective Subscale	1			
Cognitive Subscale	.615(**)	1		
Behavioral Subscale	.603(**)	.844(**)	1	
Total Scale Score	.851(**)	.909(**)	.906(**)	1

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

The next section describes the sample in more detail. School administrators were asked to provide information on their current administrative position, as well as their gender, highest degree, years of experience as an educator, years of experience as an administrator, and years of experience as an administrator at their current school. In addition, participants were asked about the number of teachers in their current school, and the number of INTECH certified teachers in their current school.

Thirty percent (n = 22) of the sample administrators were male, while seventy percent (n = 51) were female. In addition, 48% (n = 35) of the sample were principals while the remaining 52% (n = 38) were assistant principals. Table 3 shows the distribution of male and female administrators by their administrative role.

Table 3

Administrators' Gender by Role

Administrative Role	Gender	n	%
Principal	Female	25	71.4
	Male	10	28.6
	Total	**35**	100.0
Assistant Principal	Female	26	68.4
	Male	12	31.6
	Total	**38**	100.0

The highest degree earned by these administrators varied from a Master's degree to a Doctorate. Over 31% (n = 23) of the overall sample had a Master's degree, and over 53% (n = 39) had a Master's Plus 30 degree. Table 4 lists the highest degree earned by administrators broken out by their administrative role.

Table 4

Highest Level of Education

Administrative Role	Degrees Earned	n	%
Principal	Master's	12	34.3
	Master's Plus 30	20	57.1
	Specialist	3	8.6
	Total	**35**	**100.0**
Assistant Principal	Master's	11	28.9
	Master's Plus 30	19	50.0
	Specialist	7	18.4
	Doctorate	1	2.6
	Total	**38**	**100.0**

In terms of years of experience as an educator, more than 35% of the respondents (n = 26) had been in education for more than 26 years, while only 1% (n = 1) had been an educator for less than 10 years. More detailed results, broken out by administrative role, are shown in Table 5.

Table 5

Experience as an Educator

Administrative Role	Years	n	%
Principal	6 - 10 Years	1	2.9
	11 - 15 Years	1	2.9
	16 - 20 Years	7	20.0
	21 - 26 Years	8	22.9
	26 + Years	18	51.4
	Total	**35**	**100.0**
Assistant Principal	11 - 15 Years	13	34.2
	16 - 20 Years	9	23.7
	21 - 26 Years	8	21.1
	26 + Years	8	21.1
	Total	**38**	**100.0**

The sample also had various years of experience as administrators. The vast majority (77%) of the sample (n = 56) had been administrators for 10 or fewer years, including 49% (n = 36) who had been administrators for five or fewer years. Table 6 shows the years of experience as administrators of the sample, broken out by their administrative role.

Table 6

Experience as an Administrator

Administrative Role	Years	n	%
Principal	0 - 5 Years	5	14.3
	6 - 10 Years	15	42.9
	11 - 15 Years	10	28.6
	16 - 20 Years	2	5.7
	21 - 26 Years	3	8.6
	Total	**35**	**100.0**
Assistant Principal	0 - 5 Years	31	81.6
	6 - 10 Years	5	13.2
	11 - 15 Years	1	2.6
	16 - 20 Years	1	2.6
	Total	**38**	**100.0**

Overall, the majority (66%) of administrators (n=48) were fairly new to their current school, having been there 5 years or fewer. Table 7 shows the years of experience of the sample administrators in their current schools, based on their administrative role.

Table 7

Experience as an Administrator in Current School

Administrative Role	Years	n	%
Principal	0 - 5 Years	12	34.3
	6 - 10 Years	16	45.7
	11 - 15 Years	7	20.0
	Total	**35**	**100.0**
Assistant Principal	0 - 5 Years	36	94.7
	6 - 10 Years	1	2.6
	11 - 15 Years	1	2.6
	Total	**38**	**100.0**

The survey also asked about the number of teachers in the current administrator's school. The vast majority (85%) of administrators (n = 62) reported having at least 26 teachers in their present school. More detail is provided in Table 8.

Table 8

Number of Teachers in Administrators' Present School

Teachers	n	%
0 - 25	11	15.1
26 - 50	44	60.3
51 - 75	15	20.5
76 - 100	3	4.1
Total	73	100.0

At the same time, the administrators were asked about the number of INTECH certified teachers in their schools. Almost all of the administrators (n = 66) reported having between zero and 25 INTECH certified teachers in their school, as reported below in Table 9.

Table 9

INTECH Certified Teachers in Administrators' Schools

Teachers	n	%
0 - 25	66	90.4
26 - 50	6	8.2
51 - 75	1	1.4
Total	73	100.0

It is important to establish that, in terms of important demographic characteristics that could explain impact on student outcomes, there were no differences between the teachers who received the INTECH training and those who did not in order to establish the equivalency of the groups for making statistical comparisons. Table 10 shows the mean years of experience and SPS scores of the teachers from each group. *ANOVA* comparing those groups of teachers revealed that there was no significant difference between the groups in terms of SPS scores (M_{INTECH} = 103.29; $M_{NON\text{-}INTECH}$ = 101.36) $F(1, 52) = 0.28$, *NS* and in terms of years of teaching experience (M_{INTECH} = 16.97; $M_{NON\text{-}INTECH}$ = 16.56) $F(1, 52) = 0.03$, *NS*. In addition, there was no significant difference between INTECH certified and non INTECH certified teachers in terms of degrees earned (χ^2 (2, n = 53) = 0.09, NS).

Table 10

Descriptive Statistics for INTECH and non-INTECH Teachers

		n	Mean	Std. Deviation
INTECH No	Years of Experience	27	16.56	9.14
INTECH Yes	Years of Experience	27	16.97	8.64
INTECH No	SPS	27	101.36	11.99
INTECH Yes	SPS	27	103.29	14.58

Testing the Hypotheses

Hypotheses

There were five research hypotheses for this study:

Hypothesis 1. Affective Reactions to Change - Elementary school administrators enjoy the change in the organization as it relates to implementation of Louisiana INTECH professional development in the school.

Hypothesis 2. Cognitive Reactions to Change - Elementary school administrators recognize the occurrence of Louisiana INTECH professional development and its potential benefit to school and staff.

Hypothesis 3. Behavioral Reactions to Change - Elementary school administrators take actions to support or initiate changes related to the Louisiana INTECH professional development.

Hypothesis 4. Students of Louisiana INTECH certified teachers exhibit higher mathematics student achievement than students of non-Louisiana INTECH certified teachers as evidenced by the difference between mean pretest and mean posttest scores.

Hypothesis 5. Students of Louisiana INTECH certified teachers exhibit higher reading student achievement than students of non-Louisiana INTECH certified teachers as evidenced by the difference between mean pretest and mean posttest scores.

Hypothesis 1

The first hypothesis states: Elementary school administrators enjoy the change in the organization as it relates to implementation of Louisiana INTECH professional development in the school. To measure this variable, the Affective scale of the *Perceptions of Louisiana INTECH Professional Development* was used. Cronbach's alpha is common statistic used to determine the internal consistency reliability of a measure. Typically, a minimum value of .70 is considered to be an adequate indicator of reliability for psychological studies (Morgan, Leech, Gloeckner, & Barrett, 2004). For this study, Cronbach's alpha for this scale was .857, indicating a high level of reliability for the scale in this sample.

Overall, administrators indicated that they indeed agreed that they enjoyed the change in the organization as it related to the implementation of INTECH ($M = 3.33, SD = .49$). *ANOVA* was utilized to examine whether there were differences in the degree to which administrators enjoyed the change based on various demographic characteristics. Table 11 shows the responses to individual items on the survey. Indeed, there was a significant difference between male and female administrators (M_{male} = 3.11; M_{female} = 3.43) $F(1, 72) = 6.61$, $p < .05$. There was not a significant difference between principals and assistant principals on this scale ($M_{principal;}$ = 3.25; $M_{assistant}$ = 3.40) $F(1, 72) = 1.73$, *NS*. There were also no differences based on respondents' educational credentials or degrees ($M_{Masters}$ = 3.34; $M_{MastersPlus}$ = 3.29; $M_{Specialist}$ = 3.42; $M_{Doctorate}$ = 3.67) $F(1, 72) = 0.32$, *NS*.

