Interactive Whiteboard Use: The Catalyst of Student Achievement

Tenneille Terrell Lamberth
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The University of Southern Mississippi

INTERACTIVE WHITEBOARD USE:
THE CATALYST OF STUDENT ACHIEVEMENT

by

Tenneille Terrell Lamberth

Abstract of a Dissertation
Submitted to the Graduate School
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

May 2012
ABSTRACT

INTERACTIVE WHITEBOARD USE: THE CATALYST OF STUDENT ACHIEVEMENT

by

Tenneille Terrell Lamberth

May 2012

The No Child Left Behind (NCLB) Act of 2001 forced school districts to become more accountable by requiring all students to read on grade level by the year 2014. However, President Obama’s educational policy shift is allowing states to develop their own accountability and improvement system. This study examined fourth and eighth grade math achievement on the Mississippi Curriculum Test, 2nd edition and interactive whiteboard use, attitudes and perceptions, and professional development. Data were collected from 21 participating Mississippi Gulf Coast area schools to determine if a correlation existed between fourth and eighth grade math achievement and interactive whiteboard use, attitudes and perceptions, and professional development.

Data collected from school building surveys and the MCT2 scores were retrieved from the Mississippi department of education website. The fourth and eighth grade math achievement and interactive whiteboard use, attitudes and perceptions, and professional development were studied to analyze the correlation.
The University of Southern Mississippi

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A Dissertation
Submitted to the Graduate School
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in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

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James Johnson

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Dean of the Graduate School

May 2012
DEDICATION

First, I would like thank and praise God for giving me this opportunity. I would like to dedicate this book to my supportive and loving family: husband Joseph Lamberth, sons Joshua and Jordan Lamberth, parents Dr. Philip and Ruth Terrell, and sisters Tyra Terrell Bailey (doctoral candidate May 2012) and Dr. Tori Terrell. I thank God for your guidance and motivation in my life. Without your encouragement, support, and belief in me this would have never been possible.
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CHAPTER I
INTRODUCTION OF THE STUDY

Computers were first found in American schools in the early 1980s (Becker, 1983). Originally, the use was for faculty, staff, and student labs. The 1990s introduced computers in the classroom for student use (Anderson & Ronnkvist, 1999; Becker, 1998; U.S. Congress, 1995). Computers were challenging to understand and the set-up was difficult (Bassi & Van Buren, 1999). Today has ushered in change and a better use of technology in the classroom. The interactive white board has been at the forefront of educational change (Glover & Miller, 2003). Several researchers suggest in mathematics teaching, educational technology such as the interactive white boards can network teachers, enhance student learning, promote collaboration among students, and offer individualized instruction (Davison & Pratt, 2003; Miller, 2003). The benefits of using technology in the classroom are continually increasing. As research continues to prove that student achievement is increased with technology in a classroom setting, stakeholders are beginning to place emphasis on providing financial support for technological advances in the classroom. According to Cradler, McNabb, Freeman, and Burchett (2002), evidence is mounting to support technology advancements because the 21st century information and communication tools can positively influence student learning processes and outcomes.

The use of the interactive whiteboard in classrooms has changed the role of both the teacher and student. Students have more opportunities to take an active role in their learning, rather than receiving information strictly from textbooks or teacher lecture. Students gain deeper comprehension and sense of ownership from their lessons. Researchers Pitler, Hubbell, Kuhn, and Malenoski (2007) addressed learning by
indicating that technology’s use in the classroom has an additional positive influence on student learning when the learning goals are presented prior to technology use. These authors believe that technology implementation when applied effectively will increase student learning, understanding, and achievement. In addition, educational technology such as the interactive whiteboard will motivate students, promote cooperative learning, and develop critical thinking and problem solving skills.

Technology allows teachers to become facilitators rather than reinforcing teacher-centered style deliverance. Wenglinsky conducted a study pertaining to the effects of technology on student achievement. His findings concluded that students who use computer simulations and applications scored higher on national standardized tests than those students who did not (Wenglinsky, 2000; Billig, 2003). Wenglinksy also noted students scored higher on the test when their teacher had technology professional development training and support (Wenglinsky, 2000; Billig, 2003). According to The International Society for Technology in Education (2002), technology helps students become information seekers, analyzers, problem solvers, and creative and effective users of productivity tools while making them positive contributors to society. Prensky (2001a) believes teachers need technology that enables students to speak in their “native” tongue. For students of the digital age, whose lives outside the classroom are inundated with technology, an interactive whiteboard provides continuity. The interactive whiteboard reinforces the students' need for digital learners to receive quick instant responses as they create, synthesize, share, and organize content information.

Technology is a significant tool for the teacher and student. It can help both students and teachers set goals for themselves and monitor progress offering suggestions and resources to enhance teaching and learning. Interactive whiteboard education
technology provides opportunities to differentiate instruction and change classrooms into engaging learning environments. Technology tools like the computer, Internet resources, and interactive whiteboard and software programs usually result in a higher level of motivation among students (Pitler et al., 2007). By learning to use technology, students gain self-confidence and will be better prepared for the important skills given the current advanced technological world in which we live in.

Statement of the Problem

Improving student achievement is an important goal for successful schools. Research indicates that instruction with the interactive whiteboards has positive effects on classroom teaching and learning. The mastery learning theory is based on the premise that all children can learn if given the proper environment (Bloom, 1981). Bloom’s model emphasizes students need for feedback, correctives, and enrichment. Under favorable learning conditions, some students will learn more, especially those involved in engaging activities (Bloom, 1981). Recognizing relevant and individual differences among students and varying instruction to better meet diverse learning needs is necessary for student achievement (Borko, Mayfield, Marion, Flexer, & Cumbo, 1997). Hence, interactive whiteboards help place the knowledge in the hands of students while supporting the teacher in the act of teaching (Snyder, 2006). Classrooms today are filled with a range of diverse learners in which many students have grown up with computers and the Internet. As a result of technology, high-order thinking, problem solving skills, workforce preparation, research skills, and ability to apply learning to real-world situations, organizational skills, and interest in the content has increased (Cradler et al., 2002).
Technology in instruction can help teachers meet the needs of all students according to Ed Tech Action Network (2009). Teachers find their classroom dynamics changing and increasing as they strive to meet the demands of complex student populations. Consequently, a constructivist perspective views student learning as actively engaged in making meaning, and teaching with the approach that looks for what students can analyze, investigate, collaborate, share, build, and generate based on prior knowledge, rather than what facts, skills, and processes they can memorize for test purposes (Brooks & Brooks, 2001). Many technology solutions, including interactive whiteboards, are offered to ease challenges of teaching in today’s classroom. Although there have been improvements in students’ academic achievement, there has not been an instructional strategy that has shown to be proficient in increasing all students’ learning (Marzano, 2009b). A study conducted using the interactive whiteboard found that this new technology will challenge the face of teaching and this technology will add a whole new set of instructional strategies that were never available before in conjunction with how teachers interact with students (Marzano, 2010). A school district in Texas with a diverse population of 39,000 implemented a Digital Learning Classroom Project. This study took third and fifth grade high stakes assessment scores in classrooms using the Promethean ActivClassroom and compared it to similar classrooms without the technology. The school wanted to use the technology to close the achievement gap in math and reading and also help with the NCLB requirements. When the project results were reviewed, there were notable increases in student performance in classrooms implementing Promethean's ActivClassroom interactive whiteboard. In a sub group of ELL students, 50% of 5th grade students in digital classrooms received the Texas Assessment of Knowledge and Skills Commended rating, compared to 8.5% of the same
ELL sub group of students in non-digital classrooms. For TAKS Reading Performance in third grade, the percentage of the sub group of students who achieved the TAKS Commended level was 10% higher than comparable classrooms without the Promethean interactive whiteboard technology. Perhaps the most significant result of the study showed a 100% TAKS pass rate for fifth grade ELL students in Promethean interactive whiteboard classrooms compared to a mere 73.2% in non digital classrooms (Marzano, 2010). Computer-based technology proponents have extensively debated that the use of technology can have a transformative power on teaching and learning (Office of Technology Assessment, 1995; Roschelle, Pea, Hoadley, Gordin & Means, 2000; Sandholtz, Ringstaff, & Dwyer, 1997). The use of technology in the classroom was designed to promote more student-centered instruction which resulted in a change from traditional instruction to more constructivist instruction.

The No Child Left Behind Act (NCLB) was signed into law by President George W. Bush on January 8, 2002. This landmark act seeks to raise the academic performance of all children, subgroup by subgroup, with the ultimate goal of 100% proficiency by 2013-2014. This law mandated that all states implement accountability systems in which teachers and schools be held accountable for the academic education of all students (NCLB, 2002). With NCLB, the federal government continued with the over 40- year history (since the Elementary and Secondary Education Act of 1965) to be involved in public education by emphasizing sound instruction and accountability for results (NCLB, 2002). Test results and other data are disaggregated by minority, economically disadvantaged, and special education subgroups; students, schools, and school systems can be identified and rated based on the level of success according to set standards (Gall, Gall, & Borg, 2007). The law also requires that teaching methods are based on
scientifically proven practices and that all students are taught by highly qualified teachers. One way or another, The No Child Left Behind Act (2002) now called the Elementary and Secondary Act (2010), covers all public schools in all states. The passing of the No Child Left Behind Act (NCLB, 2002) has emphasized assessment and accountability. Standards and expectations are raised yearly as can be seen from our nation’s report card. Without technology, students will suffer long term effects due to the lack of opportunity to cultivate skills that will help them achieve, prosper, and be productive in today’s work force. It is hoped that this study produced findings that will enable educators to use technology rich resources like the interactive whiteboard to achieve the schools’ curriculum and states’ standards.