Table 11

Administrator Responses to Affective Response to Change Subscale (n = 73)

	Mean	Std. Deviation
Item 3: I usually don't resist change.	3.38	.637
Item 4: I like change.	3.40	.682
Item 7: Change does not frustrate me.	3.29	.634
Item: 12: I often suggest new approaches to things in my school.	3.36	.537
Item 13: Most changes are not irritating	3.26	.624
Item 18: I don't hesitate to try new ideas.	3.30	.739

There were some differences between administrators on the Affective subscale based on their years of experience as an educator and years of experience as an administrator in their current school. There was a significant difference based on the number of years of experience as an educator ($M_{6\text{-}10}$ = 3.50; $M_{11\text{-}15}$ = 3.65; $M_{16\text{-}20}$ = 3.34; $M_{21\text{-}26}$ = 3.10; M_{26+} = 3.28) $F(1, 72)$ =

2.69, $p < .05$. One group (6-10 years as an educator) had only had one person, therefore a Post Hoc analysis was not run. While there were no significant differences based on the numbers of years experience as an administrator ($M_{0-5} = 3.43$; $M_{6-10} = 3.25$; $M_{11-15} = 3.20$; $M_{16-20} = 3.11$; $M_{21-26} = 3.33$) $F(1, 72) = 0.82$, *NS*, there was a significant difference based on the number of years as an administrator at their current school ($M_{0-5} = 3.42$; $M_{6-10} = 3.06$; $M_{11-15} = 3.38$) $F(1, 72) = 3.67$, $p < .05$. Post-hoc tests (Bonferroni) revealed that the difference was between those who had been administrators at their current schools for 0-5 years and those that had been administrators at their current school for 6-10 years. Table 12 shows these differences.

Table 12

Post-hoc Analysis of Years of Experience as Administrator at Current School

Years of experience as an administrator in the present school.	Years of experience as an administrator in the present school.	Mean Difference	Std. Error	Sig.
0 - 5 Years	6 - 10 Years	.36 (*)	.13	.027
	11 - 15 Years	.05	.18	.99
6 - 10 Years	0 - 5 Years	-.36 (*)	.13	.027
	11 - 15 Years	-.31	.20	.376
11 - 15 Years	0 - 5 Years	-.05	.18	.99
	6 - 10 Years	.32	.20	.376

Note. * the mean difference was significant at the .05 level

Finally, there were no differences in responses between administrators on the Affective subscale based on the number of teachers in the school ($M_{0-25} = 3.48$; $M_{26-50} = 3.22$; $M_{51-75} = 3.54$; $M_{76-100} = 3.22$) $F(1, 72) = 2.09$, *NS,* nor based on the number of INTECH trained teachers in the school ($M_{0-25} = 3.33$; $M_{26-50} = 3.36$; $M_{51-75} = 3.17$) $F(1, 72) = 0.07$, *NS.*

The results of the data analyzed concerning school leaders' affective reactions to change for Hypothesis 1 suggest that CPSB elementary school administrators do enjoy the changes in their schools in relation to the implementation of Louisiana INTECH professional development. Furthermore, the evidence suggests that the surveyed school leaders are not resistant to change nor or they frustrated by change. Moreover, the data indicates that CPSB elementary administrators embrace change and do not hesitate to try new ideas. According to Fullan (2002), only school administrators who are adept in promoting and leading a continuously changing school environment can promote effective change, leading to significant learning gains.

Hypothesis 2

The second hypothesis states that elementary school administrators will recognize the occurrence of Louisiana INTECH professional development and its potential benefit to school and staff. To measure this variable, the Cognitive scale of the *Perceptions of Louisiana INTECH Professional Development* was used. For this study, Cronbach's alpha for this scale was 0.85, indicating a high level of reliability for the scale in this sample.

Overall, administrators indicated that they indeed agreed that they recognized the occurrence of the INTECH program and its benefit to school and staff ($M = 3.41, SD = .40$). Table 13 shows the results for each item, including the mean response on the item on a 1-4 scale, and the standard deviation.

Table 13

Administrator Responses to Cognitive Response to Change Subscale (n = 73)

	Mean	Std. Deviation
Item 1: I look forward to changes in my school	3.47	.529
Item 2: Changes usually benefit my school.	3.40	.595
Item 5: Most school members would benefit from change.	3.30	.545
Item 6: I am inclined to try new ideas.	3.52	.530
Item 9: I would support the change.	3.42	.498
Item 11: Other people would think that I support the changes.	3.36	.510

ANOVA was utilized to examine whether there were differences in the responses to the Cognitive subscale questions based on various demographic characteristics. Indeed, there was a significant difference between the responses of male and female administrators ($M_{male} = 3.48$; $M_{female} = 3.24$) $F(1, 72) = 5.83$, $p < .05$. There was not a significant difference between principals and assistant principals on this scale ($M_{principal;} = 3.47$; $M_{assistant} = 3.36$) $F(1, 72) = 1.28$, *NS*. There were also no differences in responses based on the degree received ($M_{Masters} = 3.49$; $M_{MastersPlus} = 3.35$; $M_{Specialist} = 3.40$; $M_{Doctorate} = 4.00$) $F(1, 72) = 1.23$, *NS*.

There were no differences in scale scores on the Cognitive subscale based on the amount of experience the administrator had. There was no significant difference in scale scores based on the number of years of experience as an educator ($M_{6\text{-}10} = 3.67$; $M_{11\text{-}15} = 3.48$; $M_{16\text{-}20} = 3.41$; $M_{21\text{-}26} = 3.24$; $M_{26+} = 3.47$) $F(1, 72) = 1.07$, *NS*. There were no significant differences in scale scores based on the numbers of years experience as an administrator ($M_{0\text{-}5} = 3.41$; $M_{6\text{-}10} = 3.46$; $M_{11\text{-}15} = 3.32$; $M_{16\text{-}20} = 3.28$; $M_{21\text{-}26} = 3.61$) $F(1, 72) = 0.47$, *NS*, and there was not a significant difference in scale scores based on the number of years as an administrator at their current school (M_{0-5} = 3.41; M_{6-10} = 3.40; M_{11-15} = 3.42) $F(1, 72) = 0.01$, *NS*.

Finally, there were no differences in scale scores on the Cognitive subscale based on the number of teachers in the school (M_{0-25} = 3.42; M_{26-50} = 3.38; M_{51-75} = 3.47; M_{76-100} = 3.56) $F(1, 72) = 0.31$, *NS,* nor based on the number of INTECH trained teachers in the school (M_{0-25} = 3.41; M_{26-50} = 3.42; M_{51-75} = 3.50) $F(1, 72) = 0.03$, *NS.*

Hypothesis 2 examined CPSB elementary administrators' cognitive reactions to change and provided data in relationship to school leaders' perceptions of change, inclination toward change and support of change. The data examined from this hypothesis acknowledges a strong agreement of awareness on the behalf of the administrators that the INTECH program offers significant benefits to school and staff. These findings are in keeping with research by Fullan (1993, 1999, 2003) that indicate incorporation of change, which includes the entire school community is linked with effective school leadership.

Hypothesis 3

The third hypothesis stated that elementary school administrators would take actions to support or initiate changes related to the Louisiana INTECH professional development. To measure this variable, the Behavior scale of the *Perceptions of Louisiana INTECH Professional Development* was used. For this study, Cronbach's alpha for this scale was 0.89, indicating a high level of reliability for the scale in this sample.

Overall, administrators indicated that they agreed that they took actions to support or initiate changes related to INTECH ($M = 3.28, SD = .42$). Table 14 shows the overall responses on the survey for the Behavior Response to Change scale.

Table 14

Administrator Responses to Behavioral Response to Change Subscale (n = 73)

	Mean	Std. Deviation
Item 8: Changes would help me perform better at work.	3.18	.536
Item 10: Changes tend to stimulate me.	3.32	.550
Item 14: The changes would help improve unsatisfactory situations in my school.	3.26	.528
Item 15: I would do whatever possible to support the changes.	3.42	.575
Item 16: I find most change to be pleasing.	3.23	.486
Item 17: I would benefit from the changes.	3.29	.456

ANOVA was utilized to examine whether there were differences in the degree to which administrators recognized the occurrence of change based on various demographic characteristics including gender, position, highest degree received, or years of experience as an educator, years of experience as an administrator, and years of experience as an administrator in their current school. There was no significant difference between male and female administrators responses ($M_{male} = 3.34$; $M_{female} = 3.14$) $F(1, 72) = 3.55$, *NS*. This result was surprising given the consistent findings of difference based on gender on the Affective and Cognitive scales. Thus, *ANCOVA* was used to test if there would be a difference in how males and females scored on the Behavioral subscale when controlling for other factors, including highest degree, years of experience as an educator, years of experience as an administrator, years of experience as an administrator in the current school, number of teachers in the school, and number of INTECH teachers in the school. Table 15 shows the results of that analysis, in which a gender difference was found only when the number of teachers in the school was controlled for, or when the number of INTECH teachers in the school was controlled for.

While male administrators' responses indicated a larger difference in the degree to which they recognized the occurrence of change in regard to INTECH professional development, the only significant difference in the findings was noted when examining the category of the number of teachers in the school and in the category of the number of INTECH teachers in the school. This finding suggests that male administrators with larger numbers of teachers or INTECH trained teachers in the schools may be more supportive of change in relation to INTECH.

Table 15
ANCOVA of Gender on Behavioral Subscale Score Controlling for Other Factors

Source	df	F	Sig.
Highest Degree Earned	1	3.53	.064
Years of Experience as an Educator	1	3.58	.063
Years of Experience as an Administrator	1	3.93	.051
Years of Experience in Present School	1	3.50	.065
Number of Teachers in Present School	1	4.16	.045*
Number of INTECH Teachers in Present School	1	4.12	.046*

Note. * the mean difference was significant at the .05 level

There was not a significant difference of scores on the Behavioral scale between principals and assistant principals ($M_{principal;}$ = 3.28; $M_{assistant}$ = 3.29) $F(1, 72) = 0.002$, *NS*. There were also no differences in scale scores on the Behavior subscale based on the degree received ($M_{Masters}$ = 3.30; $M_{MastersPlus}$ = 3.24; $M_{Specialist}$ = 3.33; $M_{Doctorate}$ = 3.83) $F(1, 72) = 0.74$, *NS*.

There were no differences in scale scores on the Behavior subscale based on the amount of experience the administrator had. There was no significant difference in scale scores based on the number of years of experience as an educator (M_{6-10} = 3.17; M_{11-15} = 3.38; M_{16-20} = 3.24; M_{21-26} = 3.15; M_{26+} = 3.35) $F(1, 72) = 0.81$, *NS*. There were no significant differences in scale scores on the Behavioral subscale based on the respondents' numbers of years experience as an administrator (M_{0-5} = 3.28; M_{6-10} = 3.29; M_{11-15} = 3.24; M_{16-20} = 3.00; M_{21-26} = 3.67) $F(1, 72) = 0.98$, *NS*, and there was not a significant difference in scale scores on the Behavior subscale based on the number of years as an administrator at their current school (M_{0-5} = 3.31; M_{6-10} = 3.22; M_{11-15} = 3.29) $F(1, 72) = 0.28$, *NS*.

Finally, there were no differences in scale scores on the Behavior subscale based on the number of teachers in the school (M_{0-25} = 3.30; M_{26-50} = 3.25; M_{51-75} = 3.32; M_{76-100} = 3.44) $F(1, 72) = 0.26$, *NS,* nor based on the number of INTECH trained teachers in the school (M_{0-25} = 3.28; M_{26-50} = 3.36; M_{51-75} = 3.17) $F(1, 72) = 0.14$, *NS.*

The third hypothesis examined CPSB school administrators' behavioral reactions to change. The findings from this hypothesis suggest that CPSB elementary leaders desire change as an element of being stimulated while at work. The data indicated positive responses in relationship to change being pleasing at work, change improving negative situations in the school, and change being overall beneficial in the administrative environment. These findings are supported by the work of Fullan (1991) who concludes that school administrators must enable and encourage their schools, perhaps best demonstrated by leaders modeling the change they promote within the school setting. Additionally, Teste and Schneider (1999) report that school leaders perceive change as an essential element of the total school improvement effort.

Hypothesis 4

The fourth hypothesis stated that students of Louisiana INTECH certified teachers would exhibit higher mathematics student achievement than students of non-Louisiana INTECH certified teachers as evidenced by the difference between mean pretest and mean posttest scores. In order to test this hypothesis, *ANOVA* was used to examine the difference between the gain scores from 2^{nd} to 3^{rd} grade on the mathematics portion of the *ITBS* of students in INTECH trained teachers' classrooms and students in non-INTECH classrooms.

Overall, there was a significant difference between the mean mathematics gain scores of students in INTECH classrooms and, combined, both groups improved an average of 21.48 points on the mathematics portion of the *ITBS* (SD = 11.57) from 2^{nd} to 3^{rd} grade. However, students in INTECH classrooms gained significantly more than student in non-INTECH classrooms ($M_{INTECH} = 22.57$; $M_{NON\text{-}INTECH} = 20.48$) $F(1, 850) = 6.97$, $p < .01$.

The fourth hypothesis examined the difference in mathematics mean gain scores between students in INTECH teachers' classrooms and students in non-INTECH teachers' classrooms. The data suggested that students in INTECH teachers' classrooms performed at higher levels in the area of mathematics. These findings concur with research conducted by Norman (2000) and Mann et al. (1999) which suggested a link between technology professional development and increased student achievement in mathematics.

Hypothesis 5

The fifth and final hypothesis stated that students of Louisiana INTECH certified teachers would exhibit higher reading student achievement than students of non-Louisiana INTECH certified teachers, as evidenced by the difference between mean pretest and mean posttest scores. In order to test this hypothesis, *ANOVA* was used to examine the difference between the gain scores from 2^{nd} to 3^{rd} grade on the reading portion of the *ITBS* of students in INTECH teachers' classrooms and students in non-INTECH teachers' classrooms.

Overall, there was no significant difference between the mean reading gain scores of students in INTECH teachers' classrooms and those in non-INTECH teachers' classrooms. Combined, both groups improved an average of 16.84 points on the reading portion of the *ITBS*

(SD = 12.55) from 2nd to 3rd grade. Students in INTECH teachers' classrooms did not gain significantly more on their reading scores on the *ITBS* compared to students in non-INTECH teachers' classrooms (M_{INTECH} = 17.05; $M_{NON\text{-}INTECH}$ = 16.65) $F(1,850) = 0.64$, *NS*.

The final hypothesis examined the difference between reading mean gain scores of students in INTECH teachers' classrooms and those in non-INTECH teachers' classrooms. The findings indicated that the students in the INTECH teachers' classrooms did not perform at significantly higher levels than students in non-INTECH teachers' classrooms in regards to reading achievement. Due to the fact that INTECH professional development is primarily a technology integration model and not a reading curriculum skills model, it is not surprising that these findings are not supported in the literature. In fact, these findings are contrary to the work of Kulik (2003), Hiebert & Raphael (1998), Pinkard (1999) and Reinkin (1987, 1988) in regards to technology professional development supporting increased student achievement in reading.

Summary

According to the results reported, four of the five hypotheses were supported. In general, school administrators were supportive of the Louisiana INTECH program. Administrators reportedly agreed that they were supportive of the changes the INTECH program brought to their schools. While there were some differences in the degree to which various groups, based on administrative position, gender, highest degree, level of experience, or number of teachers in their school, reported being supportive, all groups reported support.

The same pattern was found in administrators' rating of their recognition of the occurrence of the INTECH program and its potential benefit for staff. Administrators generally agreed that they recognized the program and its benefits, and while there were some differences based on different group characteristics, all the differences indicated the degree to which administrators were positive about the program.

Elementary school administrators in Calcasieu Parish Schools reported, overall, that they would indeed take actions to support or initiate change as a result of the INTECH program. There were no differences in scores on the Affective, Cognitive, or Behavioral subscales across any of the subgroups in the sample.

Finally, there were significant differences reported between the performance of students who were in INTECH trained teachers' classrooms compared to students who were in non-INTECH trained teachers' classrooms in terms of their gain scores on the mathematics *ITBS* from second to third grade. There was not a significant difference between the same groups of students in their reading scores. Further discussion of these findings is found in Chapter 5.

Chapter Five: *Discussion*

Introduction

The purpose of this chapter is to pair existing research and theory with the results of the study. In the study, the Louisiana Integration of Technology (INTECH) professional development model was hypothesized to be a catalyst for change within schools and increased student achievement. While there have been numerous other studies looking at the positive correlation between leadership, technology professional development, and student achievement, none have examined the INTECH model, which is particular to Louisiana. The present study examines the following two main research questions of interest: 1) Do elementary school leaders perceive INTECH professional development as a catalyst for change in their school? 2) Does this professional development positively impact student achievement in mathematics and reading as evidenced by significant gains on the *Iowa Tests of Basic Skills*? This chapter explores the findings in relation to the two research questions of interest, and the five related hypotheses, as presented in chapter four.

This chapter is organized into five sections. The introduction provides a general overview, as well as the purpose and organization of the chapter. The second section examines the study's findings. In the third section, the limitations of the research study in relation to the findings are presented. Recommendations for future studies and implications for practice are within the fourth section. Lastly, the chapter presents a brief discussion of the conclusions drawn from the study in relation to school leadership, and Louisiana INTECH professional development.

Findings

The present study's purpose was to determine whether a particular model of professional development, Louisiana INTECH, could be related to significant positive change in student achievement in relation to school leaders' perception of INTECH professional development as a catalyst for change. This study used a sample of 73 elementary principals and assistant principals who had third grade classrooms in their schools, which represents the total number of possible elementary administrators in the Calcasieu Parish Public Schools. All 73 administrators completed the *Perceptions of Louisiana INTECH Professional Development* survey. The research considered five hypotheses, couched within the following five subareas: affective reactions to change, cognitive reactions to change, behavioral reactions to change, positive change regarding mathematics scores, and positive change regarding reading scores.