According to the No Child Left Behind Act of 2001, policyholders, stakeholders, and educators are accountable for improving student achievement and progress on state assessments (Roeber, 2003). The purpose of accountability is to ensure that all children have a fair, equal and significant opportunity to obtain high quality education and reach proficient standards on challenging state academic achievement standards and state academic assessments (Roeber, 2003). However, as of September 23, 2011, President Obama’s educational policy shift is allowing states to develop their own accountability and improvement system. Under this new policy, states may adhere to standards they develop, align their schools’ curriculum to those standards, and test students to make sure they are learning what is necessary. President Obama’s waiver is allowing states to focus on teaching and learning and not on testing while not lowering standards (Dillon, 2011). Educational accountability, testing, and instructional practices are a clear concern for today’s educators. Accordingly, learning experiences should be organized around competency development categories. Teachers and students alike are performance-
centered in their orientation to learning (Jarvis, 2008). The changes in statewide examinations to ensure that educators are being held accountable for the education of students are a relevant concern (Barksdale-Ladd & Thomas, 2000; Firestone, Schorr & Monfills, 2004). Researchers have found that teachers have changed their instructional practices and classroom resources in response to accountability (Jones & Tanner 2002; Linn, 2000; McNeil, 2000; Vogler, 2002; Yarbrough, 1999). During the 2008-2009 school years, Marzano Research Laboratory conducted a study on the effects of Promethean ActivClassroom interactive whiteboard on student achievement. In one of the treatment groups, teachers used Promethean interactive whiteboard ActivClassroom, and the data showed statistical gains in student achievement with the use of Promethean ActivClassroom interactive whiteboard technology (Marzano, 2009a). Students are social constructivists, so to make sense of new information, students must interact socially to talk about new information, reflect, and collaborate (Vygotsky; 1923, as cited in Maurizio, 2004). According to the constructivism theory, teachers should use instructional practices and educational classroom resources that make their classes interesting, develop students’ higher level thinking skills, and spark an interest in the subject and relevance. On the other hand, teachers have a sole responsibility to prepare students for the state accountability examinations (Cawelti, 2006). Educators see and perceive education as a process of developing increased competence to achieve their full potential in life. Teachers make sure learners are able to apply whatever knowledge and skill they gain today to living more effectively tomorrow.

As a result of the pressures of educational reform and high stakes assessment, some schools run the risk of foregoing active mastery theory learning, student-centered learning activities for building test taking skills and the memorization of discrete facts
Research indicates that although teachers acknowledge the importance of including active and student-centered strategies on a consistent basis, the state test seems to drive the curriculum and warrant more teacher-focused instructional methods such as lecture, worksheets, and whole-class instruction (Amrein & Berliner 2002). Recognizing the problems of multiple standards, the National Governors Association Center for Best Practices, Council of Chief State School Officers, Achieve, the College Board, and ACT initiated a Common Core Standards Initiative (2009). Educators may now feel the need to abandon the teacher-centered instructional approaches. NCLB (2002) and President Obama’s initiative encourages states to base their curriculum on strategies that have been proven to work instead of education fads that may be here today and gone tomorrow.

To improve student achievement, school leaders are introducing new technology called the interactive whiteboard. This technological tool is increasing in popularity for educators who want to present information that is engaging to both small and large groups of students. Educators are attempting to actively involve students in the learning process with the use of technology such as the interactive whiteboard. According to Marzano (2009a), the interactive whiteboard engages a broader spectrum of students in multiple ways. A three year study of the historical gains of middle school student showed significantly improved student achievement in Math when using the sound enhanced classrooms of the Interactive whiteboard. The study also showed a minimum of annual gains of 11% as measured on the FCAT assessment test in Florida (Marzano, 2009a). Magana and Frenkel (2004) explained that this technology is the leading source for improving student achievement. The Promethean ActivClassroom software was
designed by educators for educators with the intent of supporting best practices of curriculum and instruction to transform classrooms effectively (Magan & Frenkel 2004).

Research Questions

The purpose of this study was to determine if there was a relationship between fourth and eighth grade math student achievement and the following factors: the use of interactive whiteboards and professional development. Teacher attitudes and perceptions of interactive whiteboards implemented by Mississippi’s public school systems were also examined. The independent variables were interactive whiteboard use, attitudes and perceptions of interactive whiteboards, and interactive whiteboard professional development. The dependent variables examined were fourth and eighth grade math achievement. Many schools are experiencing difficulty achieving and maintaining math standards set forth by the NCLB law (U.S. Department of Education, 2009).

1. Is there a relationship between the use of interactive whiteboards and fourth and eighth grade math student achievement?

2. Is there a significant relationship between fourth and eighth grade student math achievement and teachers’ attitudes and perceptions of the use of interactive whiteboards?

3. Is there a significant relationship between fourth and eighth grade student math achievement and interactive whiteboard professional development provided to teachers?

Delimitations

The following factors delimited the study:

1. Mississippi school teachers

2. Public education teachers
3. K-8th grade school teachers
4. Teachers with interactive whiteboards for at least a year
5. Teachers without classroom interactive whiteboards
6. Data of the 2010-2011 school year from six school districts on the Mississippi Gulf Coast

Assumptions

The researcher assumed that the survey participants were genuine and honest in their survey responses. It was also assumed that the responses of the participants were given in good faith, without prejudices, and accurate representation of interactive whiteboards. It was further assumed that survey participants having interactive boards in their schools had access to some interactive whiteboard educational technology, professional development technology training, and support.

Definition of Terms

21st Century Learning Skills: A set of skills that are needed to compete on a global level and be able to successfully work in the 21st century; the skills include critical thinking and problem solving; communication; collaboration; creativity and innovation; information, media, and technology skills; life and career skills; initiative and self-directions; social and cross-cultural skills; productivity and accountability; and leadership and responsibility (Partnership for 21st Century Skills, 2009).

ActivBoard: A presentation tool designed by teachers for teachers. The objective is to transform interactive engaging classroom learning environments (Marzano, 2009a).

ActivClassroom: The result of the implementation of the ActivBoard. It creates a connective educational environment were educators engage and empower students to create a new world of learning for students (Marzano, 2009a).
Assessment: A method or methods used to determine what a student knows or can do during and after instruction (Marzano, 2009b).

AYP (average yearly progress): The key measure to determine if a school or school district has made the required annual progress according to the requirements set forth by the No Child Left Behind Act of 2001 (MDE, 2009).

Constructivism: A philosophy of learning based on the premise that by reflecting on students’ own experiences, students construct their own understandings, individually make sense of their experiences and this process accommodates new experiences for learning (Clements, 1997).

Digital immigrant: A person born prior to the digital age that may or not speak the digital technology fluently; anyone who is uncomfortable using digital technology (Prensky, 2001a).

Digital media: Any digitized content that can be transmitted over a network or storage device that holds digital data (Prensky, 2001b).

Digital native: A person born during the digital age that is very comfortable with digital technology (Prensky, 2001a).

Educational technology: Technology applications and software designed and used for instructional purposes (Marzano, 2009a).

Information Communication Technology (ICT): A new generation of learners which have grown up with information and communication technology as an integral part of their everyday lives.

Interactive whiteboard: A touch sensitive board connected to a digital projector and computer. Software can be downloaded and the board can be used by either hand or a specific pen.
Mississippi Curriculum Test 2nd Edition: A customized criterion-referenced test fully aligned with Mississippi’s framework. The test is administered to students in grades 3-8. This test is in compliance to with No Child Left Behind Act (MDE, 2009).

NAEP: National Assessment of Educational Progress; A largest nationally representative and continuing assessment of what American students know and can do in various subject areas; the results of the NAEP assessments are reported in the Nation’s Report Card (United States Department of Education, 2009).

NCLB: No Child Left Behind Act of 2001; The reauthorization of the Elementary and Secondary Education Act with the intent of closing the achievement gap with accountability, flexibility, and choice so no child is left behind (U.S. Department of Education, 2002)

Pedagogy: Methods and practices of teaching (Pierson, 2001; Prensky, 2005b).

Promethean: Promethean is a brand name for an interactive whiteboard. The manufacturer claims to be the global leader of the interactive whiteboard and its resources (Promethean World, 2009).

Student achievement: A measure of a set and defined level of success for a student (Protheroe, 2005).

Technology integration: Incorporating technology into classroom instruction and lessons (Marzano, 2010).

Justification of Study

If there was a relationship between student achievement using interactive whiteboards in individual school buildings, the data could be used to drive school improvement. This study could assist administrators in determining the most effective instructional strategies and technology resources to be implemented and purchased by
Mississippi school districts. The information may answer questions to trends in data found and may determine the direction of professional development, use of technology resources for instruction, and future purchases of technology and its software. This information could also help program evaluation of schools failing to meet the AYP.

Each year many schools and their leadership teams analyze test score data from the Mississippi Curriculum Test 2nd Edition. Districts spend money for professional development and instructional resources focusing on strategies to increase student achievement. Results of the tests are sometimes disappointing when student scores only improve by a minimal margin or stay the same from school year to school year. Therefore, there is a need to examine if school funds could be better spent on certain technology programs or provide professional development with the implementation of the interactive whiteboards for use in their instructional methods.

Mississippi’s quality distribution index clearly set the guidelines for student achievement (MDE, 2009). School districts cannot afford in these uncertain economic times and reduced budgets to spend money for interactive whiteboards and professional development without signs of significant improvement in target areas. Research has argued that teachers use technology in ways that are consistent with their current instructional practices. However, Cuban, Kirpatrick, and Beck (2001), found minimal support for the idea that technology transforms teachers instructional practices. Moreover, both novice teachers and veteran teachers benefit from professional development; however, the professional development must be beneficial for the teacher to satisfy needs of the students (Birman, Desimone, Garet, & Porter, 2000). The plan for this study was to focus on the use of interactive whiteboards, professional development opportunities, and teacher attitudes and perceptions of the use of interactive whiteboards.
within school districts across Mississippi in an attempt to identify the correlation between the use of interactive whiteboards and math student achievement.

The question of whether to include technology in the classroom is no longer a relevant question due to the No Child Left Behind Act mandate to fully integrate technology in the classroom. The mandate shifts the question and exploration to how one utilizes an interactive whiteboard to improve student achievements. Some researchers agree that environments enriched by educational technology increase student motivation for learning (Marzano, 2009b). Through educational technology, such as interactive whiteboards, schools can increase student interest and learning by increasing the investment in educational technologies for classroom use. Investments in interactive whiteboards could possibly reduce the budget for areas such as textbooks, paper, and other supplemental materials while increasing student motivation for learning. As a result, students could possibly leave high school better prepared to enter college, the military, and the work force because they would have been exposed to 21st Century technologies and skills. According to Protheroe (2005), the need to know what affect technology has on student achievement is more urgent in the 21st century than before due to the emphasis on accountability and the substantial cost of purchasing and implementing technology such as interactive whiteboards.

Summary

This study produced findings that assist with the use of an interactive whiteboard in today’s 21st century classroom as a tool that can be used to support teachers in the quest to improve student learning. According to the research of Sherry and Jesse (2000) this technology is helping students gain skills that are measured by standardized tests. The interactive whiteboard is adaptable for numerous uses with and without software.
Interactive whiteboard use is only limited to the ability of the teachers’ and students’ competence levels in regards to the technology.