Overall, the data supported four of the five hypotheses. In general, school administrators were supportive of the Louisiana INTECH program, and reportedly agreed that they were supportive of the changes the INTECH program brought to their schools. Although there were varying degrees to which different groups reported being supportive, all groups reported support.

In the first research hypothesis, affective reactions to change were examined. The first hypothesis states: Elementary school administrators enjoy the change in the organization as it relates to implementation of Louisiana INTECH professional development in the school. Specifically, the evidence suggests that, overall, CPSB elementary school administrators greatly welcomed change, and often suggested new approaches to issues or problems within the campus. These findings appear to be consistent with existing research which identifies "openness to change," and ability to change as elements of visionary leadership (Faidley & Musser, 1989; Rinehart & Russo, 1995). Indeed, by embracing the ability to see beyond the immediate context, and welcoming change, visionary leaders set themselves apart from their peers. Furthermore, according to Fullan (2001a), visionary leaders take pride in the boldness of their ideas, empowering others to evolve along with them.

Moreover, openness to change is in keeping with the concept of transformational leadership, where individuals view themselves to be change agents (Lussier & Achua, 2007). Transformational leaders remain adaptable and flexible, continuously improving and changing those individuals around them. This theory, which is an outgrowth of cultural theory, embodies the concept that the implementation of new concepts and endeavors, particularly when paired with growth within others, promotes and enables leaders to continually transform themselves (Kuhnert & Lewis, 1987). Indeed, transformational leaders view themselves to be powerful and effective change agents (Lussier & Achua, 2007).

Adoption of the theory of transformational leadership, and accompanying theoretical evolution, typically translates to avoidance of the status quo, in regards to leadership paradigm (Lussier & Achua, 2007). The study's findings support this concept, suggesting that CPSB elementary administrators may integrate elements of transformational leadership within their practice. Specifically, positive responses to the following survey items within the affective, cognitive, and behavioral domains suggest a link between CPSB elementary administrators and practice of transformational leadership: 1) I look forward to changes in my school, 2) Changes usually benefit my school, 5) Most school members would benefit from change, 6) I am inclined to try new ideas, 8) Changes would help me perform better at work, 10) Changes tend to stimulate me, 12) I often suggest new approaches to things in my school, 17) I would benefit from the changes.

Additionally, as predicted in the first hypothesis, the study results suggest that school leaders do enjoy change within the organization in relation to Louisiana INTECH (*M = 3.33, SD = .49*). However, it is worth noting that said enjoyment of change varies in occurrence within the research group. Data indicated that there are specific differences between the perceptions of male and female administrators regarding the enjoyment of change in the organization as a result of INTECH ($M_{male} = 3.11$; $M_{female} = 3.43$), although both were positive about the change. As found by Klecker and Loadman (1999), in their study *Measuring Principals' Openness to Change on Three Dimensions: Affective, Cognitive, and Behavioral*, the data suggest that females within this area of the study, hypothesis one, are more inclined to perceive technology professional development as a catalyst for change than their male peers. The data support that female school administrators are overall more open to implementing the changes associated with INTECH professional development. As such, further research should be conducted, which will be addressed in this chapter's recommendations for further research.

Moreover, regarding hypothesis one, the data suggest that there were some differences in the affective subscale based on several subject characteristics. One difference is based on an administrator's years of experience as an educator, where the findings show that, overall, more enjoyment of change takes place with fewer years of experience as an educator ($M_{6-10} = 3.50$; $M_{11-15} = 3.65$; $M_{16-20} = 3.34$; $M_{21-26} = 3.10$; $M_{26+} = 3.28$). Again, this is consistent with Klecker and Loadman's (1999) research of administrators' openness to change. Another area of difference worth noting is years of experience at the administrator's present campus, which shows that surveyed administrators experience markedly less enjoyment of change ($M_{0-5} = 3.42$; $M_{6-10} = 3.06$; $M_{11-15} = 3.38$) with six to ten years of experience at a campus, than those with fewer or greater years experience at the present campus. After a thorough review of the literature, nothing was found in regards to enjoyment of change which would support or explain this finding.

Hypothesis two examined cognitive reactions to change. This hypothesis addresses the study group's perceptions, knowledge, and awareness of change, within the context of INTECH, in relation to the campus. The second hypothesis states that elementary school administrators will recognize the occurrence of Louisiana INTECH professional development and its potential benefit to school and staff. This is akin to the work of James McGregor Burns, in his book *Leadership* (Kuhnert & Lewis, 1987), where he contends that followers become leaders through keen interest and deliberate attention to the greater good (Lussier & Achua, 2007).

Overall, administrators indicated that they strongly agreed that they recognized the occurrence of the INTECH program and its benefit to school and staff ($M = 3.41, SD = .40$). Of note, however, is the fact that there was again a gender difference in regard to positive perceptions of change within the cognitive realm. However in this case, it was male administrators who were found to be more open to change within the area of cognitive responses.

Awareness of INTECH as a benefit to the entire school community is indelibly linked with the work of theorist Michael Fullan (1992, 2001b), who regards educational change as multidimensional, involving the classroom, school, and district. Stakeholders, such as administrators, teachers, students and parents, have a substantial impact on the implementation, form and type of change. The Louisiana INTECH technology embedded professional development model engages all of these dimensions and is a potential pathway to implement the necessary instructional changes to improve classroom practices. Indeed, this is related to the results presented in chapter four, which reports that CPSB elementary administrators are inclined to try new ideas, and agree that most school members would benefit from change.

Hypothesis three examined behavioral reactions to change. The third hypothesis states that elementary school administrators would take actions to support or initiate changes related to the Louisiana INTECH professional development. Overall, administrators indicated that they agreed that they took actions to support or initiate changes related to INTECH ($M = 3.28, SD = .42$). The evidence seems to indicate that change would be strongly supported by all elementary administrators within the school district, and that changes within the campus in relation to INTECH specifically would be supported. According to the data, CPSB administrators agreed that changes brought about through INTECH training would aid in improving unsatisfactory conditions within their campuses.

Additionally, the data suggested that school administrators desire and need change in order to be challenged and stimulated while at work. Specifically, positive responses to the following survey items suggest a link between CPSB elementary administrators and a desire or need for change in order to be challenged or stimulated while on the job: 8) Changes would help me perform better at work, 10) Changes tend to stimulate me, 17) I would benefit from the changes. These findings are supported by the research of Dunham, et al. (1989) who wrote that individuals who enjoy change also expect a corresponding challenge. Indeed, the evidence suggested that school administrators within the study view change to be linked to being challenged and stimulated while on the job.

Additionally, it is important to note that, unlike hypotheses one and two, hypothesis three does not present a marked difference in gender perceptions in relation to whether elementary school administrators would take actions to support or initiate changes related to the Louisiana INTECH professional development. Chapter four addresses this unexpected variant within the Table 14. The ANCOVA found that there was a slight gender difference, with males more supportive of taking actions to support or initiate changes related to the Louisiana INTECH professional development, when examining the category of the number of teachers in the school, and also in the category of the number of INTECH teachers in the school. Because these findings are not consistent with the work of Klecker and Loadman (1999) and hypothesis one, which indicated that female administrators are more open to change than their male counterparts, the results from this ANCOVA should be viewed in light of their similarity to the data from hypothesis two, which also showed males to be more supportive of change in relation to INTECH. These findings suggest that males appear to be more supportive of change in relation to INTECH.

The fourth hypothesis stated that students of Louisiana INTECH certified teachers would exhibit higher gains in mathematics achievement than students of non-Louisiana INTECH certified teachers as evidenced by the difference between mean pretest and mean posttest scores on the math portion of the *ITBS*. In order to test this hypothesis, *ANOVA* was used to examine the difference between the mathematics gain scores from 2nd to 3rd grade of students in INTECH trained teachers' classrooms and those students in non-INTECH trained teachers' classrooms.

Overall, there was a significant difference between the mean mathematics gain scores of students in INTECH teachers' classrooms and those in non-INTECH teachers' classrooms. Combined, both groups improved an average of 21.48 points (SD = 11.57), from 2nd to 3rd grade. However, students in INTECH teachers' classrooms gained significantly more in the area of mathematics achievement than student in non-INTECH teachers' classrooms ($M_{INTECH} = 22.57$; $M_{NON\text{-}INTECH} = 20.48$). This finding supports previous research as presented by The National Council for Teachers of Mathematics (NCTM), which recommends math reforms grounded in constructivist learning theory, where teachers are encouraged to facilitate students' progress in making connections to the real world (Cauthen, 2003; Pippenger, 2003). Indeed, it is constructivist theory which guides the INTECH learning strategies and pedagogy that are employed by the teachers, acting as students, who build new content knowledge through higher order thinking and problem solving in mathematics and technology as they participate in INTECH teacher developed lessons.