Teachers educating students in the 21st century sometimes lack the knowledge of and use of interactive whiteboards because of the following:

1. Lack of time
2. Undersupplied equipment and resources
3. Inadequate Funding
4. Lack of professional training and support. (Ed Tech Action Network, 2009)

Leaders of the 21st century are hopeful that interactive whiteboard technology can help support the problems that they are continuing to budget for in educational technology. Some educators believe that merely placing a computer in the classroom is all that is needed to improve student achievement (Kleiman, 2004). Other educators are interested in finding out if the educational technology itself is the answer or if good teaching along with good educational technology resources and practices are the answer. Researchers and educators both want to provide teachers with strategies and resources that are proven to work and in addition get real results in the classroom (U.S. Department of Education, 2009).
CHAPTER II
REVIEW OF THE LITERATURE

Introduction

In today’s educational world, standards and accountability have dominated instruction, teaching and learning as schools prepare for the 21st century. To increase the achievement gap, large initiatives have been implemented to address these challenges. Notably, the No Child Left Behind Act of 2001 (NCLB) has required states to set specific targets for schools and districts and to assess achievement with standardized test (NCLB, 2001). Under this law, support and resources are given to schools to help meet the demands of NCLB. Schools are ultimately held accountable for the students’ achievement scores on standardized tests. This section outlines the need for the research and development of the research questions by analyzing relevant literature. The chapter is divided into five sections. The first section focused on the theoretical framework for the Mastery Learning and Constructivist Theory followed by relevant literature. The second section provided information on 21st century learning environments and how teachers and students are affected by the use and integration of technology in the classroom. The third section focused on how technology in the classroom impacts academic performances. The fourth section of the review provided clarity for the need and use of advanced technology, such as the interactive whiteboard, in schools to meet accountability standards and prepare students to be life-long learners in this technological world. Lastly, the fifth section describes the information on professional development for teachers to provide an adequate teaching and learning experience for the teacher and student as an educator teaching in the 21st century.
Each year, educators are faced with the demands of meeting accountability standards and increasing student achievement. Educators are presented with several instructional tools and strategies all which promise to increase student learning when used effectively. Schools often purchase resources and implement strategies hoping for their promise to improve student achievement. Fortunately, many resources and strategies do show evidence of positive results. A research supported strategy is mastery learning (Guskey, 2009). Mastery learning provides a foundation for innovation, strategies, intervention, and implementation for teachers in classrooms today.

Mastery learning stems from Bloom (1971, 1976, & 1984) who explored how teachers might adapt instruction in the classroom to improve student learning. Bloom recommended that if teachers provided necessary time and appropriate learning settings, nearly all students could reach a high level of achievement despite their wide variety of learning rates and modalities (Guskey, 2009). Through observation, Bloom found that the traditional teaching practice consisted of organizing lesson content into units and assessing at the end of the unit. According to Bloom, assessments would be more valuable if they were used as a process of teaching and learning to provide feedback on students’ individual learning and then provide specific activities.

The mastery learning strategies seek to incorporate feedback and corrective response labeled mastery learning (Bloom, 1971). The use of these strategies allows teachers to organize concepts and skills they want students to acquire into learning units taking about one to two weeks of instructional time after which students are given a formal assessment. The assessment can be used to target suggestions or correctives to what students must do to rectify the learning obstacles and to master the desired
outcomes (Bloom, 1971, 1976, 1984). After students receive the suggestions and have the opportunity to revise their answers, they take a parallel assessment that addresses the learning goals. This assessment verifies successes or remedies to student’s individual learning. This tool is also powerful in motivating students while giving the student another chance to succeed. Bloom recommends extension and enrichment activities to broaden and expand students’ learning and understanding along with remediation and corrective activities for the students who find the instructional lessons difficult. It is the belief of Bloom that the majority of all students can master instructional content when provided more conducive conditions of mastery learning (Guskey, 2009). Research has found, when compared with traditionally taught classes, students in well implemented mastery learning classes consistently reach higher levels of achievement and develop greater confidence in themselves as students to learn (Kulik, Kulik & Bangert-Drowns, 1990). Elements of mastery learning; pre-teaching, high quality group based instruction, regular assessments, and high quality corrective feedback are evident in recently developed instructional models. Researchers believe the core elements to mastery learning are based on teachers ensuring the conditions for success before instruction begins (Guskey, 2009; Marzano, 2009b; & Rosenshine, 2009). Moreover, coupled with technology and mastery learning elements, enthusiasm has generated by the use of interactive whiteboard technology. Policy-led initiatives help to develop the use of interactive whiteboards in schools for the embedding of Information and Communication Technology (Ofsted, 2004). This phase is described as outlining the policy driven incorporation of technology in classrooms.

Teachers are pivotal to the role of student learning and accountability. Almost every facet of society in the 21st Century has some form of technology. Therefore, it is
imperative that educators educate children by including technology in the curriculum and instructional practices. It is important that the educator understands the student’s learning needs and implement strategies that will meet those needs. The theory of mastery learning proposes that all students can learn if placed in the right conditions (Bloom, 1984). Bloom (1984) suggests that teachers adapt to the aspects of individualized instruction and tutoring to improve student achievement in the classroom by providing the necessary time and learning conditions. He believed that the learning process would be more valuable if students received feedback and had prescribed learning activities. Elements of mastery learning, pre-teaching, high quality group based instruction, regular assessments, and high quality corrective feedback are evident in recently developed instructional models. Researchers consistently link these elements: effective instruction and student learning successes (Guskey, 2009; Marzano, 2009b; Rosenshine, 2009). When teachers realize that students learn differently they can tailor the instruction to meet the individual needs of the students (Levy, 2008). When compared to students who were traditionally taught, students of mastery learning consistently had higher levels of student achievement and greater confidence in their ability to learn (Kulik, Kulik, & Bangert-Drowns, 1990).

Constructivism is not a new idea for it can be traced back to Jean Piaget’s research and studies. According to the National Council of Teachers of Mathematics, (2000) different professional organizations have embraced the notion that constructivist philosophies and theory of learning have recommended changes in the way mathematics is taught. Constructivism states that students, adults and children make sense of their world by relating new experiences to those they already understand. Students evaluate new concepts and ideas to see how they fit together with existing information. When
faced with information that must be deciphered, such as concepts, physical objects, and ideas, the students must interpret what they see in order to conform to the present set of rules, or generate a new set of rules to account for the new information. Throughout a student's education, individual perception and rules constantly change along with their understanding. Although constructivism is a philosophy of learning and not teaching, understanding constructivist learning can make for a more effective teacher (Clements, 1997). Teachers should always expose students to new ideas and concepts and should also help students resolve problems in ways that are significant to the learner.

Furthermore, the constructivist theory provides a theoretical framework for the use of interactive whiteboards in the classroom. Moreover, students often encounter discrepant concepts such as physical objects or ideas that do not always make sense. The student must either interpret what he sees to conform to his present rules or generate a new set of rules. Throughout life the perceptions and rules constantly change. Educators should always expose students to new ideas that create inconsistencies and they should be there to resolve these discrepancies in meaningful ways (Clements, 1997). Ultimately, a constructivist approach using differentiated instruction which enables teachers to plan strategically in order to reach the needs of diverse learners in classrooms would be an alternative approach to traditional methods of instruction (Gregory & Chapman, 2002). The educator’s role is to help learners develop their potentials using multiple intelligences while understanding the students’ learning needs (Gardner, 2004). Although apathetic learning creates barriers to learning, Philip Schlechty’s Working on the Work framework hypothesizes that in order for students to complete school work and retain what they have learned, they must be authentically engaged and the work must be relevant and interesting to the students. The Schlechty framework requires teachers to
restructure by changing quality of learning experiences in the classroom if the desire is to improve student achievement (Schlechty, 2000). The goal is to create learning environments where students are actively engaged in the learning process. Student engagement is an important factor that affects teaching and student’s motivation to learn.

Pertinent Research Literature

History of Instructional Technologies

The term *instructional media* has been defined as the physical means by which instruction is presented to learners (Reiser & Gagne, 1983). Many definitions are formed under this description of *instructional media* from the instructional delivery: teachers’ live instruction, textbook, computer, interactive whiteboard, and so on. These descriptions are classified as instructional mediums. As specialists evaluate viewpoints of instructional media prior to the 20th century, the teacher, chalkboard, and textbook have been categorized separately from other media (Tickton, 1970). Instructional media has been defined as the physical means, other than teacher, textbook, and chalkboard when presenting instruction to students. Thomas Edison predicted that books would become obsolete and that it would be possible to teach with the motion picture. During the years (1914-1923), Thomas Edison’s predictions did not come true; however, the visual instructional movement did grow (Saettler, 1990).

Technological advances in radio broadcasting sound recording and motion pictures led to an increased interest in instructional media. The movement became the audiovisual instructional movement (Finn, 1972; McCluskey, 1981). In spite of the Great Depression, textbooks were written on the topic of visual instruction. *Visualizing the Curriculum* served as one of the most significant textbooks written (Hoban, Hoban, & Zissman, 1937). Radio gained a great deal of attention in the 1930s. However, the
prediction that radio, film, and television would be as common as the book and as powerful in its effect on learning and teaching was contrary to its actual application so that over the next 20 years it had little impact on instructional practices (Cuban, 1986; Morgan, 1932)).

During World War II, the audiovisual instruction movement slowed in the schools. Afterward, military personnel found that films and filmstrips used during the war were effective training tools (Saettler, 1990). In response to this discovery, post-war developments included the establishment of instructional television (Gumpert, 1967; Taylor, 1967). One of the primary roles of these stations was to educate to the public through the media (Blakely, 1979). During the 1950s and 1960s the Ford Foundation and its agencies spent $170 million dollars on educational television (Gordon, 1970). Much of the interest in television for instructional purposes had abated by the 1960s partly because of the instructional quality and the teacher delivering lecture (Blakely, 1979). Instructional programming was still an important mission of public television; however, other informational presentations and missions were forming (Hezel, 1980).

The terms educational technology and instructional technology began to replace audiovisual instruction by the early 1970s. The United States government established a group to examine the impact media had on instruction. Despite the differences in terminology, most critics of the field agreed that up to that point, instructional media had minimal impact on educational practices (Cuban, 1986, Tickton, 1970).

The next technological phase after instructional television faded became the computer. The use of computers for instructional use did not occur until the 1980s. By January 1983, computers were being used for instructional purposes in more than 40% of elementary schools, and more than 75% of all secondary schools in the United States
(Becker, 1983). Although computers used for instructional practices in schools had an impact, surveys results presented in 1995 revealed that in the United States, the impact was minimal with teachers reporting little or no use of computers for instructional practices or innovativeness. The computer was primarily used for drill and practice as reported by elementary teachers. Secondary teachers reported computers were used for teaching computer related skills such as word processing (Anderson & Ronnkvist, 1999; Becker, 1998; U.S. Congress, Office of Technology Assessment, 1995).