Furthermore, research indicates that teachers who are committed to implementing mathematics similar to an INTECH-supported, project-based learning project with technology, rather than as isolated facts, tend to produce greater student gains (Briars & Resnick 2000; Cognition and Technology Group at Vanderbilt, 1992; McCart, 1996; Wenglinsky, 1998.) This is in keeping with other existing research that indicates there is a link between students' higher mathematics test scores and teachers who had participated in technology-based professional development (Mann et al., 1999; Middleton & Murray, 1999; Norman, 2000). And although the use of technology by teachers in mathematics classrooms is unquestionably positive, it is additionally worth noting that technology and calculator-using students are shown to perform at higher levels (Cauthen, 2003; Dion, et al., 2001; Heid, 1988; Pippenger, 2003).

The final hypothesis stated that students of Louisiana INTECH certified teachers would exhibit higher reading student achievement than students of non-Louisiana INTECH certified teachers as evidenced by the difference between mean pretest and mean posttest scores. As with hypothesis four, in order to test this hypothesis, *ANOVA* was used to examine the difference between the gain scores from 2nd to 3rd grade on the Reading portion of the *ITBS* of students in INTECH trained teachers' classrooms and those students in non-INTECH classrooms. The findings show that overall; there was no significant difference between the mean gain scores of students in INTECH classrooms. Combined, both groups improved an average of 16.84 points

(SD = 12.55) from 2nd to 3rd grade. Students in INTECH classrooms did not gain significantly more points than student in non-INTECH classrooms (M_{INTECH} = 17.05; $M_{NON\text{-}INTECH}$ = 16.65) $F(1,850) = 0.64$, *NS*.

It is interesting that the present study's findings are in direct contrast to existing research, which demonstrates that computers have proven to be beneficial in increasing reading comprehension and skills in elementary schools (Hiebert & Raphael, 1998; Kulik, 2003; Pinkard, 1999; Reinkin, 1987, 1988). As discussed in chapter one, it is important to note that the INTECH model is an integration model, not a specific curriculum skill model and it is not surprising that the results indicated no significant difference in reading achievement in INTECH teachers' and non-INTECH teachers' classrooms in the primary grades. This may be attributed to the fact that in the early elementary grades, reading is primarily skills-based rather than application-based (Foorman, Perfetti, Pesetsky, & Seidenberg, 2002). Since INTECH professional development does not include any curriculum skill training in the model, it is possible that the disconnect lies with the misconception that INTECH professional development, in the primary grades, is a mechanism to enhance reading skills. Furthermore, the INTECH model focuses on technology integration strategies and this focus, too, might contribute to the lack of a significant difference in reading achievement in INTECH and non-INTECH Classrooms.

Limitations

According to Cresswell (2003), the limitations of a research endeavor outline potential weaknesses within the study. Often times, these limitations are circumstances which are beyond the control of the researcher, and serve to restrict the scope of a study, sometimes affecting its outcomes (Gay & Airasian, 2000; Rudestarm & Newton, 2001). Regarding the INTECH survey, one such limitation was related to the location that the actual surveying took place. Since elementary administrators responded to the perception survey questions individually during a principals' meeting, they may not have been in an environment most conducive to thoughtfully completing this activity. Furthermore, this study is limited by the fact that it captures only a single moment in time, and clearly could vary, to some degree, in administrator responses from day to day. Additionally, although the participants were not instructed to complete the survey in a certain timeframe, it is possible there was a desire to complete the survey quickly, as the administrative director of elementary schools gave the survey out at the end of the principal's meeting. This limitation, in particular, is a prime example of an element which was beyond the control of the researcher.

An additional limitation of the study is due to disparity of funding and lack of effective leadership at varied school sites, which led to the differing technology tools for each third grade INTECH classroom. Due to this disparity, the utilization and implementation of classroom technology was varied, as was the employment of technology strategies. A third limitation is that although participation in the district technology professional development training, or Classroom-Based Technology (CBT), was mandatory, there was no standard by which to determine the adeptness of each participant. These limitations, again, are beyond the control of the researcher, and are not addressed in this particular study.

Causal-comparative design was an additional limitation of this study. The dependent variable, mathematics and reading achievement in third grade was affected by the non-random student placement in classes. To solve, in part for this limitation, matched groups were utilized in an endeavor to control for the effect of any extraneous variables. Additionally, while *ANOVA* was used to investigate the variation between groups, ANCOVA is typically used to investigate change scores, especially when subjects are not chosen at random, in order to reduce the error in the group means. However, the nature of the data on student *ITBS* scores provided by the district did not allow for adding covariates to the model. And regarding further limitations, the causal-comparative design depicts a relationship, but lacks explanation for the relationship's resulting cause and effect (Gravetter & Wallnau, 2004).

The final limitation is the lack of specificity in the norm referenced *Iowa Tests of Basic Skills (ITBS)* test scores. In short, this exam does not adequately specify the totality of a student's specific knowledge base, capturing only a moment in time. Furthermore, this exam compares students to others in the norming group, rather than examining the individual student's academic growth over the course of the school year (University of Iowa, 2006).

Implications

The INTECH professional development model holds great promise for engaging students in higher-level thinking and problem-solving as evidenced by the results in this study supporting increased gains in student achievement in mathematics. Reading-related aspects of the INTECH professional development model did not show a significant difference regarding gains in student achievement between INTECH trained teachers' classrooms and non-INTECH trained teachers' classrooms due to the fact that reading in the primary grades is skill-based. INTECH professional development is not a specific curriculum skill-based initiative. Additionally, the study's findings validate the premise that the Louisiana INTECH professional development model is positively perceived by elementary administrators as a catalyst for change in the Calcasieu Parish elementary schools. Although the present study does not include teacher participants, it is also important to note that the willingness to change and interest in technology-based professional development exhibited by administrators is also apparent in teacher attitudes and responses in established research.

For example, Ertmer, Ottenbreit-Leftwich, and York (2005) report that teachers rated professional development as one of the most influential extrinsic factors for changing their professional practices and utilizing technology in the classroom. Additionally, "to help teachers incorporate technology in ways that support powerful instruction requires an array of professional development experiences quite different from traditional workshops and how-to training sessions," notes David (1996, p. 238). Indeed, it is incumbent that professional development for effective technology use come in a myriad of forms, such as mentoring, modeling, ongoing workshops, special courses, structured observations, and summer institutes, all of which are components of the INTECH professional development model (David, 1996; Guhlin, 1996).

Whatever the format, however, effective professional development utilizes key points from adult learning theory, or andragogy (Knowles, 1980). Adults require relevant, concrete experiences with adequate support, appropriate feedback, and long-range follow-up (Speck, 1996). Adragogy encourages that adult learners have input into the learning process, and the result is a powerful learning environment which is truly learner-centered (Knowles, 1980). Again, this type of professional development is very different from traditional one-time teacher workshops, as research indicates that teachers learn and incorporate new information best when it is presented over a long time frame instead of a single session (David, 1996). This is in keeping with the INTECH model that provides eight days of professional development spread over time.

Moreover, Cuban et al. (2001) found that technology professional development training was seldom offered at convenient times for teachers. The state of Louisiana can solve this problem is by offering INTECH professional development in non-traditional formats. Rather than requiring teachers to commit to eight days of face-to-face professional development, the model could be modified to use online components and eliminate the full face-to-face requirement. Moreover, INTECH professional development could be structured so that partnerships are built with universities to offer graduate credit for the training. These modifications hold great promise for inducing more educators to participate in the training.

Furthermore, investigation might be initiated as to how the Louisiana INTECH professional development model could become part of pre-service education in the state of Louisiana. Were this to transpire, school districts would no longer be compelled to send teachers away from the classroom for eight days in order to improve their technology-integration strategies. This could easily be accomplished with the INTECH professional development model curriculum being incorporated into a new pre-service education course, or embedding it in an existing course.

It is recommended that the Calcasieu Parish School District openly and aggressively promote the INTECH professional development model. Many school administrators are reluctant to adopt and implement a model that requires change due to uncertainty as to whether or not the district will adequately support the changes needed to implement the program. Fullan and Stigelbauer (1991) concluded that attempting to implement programmatic change could result in damage to administrators' careers due to politics in the district. CPSB school administrators would be more confident in the changes associated with INTECH if they knew these changes would be unilaterally supported by the district.

Professional development programs for administrators could emphasize the effectiveness and impact of technology embedded professional development. It is recommended that graduate administrative leadership programs in Louisiana include components that imbue prospective principals with a working knowledge of the INTECH model. Additionally, more emphasis could be placed on the importance of integrating technology into the curriculum in administrators' coursework and professional development.