Moreover, the variety and capability of technology to present information allows the linking of various contents, while the designs have captivated the interest of a constructivist perspective (Rossett & Donello, 1999). Since 1995, advances in computer technologies with regard to educational experiences for the learner are designed to involve more complex interactions between learners and instructional content. Computers, the Internet, and other digital technologies have been used to promote learning and performances (Stevens & Stevens, 1995).

The integration of educational technology to improve student achievement has been monitored for the last two decades. The International Society for Technology in Education (ISTE) has researched the effectiveness of technology in education and the convincing trend is that when implemented appropriately, the integration of technology into instruction has positive effects on student achievement (ISTE, 2008). This integration provides students with the 21st century skills needed for the competitive workplace, higher education, and military. Utilizing instructionally sound strategies in the integration of technology into instruction is one of purposes of Missouri’s eMINTS program. This program focuses on innovative instructional processes for supporting
student centered, inquiry-based practices through computer technology (eMINTS; 2002, p. 2).

Research findings demonstrate that technology in teaching and learning has a strong positive effect on student achievement. However, evaluations of teachers pinpoint the importance of teacher professional development with the lessons and technology that will influence the outcome of its use (What Works Clearinghouse, August 2007). Having technology in the classroom is not sufficient. Alignment of curriculum, leadership, and professional development are equally important. Research and case studies have documented the need for correct implementation of technology for teaching and learning to have a positive impact on student achievement (ISTE, 2008). In order to move from the 20th century to the 21st century to enhance 21st century instructional technologies, there are seven factors ISTE (2008, p. 7) notes as key conditions:

1. Effective professional development for teachers for the integration of instruction.
2. Teachers’ direct application of technology must be aligned to the district and state curriculum standards.
3. Daily incorporation of technology into the learning schedule.
4. Programs and applications must provide individualized feedback to the students and teachers so that lessons meet the needs of students and are tailored specific to the student.
5. Technology use must be incorporated in a collaborating environment.
6. Project based learning and real world learning must be the focus of instructional technology.
7. Effective technology integration requires leadership and support with opportunities for modeling to all stakeholders. The history of technology has a body of evidence showing its impact on instruction, teaching and learning. As we continue to prepare for the long term values of education, teachers and students must have access to programs that enhance and fund technology through Titles II-A and II-D, Enhancing Education Through Technology program (EETT) and Achievement Through Technology and Innovation (ATTAIN) (ITES, 2008).

21st Century Learning Environments

There are many forms of technology available for teachers to use with their students in the classroom. The interactive whiteboard is a touch sensitive screen that allows users to interact directly with images and applications from the computer. Interactive whiteboards can assist with delivering instruction that is engaging to students in the learning process. The interactive whiteboard can be used for whole class interactions in which lessons can be saved and replayed. The interactive whiteboard can be used to deliver instruction in a variety of ways as categorized by the three modalities of learning: visual, auditory, and tactile (Beeland, 2002). Visual learning through the use of an interactive whiteboard can assist with the range of text, pictures, animation, and video. Auditory learning can assist with the use of words, pronunciations, and procedures. Tactile learning physically allows students to interact with the board and numerous software programs can be utilized that involve user contact with the whiteboard. The extent to which each modality is used in the instructional practices will increase the level of student engagement during the learning process in the classroom (Beeland, 2002). Teaching and learning levels must appear in different approaches beyond covering text. In order for deeper understanding to transpire, alternative
approaches must be planned. Helping learners fully comprehend concepts is important. Sharing ideas with others and using the knowledge attained is integral to constructive learning (Marzano, 2009b). In the classroom, learning takes place in a social environment in which students must cooperate to complete tasks.

Teaching and learning in the 21st century has caused much discussion of student achievement and classroom interactions. One of the most ever-present terms in today’s education debate is 21st century skills which demands the next generation of college students and workers to be independent thinkers, problem solvers, and decision makers. The challenge has been for public schools not to focus on just the basics but to equally ensure that students gain a variety of newly important thinking and reasoning tactics and skills. Policy makers are pushing these imperative skills upon national education groups’ teacher unions, higher education groups, and workforce groups. Governors and chief state school officers of at least 10 states have committed to revising standards for teaching and learning that reflect the need for 21st century skills (Gewertz, 2008). Kennewell (2001) believes the introduction to information communication technology (ICT) resources in schools over the last two decades has had little effect on the way teachers are teaching in the classroom. One reason for this conclusion is because teachers feel that ICT will primarily benefit students when they are working independently. In essence, Kennewell points out interactive whiteboards appear to reinforce traditional pedagogies. The teacher’s orchestration, affordances, and constraints are driven by their pedagogical reasoning which becomes a transmission view rather than a construction view. Nevertheless, current researchers of learning emphasize the importance of engaging students in the learning process. Hence, some critics have strong arguments against disparaging this newly coined term 21st century skills. They
believe it is a meaningless, distracting term that takes away from the more important work of teaching the core content. Critics believe there is nothing new about these skills and emphasizing the skills will dilute standards and weaken teaching strategies. Even more, they argue, these types of higher order thinking skills cannot be measured in reliable or cost effective manners.

Assessment is the driver for accountability in the 21st century debates. Assessment is one of the best opportunities to bridge the skills of content division that has emerged from the push and shove of the 21st century skills movement. Emerging assessment models offer promising examples of how new education can integrate skills, content, and technologies. The emphasis of what students can do with knowledge rather than the knowledge that they have is the essence of 21st century skills. There are hundreds of descriptors for this broad term including skill sets, life skills, workforce skills, interpersonal skills, applied skills, and non-cognitive skills. Definitions within these skill sets fall under the broader category of 21st century skills. For example, the term, technology literacy, ranges in definition with various educational organizations and businesses that list their knowledge of information skills, digital media fluency, advanced computer, and Internet communications as the newborn term technacy signifying having a deep knowledge of technological systems.

Phrases and terms used in education have some critics arguing that these century specific terms, like 21st century skills and 21st century teaching and learning are misleading. Knowing how to think critically, analytically, and creatively are not skills specific to or unique to 21st century of students and teachers. Much of this has been argued from ancient Socrates to 20th century John Dewey. Murnane & Levy, both economists and professors at Harvard, have been researching and writing about the
The evolution of the workforce for over a decade. These researchers found that work requiring routine skills are now more often done by a computer (Murnane & Levy, 2004). In today’s society, one must be able to find and analyze information coming from multiple sources and use the information to make decisions and create new ideas. According to Murnane and Levy (2004) 21st century skills are not new, just newly important. These newly relevant skills are not options or additions according to studies by various national and international research organizations including the National Research of Council, OECD, and the International Society for Technology in Education. These research organizations have shown that complex thinking and analytical skills are integral at every stage of learning and development of the student (Bransford, Brown, Cocking 1999; Kozma, 2003; OECD 2004). The belief that skills and content are best learned together is a major finding of a recent report by the U.S. Department of Education on mathematics education (National Mathematics Advisory Panel, 2008). Report findings show that the best learning occurs when students discover the basic rules and procedures of math at the same time that they learn to think critically and use applications to solve problems. The report also concluded that there is no developmental stage or set age in which a child is reading to gain the complexities of thinking skills. However, there are building blocks of knowledge that students must master such as addition to subtraction and multiplication to division before they can complete some procedures which require they be problem solvers and analytical thinkers.

New technologies are making it easier to measure individual student mastery of 21st century skills, and the dawn of the 21st Century introduced a technologically rich environment. These environments have given birth to “digital natives.” Those born before technology and the digital age are classified as “digital immigrants” (Marc
Prensky’s digital native and digital immigrant phrases were coined as descriptors to help educators understand the task before them. Digital natives, according to Prensky (2005b), were not just born into a digital and information age. The term, digital natives, or Net generation, is said to be a new generation of students entering the education system that have been immersed all their lives. These students have sophisticated technical skills and learning preferences for which the traditional education system has been unprepared. It is said that these young people’s use of information communication technology differentiates them from other generations of students and from the teachers. Differences are so significant that the nature of education must change to accommodate skills and interest of these digital natives (Prensky, 2001b).

The generation of digital natives (Prensky, 2001a) or the Net generation (Tapscott, 1998) were born between the years 1980 and 1994 and deemed as such due to their familiarity and reliance on information communication technology. They are described as being immersed in technology and surrounded by the use of computers, videogames, digital music players, video cams, cell phones, and all other toys and tools of the digital age (Prensky, 2001a). Researchers Howe and Strauss (2000, 2003), called this generation the millennial, describing the distinct characteristics that set them apart from previous generations because they are gifted with the use of technology, and offer a positive, optimistic, and team oriented approach to life. Being immersed in a technology rich culture is said to influence the skills and interest of digital natives in ways that are significant to education. Digital natives learn differently as in comparison to past generations of students. These students are active experiential learners, who are proficient in multitasking and dependent on communications technologies for accessing information and for interacting with others (Frand, 2000; Oblinger & Oblinger, 2005;
Prensky, 2001a, 2001b; Tapscott, 1999). Commentators raise questions of these characteristics noting that there is an old approach of teaching not suited for the new generation (Prensky, 2001a).

The challenging arguments commentators proclaim is for a change in curriculum, pedagogy, assessment, and professional development in education. The debate over digital natives is based on the claim that a distinct generation of digital natives exists and that education must fundamentally change to meet the needs of the digital native. For persons born before 1980, Prensky (2001) has coined the term, digital immigrants. As claimed by Prensky, this population of teachers lacks the technological fluency of the digital natives and the skill level of these teachers is restricted. The disparity between the technological skills and interests of new students and the limited and unsophisticated technology use by educators is claimed to be creating alienation and disaffection among students (Levin & Arafeh, 2002; Levin, Richardson & Arafeh, 2002; Prensky, 2005a). Prensky (2001a) characterizes this as one of the biggest problems facing America’s educational system today. A common assumption of the generation of digital natives is that these young people live their lives completely immersed in technology and are fluent in the digital use and language of computers, video games and the Internet (Prensky 2005b, p. 8). Frand (2000) claimed that this immersion is so great that younger people do not consider computers as a form of technology. A research study offered a diverse view of how young people in education access and use technology. A survey of 4374 students across 13 institutions in the United States (Kvavik, Caruso & Morgan, 2004) found that the majority of respondents owned personal computers (93.4%) and mobile phones (82%), but a much smaller proportion owned handheld computers (11.9%). The most common technology uses were word processing (99.5%), emailing (99.5%) and surfing
the net for pleasure (99.5%). These results demonstrated high levels of ownership of some technologies by the respondents and high levels of some academic and recreational activities, and their associated skills. The researchers found, however, that only a minority of the students (around 21%) was engaged in creating their own projects and multimedia for the Web, and that a significant proportion of students had lower level skills than might be expected of digital natives. According to Pierson (2001), novice and veteran teachers must understand how technology connects with pedagogy and curriculum content.

A change in the technology’s use is dependent upon the understanding of educational philosophies and practices to use technology for 21st century teaching and learning environments. Research has focused on the integration of technology to improve students’ learning interest and student achievement. Furthermore, interactive whiteboard technology was based on several affordances (Kennewell, 2001). The benefits of effective demonstrations in whole-class teaching, and the variety of the display of representations were identified (Kennewell & Beauchamp, 2003). These characteristics had the potential to meet the needs of a wider range of learners (Leatham, 2002; Levy, 2008). Interactive whiteboards were identified as being attractive to both teachers and students in the incorporation of multimedia resources and online websites (Ball, 2003; Kennewell, 2001). One of the most important advantage and benefit of the interactive whiteboard was that it was seen to motivate students in their attention and behavior (Beeland, 2002). It was a perceived notion that interactive whiteboards linked the different learning styles in a classroom. The interactive software assisted teachers in modeling abstract ideas and concepts in new and different ways that students might respond to which would deepen their understanding (Richardson, 2002; Miller, 2003).
Bell reviewed reasons to use interactive whiteboards in the classrooms (Bell, 2002, p. 3). The reasons she mentions are

1. The IWB is great for demonstrating lessons.
2. The IWB is colorful and employs variety.
3. The IWB can accommodate different learning styles in the classroom.
4. The IWB can be used across grade levels accommodating many age groups that respond favorably to the board use.
5. Distance learning is an excellent setting for the use of IWB.
6. Classrooms with one computer can maximize computer use with assess of the IWB.
7. IWB use is a great tool for the constructivist educator.
8. The boards are attractive and clean tools.
9. The majority of students, even those with limited motor skills can use and enjoy the IWB use.
10. IWB are interactive.
11. The IWB can interface well with other peripherals.
12. The IWB is a great tool for saving and presenting lessons in which students need printed copies and examples.

Research indicated students respond to displays where color is employed, and where markings can be customized. Bell (2002) concluded that the interactive whiteboard is a powerful instructional tool which can be adapted for use by a wide range of subject and grade levels with proper planning, preparation, and training.

The disadvantages or drawbacks of interactive whiteboards tend to be in the early stages of implementation or with new teacher use. Initially, cost was a major drawback
for these technological tools. Lacina (2009) argued schools may be wary of investing dollars of technology that may be quickly outdated and only has few scientific studies that support higher academic achievement. According to Lacina (2009), it is more important for schools to provide smaller class sizes to allow for more individualized instruction. Lacina’s findings are that some classrooms have interactive whiteboards but only use them as a screen for the overhead projector. Also, Lacina’s findings were that the classrooms did not have an assortment of compatible elements that complement the board. Interactive whiteboards can be more expensive to purchase than other presentation devices. They could be difficult to maintain and also present difficulty when a teacher does not have the skills to use the interactive whiteboard in the classroom. The initial implementation of interactive whiteboards could prove difficult for professional development and preparation of lessons. Without proper support and implementation, interactive whiteboard would result in a teacher-centered style of delivery (Beeland, 2002).

*Technology in the Classroom*

Technology linked with curriculum has brought about significant changes in teaching and learning. Marzano (2009a) reported higher student achievement and teacher-student interaction as a result of interactive learning made possible with technology. According to Kerrigan (2002) technology has significant benefits when using mathematics software and websites to include promotion of students’ higher order thinking skills. As a result of research, Neiss (2001) reports that the National Council of Teachers of Mathematics pinpoints technology as an essential component of the Pre K-12 mathematics learning environment, influencing what mathematics that is taught as well as the enhancement of students learning needs. Wenglinksy (2000) used data from the 1996
National Assessment of Educational Progress (NAEP) in Mathematics to study the effects of teachers’ use of instructional technology on student achievement in mathematics. Findings revealed that when appropriately implemented and used, technology could serve to increase student mathematics achievement as well as enhance the overall learning environment of the school. Teachers who received professional development training in the area of instructional technology were found more likely competent than those who had not used computer technology in effective ways such as in applications, simulations, and math learning games. Wenglinksy (2000) also used the 1996 NAEP data to show the positive effects of using instructional technology to nurture higher order thinking skills in the mathematics classroom.

In recent years major investments have been made in classroom resources and technology. While these tools do not determine pedagogy, tools like the interactive whiteboard tend to support and encourage teaching and learning in the classrooms. Interactive whole class teaching for many teachers is categorized as a three part lesson: lesson starters, whole and or small group instruction, and lastly application from the student. Teachers use lesson starters on the interactive whiteboard to display short math problems for which students can collectively provide short oral answers (Hargreaves, Moyles, Merry, Paterson, Pell, & Esarte-Sarries, 2003). For many years traditional classrooms were heavily dominated by initiation, response, and feedback. The exchanges were usually based upon closed questions with inadequate opportunity to engage in extended responses and insufficient opportunity to communicate, express, and evaluate their own ideas (Galton, Hargreaves, Comber, Wall, & Pell, 1999). Traditional classroom’s avenue of communication could be described as one-way communication in which teachers lecture and students’ contributions are restricted in length and quality.
Although gains have been made in national test scores, researchers suggest the result is due to a closer match in what is being taught and what is being tested, or teaching to the test, rather than improved learning and understanding (Kyriacou & Goulding, 2004). Evidence suggest that the forms of interactions in the classroom associated with traditional whole class teaching and the demands of rigor, relevance, and fast pace lessons may be encouraging students to participate in activities rather than engage with mathematical thinking, undermining the development of a more reflective approach to learning and the ability of students to think strategically (Kyriacou & Goulding, 2004).

Constructivists believe if learning is to occur, then there must be a degree of interaction between the student and the context (Jones & Tanner, 2002). Interactivity has been regarded as a key to teachers and learners that should be used to develop a support of effective learning. Interactivity enables rapid and dynamic feedback and response. Students are able to use information communication technology to communicate with learning resources and participate in an environment in which learning is supported (Kennewell, Tanner, & Parkinson, 2000). Interactive whiteboards do not determine pedagogy by themselves. Teachers vary in their competence with technology and this influences practices. However, researchers’ state there is evidence to suggest that there is an expectation of proper use that influences teachers to shift their pedagogy in the direction of whole class direct teaching (Beauchamp, 2004; Kennewell & Beauchamp, 2003). The level of interaction generated depends on the Interactive whiteboard’s use and the teacher’s ability to intertwine the technology and orchestrate the lessons.

Technology promotes equity and access in education (Ed Tech Action Network, 2009). Educators are increasingly using a variety of teaching strategies to help students become successful in their academic endeavors. However, with the progression of the
21st century and the change in our school environments, educators are inquiring about ways in which technology can be integrated in lessons. Mathematics educators are learning to communicate more clearly their positions on technology (Malloy, 2002). Educators are also seeking strategies to improve pedagogical skills and active student learning. The use of interactive whiteboards can help enhance a classroom atmosphere where students think critically, become problem solvers, share ideas, and work collaboratively (Brabec, Fisher, & Pitler 2004). Brabec, Fisher, & Pitler (2004) identified nine strategies that may be integrated with technology and in turn improve student learning and achievement:

1. The applications of learning skills such as similarities and differences, classifying, and the use of metaphor and analogies.

2. Student performances in using critical thinking to summarize, take notes, and analyze information.

3. Reinforcing students interest and recognize their effort. Help student to build a positive attitude toward learning.

4. Meaningful homework and classroom practice are essential to learning because both provide opportunities for students to deepen their understanding and strengthen the learning skills.

5. Integrating technology can receive a variety of forms, including graphic representations, physical models, mental pictures, drawings, and kinesthetic classroom activities.

6. Cooperative learning assists students especially those students who are not independent learners. It is a prevailing instructional strategy.

7. Setting objectives and providing feedback establishes a course for learning.
8. Strategies and plans of generating and testing hypothesis are effective because it requires students to apply their knowledge and thus deepens their understanding.

9. Technology should always be viewed as a tool for learning rather than a solitary tool to an end. (Brabec, Fisher, & Pitler 2004, pp. 3-4)

Using these nine strategies may call for students to function at a higher level, think critically, and master the skills that are relevant to academic progress and success. These nine strategies highlight the use of technology and can be directly applied to the integration and use of the interactive whiteboard (Painter, Whiting, & Wolters, 2005).

Recent suggestions of research imply that simple uses of technology may be more of a productive path to achieving changes in high-end instructional goals (Ertmer, 2005). Therefore, the importance for educational leaders to know and implement instructional technology to create a learning community is essential to the development of 21st century goals. Students need to be prepared to live and grow in a society that seeks information by using the technology tools. Education can be more successful and resourceful by using technology. The implementation of technology in schools is significant because research has proven that technology has increased the productivity in businesses (Ertmer, 2005).

In order for technology to be successful, schools are developing, revising, and revisiting technology plans to make sure that there is sufficient availability of technology, appropriate hardware and software, and the use is linked to educational learning (NCLB, 2002). Within these plans, needs assessments are evaluated to ensure teachers acquire the skills to carry out lesson plans with the use of technology. Many mathematicians do not support the use of technology for math instruction even though technology is commonly used to conduct research and communicate the findings. However,
researchers suggest technology is essential in the teaching and learning of mathematics and technology influences how and what mathematics might be taught (Leatham, 2002; Lee, 2006). Furthermore, technology commitment and its integration in the classroom are supported by mathematics education. The research findings suggest technological tools used are beneficial to a variety of different purposes ranging from computational assistance to tutorials. According to Dhindsa and Emran (2006), technology has so much to offer to mathematics education.

Research over the past few years has focused on the integration and use as a means to improve student achievement, engaging lessons, and fostering a learning environment conducive to the needs of the class. According to Fitzpatrick (2001), technologies give students the applications needed to be responsible for their learning. These instructional tools will give students access to an increased interest and engagement of the lessons. However the use of technology is implemented, the classroom has become a challenge to educators as they face the demands of the No Child Left Behind Act (2002). Another challenge educator’s face is implementing the technology teaching tool because of inadequacy of technology, classroom time, and educators’ resistance to change. Despite the challenges, educators and students will gain new knowledge through research. Ertmer (2005) claimed that as students strive toward their goal in this information age, educators will have to continually seek the interactive technology that promotes interactive teaching and learning.