Moreover, principals could encourage, or require, that educators be comprehensively trained in technology integration strategies and technology, and that they be embedded in the schools' daily routines. According to current research, when technology becomes an element of classroom routine, student learning increases (Adams, 2004; Fisk, B. & Sloan, K. 2004). Additionally, use of teacher-led, standards-based lessons are more effective in promoting student learning than lessons delivered by computer alone (Mann et al., 1999). Ultimately, students have the most at stake in the educational system, and how, or if, it changes or maintains equilibrium (Fullan & Stigelbauer, 1991).

Furthermore, it is recommended that principals in the state and certainly in Calcasieu Parish do the following in order to encourage more teachers to participate in INTECH:

1. Use a variety of incentives and requirements to motivate teachers to participate in professional development activities designed to help them integrate technology into their classrooms.
2. Offer technology for classroom or personal use as an incentive to participation.
3. Determine expectations for teachers in regard to their use of technology in their classrooms.
4. Demonstrate support for and leadership of ongoing inquiry-driven professional development for technology use.
5. Participate in professional development programs, study groups, and other technology activities with teachers and other staff members.

Principals could empower their faculty and staff; actively listen to their concerns, encourage and promote their innovations, and support them with time and resources. Additionally, principals have the responsibility to lead significant changes in the culture of the school. If he or she departs the position or disproportionately delegates aspects of this responsibility to others, it normally will not get done, and tangible, results-driven improvement will not transpire (Fullan & Stigelbauer, 1991).

Indeed, there was a need to critically examine this state-sponsored technology integration professional development model. Based on the study's findings of administrator support of INTECH technology-infused professional development, the evidence suggests that the significant commitment of human and financial resources for this professional development initiative is positively impacting changes in CPSB elementary schools, improving student performance in mathematics, and is being supported by elementary administrators.

Recommendations for Further Research

Although the present study has examined the INTECH professional development model at the elementary level, and concluded that this model does serve to demonstrate significant gains in students' mathematics achievement, there is more research to be done in this area. It is recommended that additional research be conducted regarding what limiting factors resulted in the INTECH model not positively impacting reading classrooms. Additionally, it is recommended that further study be devoted to the high-stakes subject areas of science and social studies, and their relationship to INTECH.

Another area of recommendation for further research is observation in the INTECH classrooms as part of a longitudinal study. The present study did not address whether INTECH professional development strategies were being implemented in elementary classrooms over time. Said implementation should be validated, as it may be linked to the support of constructivist practices (Fullan, 2001; Hassard, 1992; Tobin, Kahle, & Fraser, 1990; von Glaserfeld, 1981, 1991; Vygotsky, 1978).

Lastly, it is recommended that additional research be conducted regarding the present study's findings concerning gender-specific differences in elementary administrators' perceptions of change in regard to INTECH professional development. The study indicated more female administrators support change within the affective domain, while male administrators tend to support change within the cognitive domain. Interestingly, the behavioral domain showed no significant difference regarding gender. This disparity is compelling, and is an area where further research should be conducted.

Conclusion

In today's complex and critical school improvement environment, it is becoming increasingly difficult for school leaders to enact leadership effectively on their own. The challenges that school districts are facing today, both internally and externally, are challenges that often overwhelm existing resources and defy known solutions. These complex challenges require new assumptions and methods yet to be developed. Additionally, they require organizational and individual learning and change, which are often presented through the medium of technology.

As the world becomes increasingly dependent upon technology for everyday tasks and professional endeavors, students and their parents will continue to demand an academically-rigorous public education which includes the integration of computers, the Internet, and a myriad of other relevant emerging technologies. In the United States, as well as within the global community, businesses are presently demanding graduates who are technologically proficient

(Slattery, 1998). As such, communities throughout the country are increasingly requiring effective leadership in the area of technology from insightful and visionary educational leaders.

Furthermore, all though thorough integration of technology is necessary for adequate preparation of today's students, Fullan and Stiegelbauer (1991) write that the routine demands of the principalship have increased to the point that most principals admit their inability to meet everyone's needs all the time. Thus, for the principal, as well as for the teacher, change may be seen as just one issue intruding upon the more essential commitments of keeping day-to-day instruction on track. However, the fact remains that principals are frequently effective agents of change (Fullan, 1996; Hall & Hord, 2001; Hallinger & Heck, 1996). It is this fact which prompted the present study.

If educators do not receive support for development, and others within the school community do not allow and encourage them to change, the challenge of participating in a professional development experience may overwhelm the educator, rather than fostering learning and promoting growth. It is recommended that school administrators and teachers receive visible, substantive, and continuing support from the district and the state to implement the changes driven by INTECH professional development. This would come in the form of funding for release time, stipends and technology tools for teachers.

In conclusion, though the state of Louisiana, the school districts of Louisiana, and the district technology and curriculum staffs regard INTECH as an essential professional development experience, no empirical research had been conducted concerning this model from the time of its inception until December of 2007. Despite the fact that the INTECH professional development model had been in place for over eight years, there had been virtually no research conducted on the impact of this professional development on student achievement, nor any research conducted to indicate school leaders' perception of INTECH professional development as a catalyst for change. Hence, this study was conducted and may be among the earliest of its kind. Indeed, the results of this study provide insight and direction for state, district and school leaders to ponder.

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APPENDICES

APPENDIX A

Approval to Use Survey

From: Donald Gardner [dgardner@uccs.edu] Sent: Tue 5/22/2007 10:46 AM
To: Abshire, Sheryl
Cc:
Subject: Re: Doctoral Student Requests Permission to Use Your Survey
Attachments

Dear Sheryl,

The questionnaire is public domain. Please feel free to use it.

Good luck with your research.

Sincerely,

Don Gardner

At 04:18 PM 5/21/2007, you wrote:

Dr. Gardner,

I am a doctoral candidate conducting dissertation research under the direction of Dr. Tammie Causey-Konate', an associate professor in the Department of Education, Leadership, Counseling and Foundations at University of New Orleans. My dissertation topic involves investigating the effects of Louisiana INTECH professional development and certification on elementary administrators' perceptions of change and 3rd grade reading and mathematics achievement. I would like your permission to use the 18 item *Change in Organizational Culture* survey developed by Dunham, Grude, Gardner, Cummings, and Pierce (1989).

The survey items I am requesting to use are listed below:

Factor 1: Affective Reaction to Change

Item 3. I would resist the change.

Item 4. I don't like the changes.

Item 7. The changes would frustrate me if they happened in my school.

Item 12. I would suggest these changes for my school.

Item 13. Most of the changes are irritating.

Item 18. I would hesitate to press for such changes.

Factor 2: Cognitive Reaction to Change

Item 1. I would look forward to such changes at my school.

Item 2. The changes would benefit my school.

Item 5. Most school members would benefit from the changes.

Item 6. I would be inclined to try the changes.

Item 9. I would support the changes.

Item 11. Other people would think that l support the changes.

Factor 3: Behavioral Reaction to Change

Item 8. The changes would help me perform better at work.

Item 10. The changes tend to stimulate me.

Item 14. The changes would help improve unsatisfactory situations at my school.

Item 15. I would do whatever possible to support the changes.

Item 16. I would find going through these changes to be pleasing.

Item 17. I would benefit from the changes.

(Dunham, et al., 1989, p. 11).

The survey will be administered to 70 elementary school administrators in the Calcasieu Parish Public School System in Lake Charles, LA as a part of the data collection component of my dissertation. Please let me know if you will grant me permission to use this survey. I would like to be able to move forward with data collection as soon as possible. If you have any questions, please feel free to contact me by email - sheryl.abshire@cpsb.org , at my office - 337-437-6150 or by cell phone - 337-540-5825.

I look forward to hearing from you.

Thank you in advance for your assistance.
Sheryl Abshire

Sheryl Abshire
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From: Randall B. Dunham [rdunham@bus.wisc.edu] Sent: Mon 5/21/2007 7:48 PM
To: Abshire, Sheryl
Cc: Randi Huntsman
Subject: Re: Doctoral Student Requests Permission to Use Your Survey
Attachments

Sheryl,

You have my permission to use the instrument. My assistant will send you a copy of the instrument and the Excel spreadsheet that can be used for scoring. Good luck with your research. Please share your results with us.

Randy

On May 21, 2007, at 5:21 PM, Abshire, Sheryl wrote:

Dr. Dunham,
I am a doctoral candidate conducting dissertation research under the direction of Dr. Tammie Causey-Konate', an associate professor in the Department of Education, Leadership, Counseling and Foundations at the University of New Orleans.
My dissertation topic involves investigating the effects of Louisiana INTECH professional development and certification on elementary administrators' perceptions of change and 3rd grade reading and mathematics achievement. I would like your permission to use the 18 item *Change in Organizational Culture* survey developed by Dunham, Grude, Gardner, Cummings, and Pierce (1989).