*Interactive whiteboards*

Interactive whiteboards are a piece of hardware that connects with the computer and a projector. It is a powerful educational tool used in today’s classroom. The board is touch-sensitive and can be manipulated from the whiteboard via the computer and
projector. Interactive whiteboards are a form of technology that is used in many schools today. Researchers, Bell (2002), and Beeland et al. (2002), believe interactive whiteboards can provide a significant potential for meeting the needs of students with diverse learning styles and for engaging students during the learning process. The interactive whiteboard is an educational tool that began to surface in classrooms in the late 1990s. There are many forms of interactive whiteboards that range in size and capabilities. Some boards may be wall-mounted or placed on a stand. This educational tool allows teachers and students to interact in ways different from a traditional whiteboard or flipchart (Beeland, 2002).

The interactive whiteboard’s functions can display images directly from the computer allowing student or teacher to be at the interactive white board and not confined to the computer. Elements of text, graphics, sound, animation, and video help teachers create lessons that interest and engage students during the learning process (Marzano, 2010). Lessons can be derived using software as well as the Internet. The interactive whiteboard allow for text to be typed via computer or directly on the board using a wide range of text and images. Whiteboards utilize a synchronous transmission mode. Synchronous transmission modes provide two-way interaction between the teacher and the students. This level of participation allows a wider range of involvement by the student, leading to an increased state of engagement, and an enhanced learning environment (Beeland, 2002; Bryant & Hunton, 2000). Whiteboards also have an asynchronous function, allowing captured material to be shared on paper or electronically later (Beeland, 2002).

The interactive whiteboard is one educational technology that allows teachers and students to interact with subject matter projected and displayed from a screen via
computer onto an interactive whiteboard. There have been current theories of learning that support and emphasize the importance of students being actively engaged in the learning process (Bransford, Brown, & Cocking, 1999). Practically anything that can be done from the computer can be done on the interactive whiteboard (Beeland, 2002).

The interactive whiteboard includes interaction of the student fingers and or pens which allow a kinesthetic approach through actively engaging in the activity by drawing, marking, and highlighting. This technology can be used for lessons to be saved and replayed for remediation and or enrichment purposes. Researchers suggest initial use and research of the interactive board is promising for K-12 education. Studies have documented that both teachers and students like the technology, students are more motivated to learn, and students are more engaged when the interactive whiteboards are utilized (Beeland, 2002; Hall & Higgins, 2005).

Additional studies conducted by researchers note that the use of interactive whiteboards shifts instruction from presentation to the interaction of the student. The interactive whiteboard provides teachers multiple ways to present information. The change in delivery and presentation focuses students away from traditional teacher-centered instruction to a more student-centered interactive whiteboard lesson (Cuthell, 2005; Miller, Glover & Averis, 2003, 2004; Painter, Whiting & Wolters, 2005).

Moreover, some evidence suggests that the use of interactive whiteboards can increase student achievement. Zittle (2004) explored the effects of whiteboard instruction on the geometry lessons of Native American elementary students by comparing pre-test and post-test gains between 53 students whose teachers used interactive whiteboards against 39 students whose teachers did not use interactive whiteboards. These studies found statistically significant differences between the two groups. The group using the
interactive whiteboard obtained an average gain score of 20.76, and the traditionally taught group averaged a gain of 11.48. Likewise, Dhindsa & Emran (2006) compared pre-test and post-test gains between college classes taught to six organic chemistry sections with the use of interactive whiteboards and without the use of interactive whiteboards. The case studies reported by the authors found statistically significant gains for students taught using interactive whiteboards, with the interactive whiteboard group averaging a mean effect size of 2.68 and the control group averaging a mean effect size of 2.16. These findings have provoked a rise in the use of interactive whiteboards for increasing student achievement. However, some researchers note (p. 133) the interactive whiteboard is used as a “glorified chalkboard or dry erase board.” Furthermore, the flexibility of the interactive whiteboard expands the learning processes in the classroom as well as engaging learners. This has led schools across the United States to purchase and install them in K-12 classrooms in the hope that their use will improve student scores on standardized tests.

Interactive whiteboards are designed to meet the needs of a variety of students in the learning process. Student engagement is central to student motivation during the learning process. The more students are inspired to learn, the more likely they will be successful in their activities. Numerous factors influence student motivation including parental involvement, teacher motivation and skill, and effective use of technology. Technology can be utilized to provide a creative and motivating classroom environment where students are engaged in learning. Researchers believe an environment where technology is used in innovative ways lead to improved learning and teaching (Cuthell, 2005; Kennewell, 2001). Furthermore, classroom learning is also improved through the use of visuals. Visuals promote a student’s ability to organize and process information
(McKendrick & Bowden, 1999). Visuals can also be utilized to challenge students to engage in higher order thinking skills (Smith & Blankenship, 2000). Finally, interactive whiteboard technology provides opportunities for teachers to meet the needs of students with various learning styles through the use of multiple media (Bryant & Hunton, 2000).

Interactive whiteboards were initially developed for presentations in work settings and then for higher education (Stephens, 2000). With the potential use in primary school, the initial innovator of this technology had a vision of what the technology might achieve (Glover & Miller, 2003). The enthusiasm for the interactive whiteboard has grown after the initial computers indicated the potential for what new technology would do for the classrooms. Constructivist practices and its correlation between technologies promote complex situations, which in turn, encourage an increase in student achievement. Some researchers argue technology can promote a constructivist compatible instruction whereas other research proponents suggest that technology supports the existing teaching and learning in the classroom (Becker, 2001). The commonality between researchers is that the interactions of teaching and learning depend on the competencies of the teacher training, resources received, and instructional practices.

**Professional Development**

Improved student achievement depends in part on the teacher’s professional development (Sanders & Rivers, 1996). Ultimately, the intended outcome of the accountability policy is improved student achievement. Improvement in students’ achievement cannot occur without changes in student learning and improving teacher professional development (NCLB, 2002). According to Hawley (2002) this quality of professional development can be achieved through shared knowledge, dedication, and
holding high standards that all students can learn no matter their socioeconomic background. Moreover, professional development is essential in integrating technology in an effective manner. If teachers are highly skillful in the implementation of technology in the classroom, this could prove to be beneficial for teachers in creating reports and charts which would also be beneficial to students in helping to develop skills (Certo, 2006). Teachers are one of the most significant influences on student achievement and the impact varies widely (Kane, Rockoff, & Staiger, 2006; Nye, Konstantopolous, & Hedges, 2004; U.S. Department of Education, 2009). Therefore, to reduce the achievement gap and reduce the impact of variations on teachers’ competencies, a redesign of systems that recruit, prepare, select, develop, retain, advance, and evaluate teachers is necessary (Gersten, Beckmann, Clarke, Foegan, Marsh, Star & Witzel 2009; Hill, Stumbo, Paliokas, Hansen, & McWalters, 2010).

Ongoing learning for teachers is essential for continuous improvement as well as a key element for practice in any profession (Alter & Coggshall, 2009; Barber & Mourshed, 2007). Professional development experiences must focus teachers on closing gaps between the standards and the nature of their own instruction (Valli & Buese, 2007). According to the National Association of Elementary School Principals report of 2005, the achievement gap has been in existence for over three decades. However, although there are instances of successes it may not mean that the level of educational support that the students receive during instruction is adequate (NAEP, 2005 as cited in Mathis, 2005). NCLB did not have a significant impact on improving reading and math achievement across the states. Based on the NAEP results, the national average achievement remains flat in reading and grows at the same pace in math after NCLB (Jackyung, 2006). To understand the achievement gap and the factors or conditions that
were preventing all students from achieving, Barton (2005, p. 14) described factors that were crucial to students’ learning and were barriers to academic achievement.

1. The teacher who was not organized or prepared for instruction.

2. Teacher’s goal and interest not aligned to the scope and sequence of the curriculum to ensure building blocks for students’ success.

3. The structure and class size impacted student’s failure or success.

4. Proper uses in technology-assisted instruction could or could not enhance learning.

5. Safety of the school was important in minimizing mental and emotional pressures.

6. Students’ mobility and transportation to and from school.

7. Birth weight crucial to child development.

8. Exposure to lead poisoning that was hazardous to students’ health.

9. Hunger and meager nutrition led to poor learning disorder.

10. Reading to young children stimulated interest for reading and learning.

11. Television watching caused a reduction in homework time.

12. Parent accessibility in the home was the support for the school to home connection.

In essence, the school, the community, and the home were imperative to student learning. For learning to be effective the teacher had to have high regards for the student’s academic achievements. If teachers have high expectation for students’ achievement, then students will work hard to meet those expectations. It is equally viable for teacher leaders to portray high quality leadership values, pedagogy, professional development, and knowledge of the curriculum, positive attitude, teacher experience,
attendance, class size, and availability of appropriate technology-assisted instruction which are key elements for a school to accomplish its goal (Barton, 2005).

Professional development keeps educators in touch with new concepts and strategies that may help students learn. In a non-traditional classroom, students are responsible for their own learning, making predictions, using strategies such as think pairing, sharing, collaborating, and taking an active role in the learning process. Engagement in instruction will enhance learning, which will foster transfer of learning. Students who are engaged learn more, retain more, and enjoy learning activities more than students who are not engaged (Akey, 2006). High quality professional development will build high quality instruction. Hence, high quality professional development builds a capacity that improves student achievement (Desimone, 2009). Collaboration helps educators to look at students’ strengths and weakness, and the sharing of ideas that may be helpful to learners (Tomlinson, 1999; Tomlinson, Brimijoin, & Narvaez, 2008). Unfortunately, often professional learning activities are disconnected from the school improvement goals and teacher practice (Cohen & Hill, 2000). According to a survey conducted by The Teaching Commission in 2004, 42% of teachers indicated professional development left something to be desired or a waste of time. The other 18 percent of teachers indicated the professional activities helped them in becoming more effective teachers (Peter D. Hart Research Associates & Harris Interactive, 2004). NCLB facilitated the requirement that states ensure high quality professional development for teachers and teacher quality improvements (NCLB, 2001). According to Marzano (2010) the task of teachers helping learners understand a concept is important and will help to create a healthy learning atmosphere. Furthermore, a national survey representative of 890 teachers mostly agreed that improved professional development would be very
effective; 51% believed it somewhat effective while 44% believed it improved teacher effectiveness (Coggshall, & Ott, 2010).

Teachers have to have continuous training in order for students to have the best learning outcomes (Desimone, 2009 p. 183-188). To be considered high quality, the professional development must support a direct impact on teacher practice. The goals of the school and district must be outlined to improve the tasks at hand. Consistent messages and goals for professional development need to be determined and then selected high quality professional development activities can be provided. Researchers identify five characteristics of high-quality professional development:

1. Goals aligned with state, school, and district standards and assessment and other professional development learning activities.
2. A focus on core content and modeling of strategies for the teacher to teach the content.
3. Opportunities and inclusion for active learning of new teaching strategies.
4. A provision of opportunities to collaborate among teachers.
5. The inclusion of embedded follow-up and continuous feedback (Garet, Porter, Desimone, Birman, & Yoon, 2001, pp. 920-926).

These characteristics of high-quality professional development are consistent with those identified by researchers (Garet, Porter, Desimone, Birman, & Yoon, 2001, pp. 920-926). Moreover, professional learning activities are more likely to be effective if they are part of a program of ongoing professional development (Cohen & Hill, 2000).

Technology involves great tools that can be used to enhance learning. Unfortunately, teachers often do not have the proper training to effectively use the current technology. Many school districts have the money to purchase the technology; however,
they do not see the particular tool as an investment. The No Child Left Behind Act has caused administrators and teachers to increase the rigor in classrooms. Educators have been pressured to find ways to support successful teaching and learning by using professional development. One of the keys to keeping good teachers is professional development. Teachers must produce and continue to acquire the 21st century classroom skills needed for teaching and learning to occur. According to Garet, Porter, Desimone, Birman and Yoon (2001, pp. 920-937) teachers reported a greater change in their skills and knowledge when professional development:

1. Built on what teachers had already learned in related professional development.
2. The content was emphasized and pedagogy was aligned with state and district standards and assessments.
3. The teachers were supported in developing professional and ongoing communication in which they were changing their teaching in similar ways to support what had been learned (Garet, Porter, Desimone, Birman and Yoon 2001, pp. 920-937).

In addition, teachers need planning time to collaborate with peers in order to become more successful teachers (Desimone, 2009). Research suggests that incorporating technology into student learning has increased student’s achievement and academic performance. One method of classroom practice that can be integrated in a differentiated classroom is technology. High-order thinking and problem solving skills, workforce preparation, research skills, and ability to apply learning to real-world situations, organizational skills, and interest in the content has increased as a result of technology (Cradler, McNabb, Freeman, & Burchett, 2002).
Moreover, learning through professional development has been too narrowly defined; we tend to measure only logical and linguistic abilities, ignoring other areas of competence. Gardner believes that learning is not a single concept; there are multiple ways of learning and he has identified eight kinds: Verbal/Linguistic, Musical, Logical/Mathematical, Spatial/Visual, Bodily/Kinesthetic, Interpersonal, Intrapersonal, and Naturalist. Gardner's theory offers some explanation as to why people can execute certain tasks very well, but perform others poorly (Jarvis, 2008). With adequate professional development, learning, communication skills, and technology proficiency will increase. Frequently, teachers’ professional development experience in technology does not intertwine with instructional practices (NCES, 2000; as cited in Ertmer, Gopalakrishnan, & Ross, 2001). Apple Classrooms of Tomorrow (ACOT) research presented a model of instructional change that followed five stages of technology: implementation, entry, adoption, adaptation, and invention. As teachers move through the stages the comfort level of technology becomes more integrated and teaching practices change (Sandholtz, Ringstaff, & Dwyer, 1997). Valdez, McNabb, Foertsch, Anderson, Hawkes, and Raack (1999) presented a model of three stages: automation, expansion, and data-driven learning. These models offer structure to instructional practices and technology integrations. While researchers argue that technology can shift instructional practices changes, a case study of 17 teachers provided two views about technology’s role in reforming teachers’ practices: technology prompted a constructivist approach, and technology enabled a constructivist philosophy to be translated into practice. Researchers believe that constructivist instructional practices do not depend solely on the use of technology but the professional development and support to facilitate the instructional practices (Ertmer, Gopalakrishnan, & Ross, 2001)
According to Knowles, in respect to the learner, experience in a content area moves an educator from dependency on text to increased self directedness but at different rates for different people in different dimensions of life (Becker, 2001). Teachers have a responsibility to encourage and nurture different movements. Professional development among all educators is beneficial. Adults have a deep psychological need to be generally self-directing, but they may be dependent in certain temporary situation (Dantonio, 2001).

Instructional practices coupled with technology that are rich and engaging assist students in become ready to learn something new when they experience a need to learn it in order to cope more easily with real-life tasks and problems. The educator has a responsibility to create conditions and provide tools and procedures for helping learners discover their best potentials. Learning programs should be organized around life-application categories and sequenced according to the learners' readiness to learn (McRbbie & Thomas, 2000). Most technology is already familiar to the student when it reaches the classroom. The goal is to ensure class assignments become more engaging with the use of technology (Becker, 2001). Simply outlining the professional development for technology with instructional practices will help improve the skills, rigor, and relevance found in high stakes testing (Wayne, Yoon, Zhu, Cronen, & Garet, 2008). Shaping and targeting professional development in technology and instructional practices will increase the teacher’s skill of being more effective in the classroom and able to best implement strategies.

Educators see and perceive education as a process of developing increased competence to achieve their full potential in life. Teachers make sure learners are able to apply whatever knowledge and skill they gain today to living more effectively tomorrow.
Accordingly, learning experiences should be organized around competency-development categories. People are performance-centered in their orientation to learning (Jarvis, 2008). It is the same for professional development. The gap must be bridged by ensuring increased experiences so that full potentials are developed. Using technology in the classroom is a very broad category. "Learning on one's own, being self-directed in one's learning is itself a context in which learning takes place" (Merriam & Caffarella, 1999, pp. 262). The key to placing a learning experience within this context is that the learner has the primary responsibility for planning, carrying out, and evaluating his or her own learning.

Participation in professional development is used in schools all over the country. In fact, an estimated 90% of the population is involved with at least one professional development activity a year (Jarvis, 2008). Adults engaging in professional development learning do not necessarily follow all the activities or training material that have been presented to them. In essence, professional development learning occurs both by design and chance depending on the interests, experiences, and actions of individual learners and the circumstances in which they find themselves.

Professional development learning does not necessarily mean learning in isolation. Most technology used today involves a group or center of student learners. Assistance is often sought from friends, experts, and acquaintances in both the planning and execution of the learning activity experiences (Birman, Desimone, Garet, & Porter, 2000). Effective leadership, experiences, and professional development are necessary for change to occur; the core and culture of schools must change from the top down for effective use of technology in professional development experiences (Schlechty, 2001). Professional development is beneficial to educators who become lifelong learners by
broadening their knowledge and expanding their instructional skills in 21st century education. Online professional development has been known as a useful and successful way to meet educational goals. Online technology has increased significantly. Therefore, the availability of web-based professional development has increased. Graduate-level coursework can be obtained through professional development. Online learning allows educators to experience technologies that they would be able to incorporate into the classroom. Online learning communities can be used to keep ongoing professional development (Croft, Coggshall, Dolan, & Powers, 2010).

Consequently, school administrators should frequently provide professional development for teachers so that they are equipped with knowledge and skills necessary for student achievement (Dantonio, 2001). Administrators have been pressured to find ways to support successful teaching and learning by using professional development. The No Child Left Behind Act has caused administrators and teachers to increase the rigor in classrooms. One of the keys to keeping good teachers is professional development. Teachers must be able to keep up in the classroom. Great leaders and support are key elements of successful professional development. Teachers need to find time to collaborate in order to become more successful teachers (U.S. Department of Education, 2009). In the quest for continuous empowerment of teachers and student, it is essential for teachers to have continuous training in order for students to have the best learning outcomes.

Conclusion

School accountability, curriculum and instruction, teacher roles, student achievement, interactive technology and theories are varied and diverse in our nation’s schools. Furthermore, the common goal in the classroom as educators is to improve
student achievement in the 21st century. Large initiatives have been implemented to address the challenges of the No Child Left Behind Act of 2001 (NCLB, 2002). Current and past researchers of technology and teaching and learning have suggested that the proper implementation of technology and effective professional development, could transform teachers instructional practices in the direction of a more constructivist approach. The constructivist approach allows students to explore learning and generate more understanding and meaning (Lambert, Walker, Zimmerman, Cooper, Lambert, & Gardner, 2002). Teachers are pivotal to the education of students. For learning to be effective, the teacher must establish a process of inquiry and participation for knowledge to be constructed and applied.

High quality instruction is effective with or without technology. Interactive whiteboard technology may enhance the pedagogy of teachers when teaching and learning goals are outlined. Watson and De Geest (2005) suggest in teaching and learning mathematics all aspects of effective communication and use of interactive whiteboards has an impact on both the learner and the learning environment.

Interactive whiteboard use may be one of the most significant changes in the classroom learning environment. In their study, Wood and Ashfield (2007) illustrate how the interactive whiteboard has affected teaching and learning interactions. The researchers note that it is the skill and professional knowledge of the teacher who employs the interaction of the students which is critical to the learning process. From early education to the present systematic changes, reform, and instructional practices have changed. The common factor of these transitions is improved student achievement. The No Child Left Behind Act (2002) mandates marked improvement by 2014. Providing the best education remains the focus even during times of change. The use of
interactive whiteboards, professional development, and teacher perceptions of interactive whiteboards implemented are factors that contribute to students’ achievement on standardized tests such as the Mississippi Curriculum 2nd edition test.
CHAPTER III

METHODOLOGY

Introduction

This chapter describes the research design that was used for this study on the use of interactive whiteboards, teacher attitudes and perceptions of interactive whiteboard use, and the professional development of interactive whiteboards as they contribute to students’ achievement on the Mississippi Curriculum 2nd edition test. Research questions and hypotheses are outlined. The rationale for the method of the selected teachers as the research population is explained. The contents of Chapter III consist of the participants, research design, and procedures. The chapter then describes the survey instrument (Appendix A) that was used to collect the data regarding the study. The independent and dependent variables are explained, along with the statistical processes that were used to analyze the data.

Procedures

The study investigated if there was a relationship in fourth and eighth grade math student achievement and interactive whiteboards. Teachers in every classroom have a different method, style, and approach to teaching. Methods, procedure, and experience differ; however, each teacher is required to teach 90 minutes of math instruction daily (MDE, 2009). Nevertheless, school districts may implement more time in math instruction. Districts may employ different instructional resources, math programs, and professional development as they see fit to their data findings. Based upon the literature, the following research questions were proposed:

1. Is there a relationship between the use of interactive whiteboards and fourth and eighth grade math student achievement?
2. Is there a relationship between fourth and eighth grade student math achievement and teachers’ attitudes and perceptions of the use of interactive whiteboards?

3. Is there a relationship between fourth and eighth grade student math achievement and interactive whiteboard professional development provided to teachers?