The survey items I am requesting to use are listed below:

Factor 1: Affective Reaction to Change

Item 3. I would resist the change.
Item 4. I don't like the changes.
Item 7. The changes would frustrate me if they happened in my school.
Item 12. I would suggest these changes for my school.
Item 13. Most of the changes are irritating.
Item 18. I would hesitate to press for such changes.

Factor 2: Cognitive Reaction to Change

Item 1. I would look forward to such changes at my school.
Item 2. The changes would benefit my school.
Item 5. Most school members would benefit from the changes.
Item 6. I would be inclined to try the changes.
Item 9. I would support the changes.
Item 11. Other people would think that I support the changes.

Factor 3: Behavioral Reaction to Change

Item 8. The changes would help me perform better at work.
Item 10. The changes tend to stimulate me.
Item 14. The changes would help improve unsatisfactory situations at my school.
Item 15. I would do whatever possible to support the changes.
Item 16. I would find going through these changes to be pleasing.
Item 17. I would benefit from the changes.

(Dunham, et al., 1989, p. 11).

The survey will be administered to 70 elementary school administrators in the Calcasieu Parish Public School System in Lake Charles, LA as a part of the data collection component of my dissertation. Please let me know if you will grant me permission to use this survey. I would like to be able to move forward with data collection as soon as possible. If you have any questions, please feel free to contact me by email - sheryl.abshire@cpsb.org , at my office - 337-437-6150 or by cell phone - 337-540-5825.

I look forward to hearing from you.
Thank you in advance for your assistance.
Sheryl Abshire

Sheryl Abshire
District Administrative Coordinator of Technology
"Advancing Quality Education with Technology"
Calcasieu Parish Public Schools
600 South Shattuck Street
Lake Charles, Louisiana 70601
337.437.6150
337.437.1249 fax

sheryl.abshire@cpsb.org
www.cpsb.org

Randall B. Dunham
Chairperson, Department of Management & Human Resources
Keenan A. Bennett Chair
Faculty Co-Director, Center for International Business Education & Research
University of Wisconsin-Madison
School of Business
975 University Ave.
Madison WI 53706

rdunham@bus.wisc.edu
http://instruction.bus.wisc.edu/rdunham
608-263-2120

APPENDIX B

Survey

Perceptions of Louisiana INTECH Professional Development

Elementary Administrators:

As part of the doctoral program in Educational Administration at the University of New Orleans, I am completing my dissertation entitled *The Impact of Louisiana INTECH Professional Development on Elementary Principals' Perception of Change and on Student Achievement.* This study is a requirement of my doctoral program and will be valuable in providing data which will describe the impact of this professional development on third grade student achievement in mathematics and reading. I am asking for your help.

Please complete this short opinion survey entitled *Perceptions of Louisiana INTECH Professional Development* attached to this document, place it in the large brown envelope provided by the end of the principals' meeting. Let me stress that your participation in this study is completely voluntary. The results will not include your name or the name of your school. There is no code on the survey to link the survey to your school.

When all of the research is completed, a copy of my dissertation will be provided to the CPSB Research and Assessment office. You will be able to review the results by contacting Barbara Bankens, Administrative Director of Research, Assessment, and Accountability. I will also prepare an executive summary that I will share with you upon request.

Thank you very much for your time and consideration in completing this survey. If you have any questions, please contact me by email sheryl.abshire@cpsb.org or by phone 337-217-4100. I am looking forward to completing my dissertation and sharing the results with my colleagues. Your responses will be a critical component in the successful completion of my research.

Sincerely,

Sheryl R. Abshire

Appendix B
Perceptions of Louisiana INTECH Professional Development Survey

(Klecker & Loadman, 1999)

Survey Overview:

The Calcasieu Parish Public School System regularly offers Louisiana INTECH training. All teachers have been provided the opportunity to participate in this training. The purpose of this survey is to gather information concerning elementary school administrators' perceptions of Louisiana INTECH professional development as a catalyst for school change.

Please read the Louisiana INTECH Overview information below and respond to the survey items.

Louisiana INTECH Overview:

Louisiana INTECH certification is earned by teachers who have completed Louisiana INTECH training. The training is an intense, content-rich, hands-on, 56-hour staff development program designed to provide teachers with concrete examples of effective, technology-based strategies that support and enhance curriculum and can serve as a catalyst for fundamental change in overall teaching and learning processes. Teachers work in teams during INTECH training to learn basic technology skills while focusing on project-based activities that are aligned with the Louisiana Content Standards. Teachers are required to critically examine their own instructional practices to determine how technology can play a role in enhancing the teaching and learning process. They are expected to implement technology projects and activities in their classrooms developed during the training program.

Survey:

Based on your knowledge of the Louisiana INTECH professional development program and your perceptions of INTECH certified teachers in your school and their use of technology integration strategies please respond to the following statements.

		Strongly Disagree	*Disagree*	*Agree*	*Strongly Agree*
1.	I look forward to changes in my school.	1	2	3	4
2.	Changes usually benefit my school.	1	2	3	4
3.	I usually resist change.	1	2	3	4
4.	I don't like change.	1	2	3	4
5.	Most school members would benefit from change.	1	2	3	4
6.	I am inclined to try new ideas.	1	2	3	4
7.	Change frustrates me.	1	2	3	4
8.	Changes would help me perform better at work.	1	2	3	4
9.	I would support the change.	1	2	3	4
10.	Changes tend to stimulate me.	1	2	3	4

Survey:

Based on your knowledge of the Louisiana INTECH professional development program and your perceptions of INTECH certified teachers in your school and their use of technology integration strategies, please respond to the following statements.

		Strongly Disagree	*Disagree*	*Agree*	*Strongly Agree*
11.	Other people would think that I support the changes.	1	2	3	4
12.	I often suggest new approaches to things in my school.	1	2	3	4
13.	Most changes are irritating.	1	2	3	4
14.	The changes would help improve unsatisfactory situations in my school.	1	2	3	4
15.	I would do whatever possible to support the changes.	1	2	3	4
16.	I find most change to be pleasing.	1	2	3	4
17.	I would benefit from the changes.	1	2	3	4
18.	I usually hesitate to try new ideas.	1	2	3	4

UNIVERSITY of NEW ORLEANS

Survey Demographic Information:

1. Please circle your highest credential earned:

   BA/BS   Master's   Master's Plus 30   Specialist   Doctorate

2. Please circle your years of experience as an educator:

   0-5 Years   6-10 Years   11-15 Years
   16-20 Years   21- 26 Years   26 + Years

3. Please circle your years of experience as an administrator:

   0-5 Years   6-10 Years   11-15 Years
   16-20 Years   21- 26 Years   26 + Years

4. Please circle your years of experience as an administrator at this school:
   0-5 Years   6-10 Years   11-15 Years
   16-20 Years   21- 26 Years   26 + Years

5. Please circle the number of teachers in your school
   0-25   26-50   51-75   76-100
   100+

6. Please circle the number of INTECH certified teachers in your school
   0-25   26-50   51-75   76-100
   100+

7. Please circle your position in the school

   Principal   Assistant Principal

8. Please circle your gender:

   Female   Male

IRB application form version 3
Approved date 9/7/2006

APPENDIX C

IRB Approval Letter

University Committee for the Protection of Human Subjects in Research University of New Orleans

Campus Correspondence

Principal Investigator:	Tammie Causey-Konaté
Co-Investigator:	Sheryl R. Abshire
Date:	July 2, 2007
Protocol Application:	"The impact of Louisiana INTECH professional development on elementary school leaders' perceptions of change and student achievement"
IRB#:	01Jul07

The IRB has deemed that the research and procedures described in this protocol application are compliant with the University of New Orleans guidelines and exempt from human subjects regulations at 45 CFR 46 per exempt research under 45 CFR 46.101 (b) (2) (4).

Any changes to the procedures or protocols must be reviewed prior to implementation by the IRB to ensure continued exemption.

Best of luck with your project!
Sincerely,
KWalsh
Kari Walsh, (acting for IRB Chair)
IRB member

Laura Scaramella, Ph.D.
Chair, University Committee for the Protection of Human Subjects in Research

APPENDIX D

Application to Do Graduate Study in Calcasieu Parish

CALCASIEU PARISH SCHOOL BOARD
P.O. BOX 800
LAKE CHARLES, LOUISIANA 70602

Application requesting permission to do Graduate Study in Calcasieu Parish Public Schools

Name of Graduate Student: Sheryl R. Abshire

Home Address: 2705 Bocage Lane

Home Telephone: 337-478-4860

Local Address (if different): ______

Local Telephone: (if different): ______

Current Place of Employment: Calcasieu Parish School System

Position: Administrative Coordinator of Technology

Business Telephone: 337-437-6150 Home Telephone: 337-478-4860 Cell: 337-540-5825

Email Address: Sheryl.abshire@cpsb.org

Title of Study: The Impact of Classroom Technology Integration by INTECH Certified Teachers on Third Grade Student Achievement in Calcasieu Parish Public School Classrooms

Name of University: University of New Orleans

Location of University: New Orleans, LA

Proposed Time Period for conducting study: Fall 2006 and Spring 2007

Purpose of study: The purpose of this study is to determine the impact of this training and its implementation on student performance in mathematics.

What value will Calcasieu Parish School Board derive from information obtained from this study?
(NOTE: THIS IS THE PRIMARY PURPOSE FOR CONDUCTING RESEARCH STUDIES IN CALCASIEU PARISH SCHOOLS

Each year in the Calcasieu Parish schools, teachers are absent from their classrooms to participate in state sponsored INTECH (Integration of Technology) training. Although INTECH training and certification is acknowledged as the standard for a technology-trained teacher and has been in place for over eight years, there has been no research conducted to determine the impact of this state-wide professional development model on student achievement. Louisiana school systems routinely commit significant financial resources to support INTECH professional development with virtually no real evidence that this teacher professional development model impacts student achievement.

How many local public schools will be involved in the study? All elementary schools

How will the schools be selected? All schools that have third grade classrooms

How many public school students will be involved in this study? Only third grade students, approximately 3,000

How will the students be selected? Only third grade students will be used

In what kind/s of activities will students be involved? None, I will only be using existing test score data from 2004 and 2005.

How much displacement time of students will the study require? None

How many public school teachers/administrators/other staff will be involved in this study? All third grade teachers

In what kinds of activities will teachers or staff be expected to participate? None, I will be using existing demographic data on teachers

How will the teachers or staff be selected? All third grade teachers' data will be used

How much displacement time per teacher will the study require? None, I will only be analyzing existing data

Will a report of the study be made available to participating faculties? Yes

Graduate Student,

Please sign the following agreement:

(1) I agree to abide by all Calcasieu Parish School Board policies and procedures while carrying out my proposed research study.

(2) I will maintain confidentiality of all research subjects at all times.

(3) I agree not to publish or disseminate in any form any part of the research findings to any person, agency, or institution other than the above-named university and Calcasieu Parish School Board without written approval of the Calcasieu Parish School Board Superintendent or his authorized designee.

(4) I further agree that two progress reports will be submitted to the Calcasieu Parish School during the time my study is being pursued, and a complete copy of the research study will be submitted once the study is finished. All reports will be submitted to the Administrative Director of Assessment, Research, and Special Services, Calcasieu Parish School Board.

Signature of Graduate Student

7/19/2006
Date

Approval Signature of Major Professor
for Proposed Study

For use by Calcasieu Parish School Board personnel only:

Date Request Received: ____________

Calcasieu Parish School Board Research Project No. ____________

Graduate Study Researcher ____________

Title of Research Study ____________

Request approved ✓

Request not approved ____________

Reason/s:

Signature of Administrator

July 31, 2006
Date

Graduate study application

If so, in what format? Information will be available as part of my published PhD dissertation

Please attach a copy of the research proposal, including the design of the study; also, attach any questionnaire and other forms to be used with subjects. Return to Administrative Director of Assessment, Research, Special Services, and Accountability, Calcasieu Parish School Board, P.O. Box 800, Lake Charles, La 70602-0800. (Telephone 337/491-1708 / 1709; FAX 337/437-6199 or 337/436-1742).

07-002

CALCASIEU
PARISH SCHOOL SYSTEM
WAYNE SAVOY, SUPERINTENDENT

August 30, 2006

Sheryl Abshire
2705 Bocage Lane
Lake Charles, La 70601

Dear Mrs. Abshire:

Your application requesting permission to do a graduate study entitled, "The Impact of Classroom Technology Integration by INTECH Certified Teachers on Third Grade Student Achievement in Calcasieu Parish Public School Classrooms" has been approved.

If you have any questions, please contact my office at 337/491-1708/1709. Also, please direct copies of your proposal, progress reports, and the completed study to the Department of Assessment, Research, Special Services, Accountability.

Best wishes for a successful study.

Sincerely,

Barbara I. Bankens

Barbara I. Bankens
Administrative Director
Assessment, Research, Special Services
Accountability

BIB:sbm

All children are important to us.

Barbara I. Bankens, Administrative Director
Department of Assessment, Research, Special Services, Accountability
1618 Mill Street • Lake Charles, LA 70601-3351 • Office (337) 491-1708/1709 • Fax (337) 437-6199
email: barbara.bankens@cpsb.org

APPENDIX E

Letter to CPSB Assessment Department Requesting Student Test Scores

Dr. Mary Lou Calderara, CPSB Supervisor of Assessment :

As part of the doctoral program in Educational Administration at the University of New Orleans, I am completing my dissertation entitled *The Impact of Louisiana INTECH Professional Development on Elementary Principals' Perception of Change and on Student Achievement.* This study is a requirement of my doctoral program and will be valuable in providing data which will describe the impact of this professional development on third grade student achievement in mathematics and reading. I am asking for your help.

Please provide me with the student reading and mathematics *ITBS* test score data for second grade students in 2004 and third grade students in 2005. When all of my research is completed, I will be glad to provide a copy of my dissertation to the CPSB Research and Assessment office.

Thank you very much for your time and consideration in helping me complete my study. If you have any questions, please contact me by email sheryl.abshire@cpsb.org or by phone 337-217-4100. I am looking forward to completing my dissertation and sharing the results with my colleagues.

Sincerely,

Sheryl Abshire

Sheryl R. Abshire

VITA

Sheryl R. Abshire is the District Administrative Coordinator of Technology in the Calcasieu Parish School System in Lake Charles, Louisiana. As a leader in technology integration, she has served as the catalyst to initiate the integration of technology into all curriculum areas throughout her school district, the state, and internationally. She has a B.S. in Early Childhood Education, a M.Ed. in Elementary Education, and an Educational Specialist in School Administration and Supervision from McNeese State University in Lake Charles, Louisiana. She is an accomplished grant writer and regularly conducts institutes to fund innovative technology programs throughout the nation. A thirty-four year veteran educator, she has worked as a school principal, K-5 teacher, a library/media specialist, a classroom teacher, and as an adjunct professor at McNeese State University and Louisiana Tech University.

She has been involved in diverse staff development programs throughout the nation and in Great Britain involving restructuring schools through the infusion of technology and curriculum enhancements. As a 1991 National Education Association (NEA)/NFIE Christa McAuliffe Fellow, 1990 Louisiana Technology Teacher of the Year, 1992 National Teacher Hall of Fame Inductee, 1998 Louisiana Computer Using Educator of the Year, 1999 McNeese State University Distinguished Alumnus and the 2002 National Christa McAuliffe Award winner, Sheryl is a nationally recognized consultant/speaker. She serves on numerous national, state, and district committees focusing on the role of technology and curriculum integration in changing educational practice. As a member of the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) Writing Team and the Technology for School Administrators Writing Team, she is deeply involved in infusing technology into standards based instruction. Additionally, she is a member of the ISTE Standards and

Accreditation Committee working on the 2007 National Educational Technology Standards Refresh Project.

Mrs. Abshire is the past chair of the NEA Membership Advisory Committee and is the past chair of the Louisiana Association of Educators Instruction and Professional Development Committee. She is also the past president of the Louisiana Association of Computer Using Educators and presently serves as the Vice-President of Advocacy and Programs. As the Chair of the Louisiana Chief Technology Officers Association (LA-CTO), she works with district technology leaders across the state and nation.

Sheryl has served as a member of the national K-12 advisory councils for Compaq Computer, and Knowledge Adventure. Presently she serves on the national advisory boards for Blackboard, eSchool News, Pearson Digital Learning and Scholastic Administrator. She is the Chairman of the Louisiana Department of Education Committee to Advance Technology Standards and since 1997 has served as Chairman of the Louisiana Technology Advisory Commission with the responsibility to oversee and approve proposals for the expenditure of over $200 million in technological advancements in the Louisiana schools.

As the Chair of the Teacher's Retirement System of Louisiana Board of Trustees, she oversees the placement of over 15 billion dollars in retirement funds. She is the immediate past Board Chair for the Consortium for School Networking (CoSN) in Washington, D.C., is on the Executive Committee and also chairs their Public Policy Committee. As a nationally recognized speaker, she has shared her expertise with audiences at the Association for Supervision and Curriculum Development, Consortium for School Networking Conference, National Education Computing Conference, National School Board Association, National Association of Elementary School Principals, eSchool News Grants and Funding Conference and at numerous local, regional and state conferences. In 2003 she was named a national semi-finalist for Ed Tech Leader of the Year.

Sheryl is the wife of Andress L. Abshire and the mother of three children –Amy, a music teacher in the North Texas schools; Laura, an attorney and Legislative Director for Congressman Mike Ross, and Brian, a graduate student at LSU majoring in Finance.