The hypotheses related to the research questions are as follows:

\[ H_1 \] There is a statistically significant relationship between fourth and eighth grade math student achievement and the use of interactive whiteboards.

\[ H_2 \] There is a statistically significant relationship between fourth and eighth grade math student achievement and teachers’ attitudes and perceptions of the use of interactive whiteboards.

\[ H_3 \] There is a statistically significant relationship between fourth and eighth grade math student achievement and interactive whiteboard professional development provided to teachers.

Participants in the Study

Schools in the Mississippi Gulf Coast area were asked to participate. Choosing six coastal school districts employed 21 schools ranging from kindergarten to eighth grade participating. Returned surveys were assigned a random number to identify the specific school. The second instrument used for this study was the Mathematics MCT2 scores retrieved from the Mississippi Department of Education (MAARS) website for the 2010-2011 school years for each school in which surveys were returned. All MCT2 scores are posted on the MDE websites for each school district. Assessment scores are publically viewable for anyone to access and there were not any confidentiality risks due
to the composite score being given without student names. Data was recorded for individual schools by assigning random numbers, but no school districts, individual school, or school names were recorded for this research study. Teachers in grades kindergarten through eight were used in this study to analyze interactive whiteboards in the classroom. The study sample included 221 teacher respondents from various school districts located on the Mississippi Gulf Coast area. Teachers in kindergarten through eighth grade were chosen due to the certification of teaching and licensures in Mississippi.

Research Design and Procedures

Study Design

This research design was a quantitative methodology. Quantitative data was gathered from a survey and the MCT2 to determine the correlation of math achievement and interactive whiteboards on fourth and eighth grade student achievement and the following factors: the use of interactive whiteboards, teacher attitude and perceptions of the use of interactive whiteboards, and interactive whiteboard professional development provided to teachers. The survey was developed by this researcher. The independent variables of interactive whiteboard use, attitudes and perceptions of interactive whiteboards, and professional development of interactive whiteboards were examined.

Instrumentation

A pilot test was administered to 10 participants prior to the study in order to determine the reliability, and question clarity of the questionnaire. A panel of experts was used to determine content validity. The panel of experts examined the extent in which questions actually represented what they were supposed to measure in criterion (predictive and concurrent), content, concept, and readability. The Cronbach alpha
reliability coefficient test was used to determine reliability. A Cronbach’s alpha test of coefficient reliability was performed on each set of items to determine how well each set of items measured a single construct. This test was run on survey questions that were to be averaged together. A Cronbach’s alpha of 0.70 or greater is considered acceptable. Each set’s Cronbach’s alpha test proved a reliability of greater than 0.70 with the exception of the first five demographic questions. The reliability of interactive use questions Cronbach alpha was .926. The reliability of attitudes and perception questions Cronbach alpha was .954. The reliability of professional development questions Cronbach alpha was .911. The data constructed from the pilot test participants and surveys were tested using the statistical program, SPSS.

After Institutional Review Board (IRB) approval (Appendix E) was obtained, a survey was given to elementary and middle school teachers on the Mississippi Gulf Coast area school districts and the responses were analyzed using quantitative measures. The questionnaire that was used consisted of 25 quantitative items related to the literature regarding interactive whiteboards and five demographic items about the participant. The questionnaire addressed interactive whiteboard use, teachers’ perceptions and attitudes of interactive whiteboards and professional development of interactive whiteboards. Research question 1 was supported by the constructed-items 6-9 in Part II-Interactive Whiteboard Use of the survey instrument. Research question 2 was supported by responses of the constructed-items 10-25 in Part III-Attitudes and Perceptions of the instrument. Research question 3 was supported by the responses of the constructed-items 26-30 in Part IV-Professional Development of the instrument. Part I-Demographics of the instrument was constructed-items 1-5 which asked questions about the survey
participant. Part II of the instrument was divided into four subscales which asked about
the frequency and use of interactive whiteboards. This scale had the following heading:

- Very often
- Often
- Rarely
- Not at all

Part III of the instrument was divided into five subscales which asked about the attitudes
and perceptions of interactive whiteboard use. This scale had the following heading:

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree
- Neither Agree nor Disagree

Part IV of the instrument was divided into six subscales which asked about the
professional development provided for interactive whiteboards. This scale had the
following heading:

- Three or more full days
- Two full days
- One full day
- Half day
- Less than ½ day
- No professional development

Part I consisted of five demographic items of the individual’s gender, school’s
grade level(s), grade(s) teaching, years of teaching experience, and highest degree earned.
The options for school grade level and grade teaching range from grades kindergarten-eighth grade. The years of teaching experience options are 2 years or less, 3-5 years, 6-10 years, 11-15 years, 16-20 years, and 21 years or more. The options for highest degree earned are bachelor, master, specialist, and doctoral degree.

Part II consisted of four questions related to teacher use of interactive whiteboards in the classroom. Item number 6 asked how often the teacher uses the interactive whiteboard in the classroom for computer assisted instruction. Item number 7 asked how often the teacher uses the interactive whiteboard for integrated learning. Item number 8 asked how often the interactive whiteboard is used for simulations and the software that teaches higher order thinking. Item number 9 asked how often components for immediate feedback for lesson design and programming of activities and skills are used. Items 6-9 of the instrument used a 4-point Likert-type scale to address interactive whiteboard use with options of very often, often, rarely, or not at all.

Part III consisted of 16 questions relating to teachers’ attitudes and perceptions of interactive whiteboards. In item questions 10-25, participants answered questions regarding their attitudes and perceptions of interactive whiteboards of student engagement, behavior, learning, attentiveness, participation, and enjoyment. In item questions 10-25, participants answered questions regarding instruction, objectives, materials, resources, strategies, teaching methods, and curriculum. The 16 items in this section had the options of strongly agree, agree, disagree, strongly disagree, or neither agree or disagree. Part III was constructed on a 5-point Likert-type scale.

Part IV consisted in five questions related to how much and how often types of professional development was provided to teachers. The items in this section asked about professional development of interactive whiteboards in regards to lesson design, learning
activities, diversity of lessons, and the function and use of the interactive whiteboard. The following options regarding questions 26-30 are three or more full days, two full days, one full day, half day, less than half day, or no professional development. These questions were constructed on a 6-point Likert-type scale.

Data Collection Process

A permission letter (Appendix D) was attached to the survey instrument for the individuals who were asked to participate in the study. The letter advised recipients of the voluntary nature of participating and was assured that there are no negative consequences of non-participation if the participant chose not to complete the questionnaire. The participants were informed that filling out the questionnaire will indicate that they have agreed to participate in the research study.

The questionnaires were distributed to participants by mail. An addressed, stamped envelope was included for participants to return the questionnaire. The participant was asked to seal the envelope and mail it to the address that was on the envelope.

Variables in the Study

The dependent variable for the study were fourth and eighth grade MCT2 math scores. The independent variables used in this study were interactive whiteboard use, attitudes and perceptions of interactive whiteboards, and professional development of interactive whiteboards. These variables used were based on the literature.

Analysis of Data

For the demographic section in Part I of the study questions 1-5, the responses were analyzed using descriptive statistics. A significance test was conducted to
determine whether or not to accept or reject the null hypothesis. Pearson’s correlation tests were used to determine whether or not to accept or reject the null hypothesis.

Pearson’s correlation tests were used to determine if there is a relationship between the independent variables and math student achievement in grades fourth and eighth. The questionnaires were analyzed using the SPSS program. Items 6-9 were scaled from Very often (rating of 4) to Not at All (rating of 1). Items 10-25 were scaled from Strongly Agree (rating of 5) to Neither Agree or Disagree (rating of 1). Items 26-30 were scaled from three or more full days (rating of 6) to No professional development (rating of 1).

**Summary**

The questionnaire was developed to determine the relationship of math student achievement in fourth and eighth grades with interactive whiteboard use, teachers’ attitudes and perceptions of interactive whiteboards, and interactive whiteboard professional development. After permission was granted and surveys were returned the surveys were analyzed using descriptive, differential, and correlation statistical processes to compare one or more statistical categories against the constant independent variables and dependent variables of math scores.
CHAPTER IV
RESULTS

Introduction

Education reform, standards, educational accountability, testing, and instructional practices are a clear concern for today’s educators as educators attempt to guarantee high quality education for all students (Dillon, 2011). The purpose of this study was to determine if there is a relationship between fourth and eighth grade math student achievement and the following factors: the use of interactive whiteboards and professional development. Teacher attitudes and perceptions of interactive whiteboards implemented by Mississippi’s public school systems were also examined. The independent variables of teacher response score, grade level of school, grade taught, teaching experience, and highest degree earned were also included in the demographic data. The dependent variable examined was fourth and eighth grade math achievement from the MCT2 2010-2011 test. This chapter describes the results and statistical findings of the study.

Description of the Respondents

There were 900 questionnaires distributed among 35 schools and 221 among 21 schools returned representing a 25% rate on surveys returned and 60% of schools that responded to the surveys. Frequency data from this sample indicated that 95% were female. Years of experience ranged fairly even in margin percents. The majority of respondents had a bachelors degree at 52.9% and 43.4 had a master’s degree.

Primary data consisted of 221 teacher reported surveys from 21 schools in six school districts in the Mississippi Gulf Coast area. Tables 1-5 explain the frequency
demographics of each respondent’s gender, experience, degree, grade level of school, and
grades taught.

Table 1

*Frequencies of Gender*

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<th>Gender</th>
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<td>Male</td>
<td>11</td>
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<tr>
<td>Female</td>
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<td>95.0</td>
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<td>Total</td>
<td>221</td>
<td>100.0</td>
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Table 2

*Frequencies of Experience*

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<th>Years of Experience</th>
<th>Frequency</th>
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<td>2 yrs or less</td>
<td>38</td>
<td>17.2</td>
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<tr>
<td>3-5 yrs</td>
<td>29</td>
<td>13.1</td>
</tr>
<tr>
<td>6-10 yrs</td>
<td>40</td>
<td>18.1</td>
</tr>
<tr>
<td>11-15 yrs</td>
<td>39</td>
<td>17.6</td>
</tr>
<tr>
<td>16-20 yrs</td>
<td>31</td>
<td>14.0</td>
</tr>
<tr>
<td>21 yrs plus</td>
<td>44</td>
<td>19.9</td>
</tr>
<tr>
<td>Total</td>
<td>221</td>
<td>100.0</td>
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### Frequencies of Experience

<table>
<thead>
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<th>Degree</th>
<th>Frequency</th>
<th>Percent</th>
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<tr>
<td>Bachelors</td>
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<tr>
<td>Masters</td>
<td>96</td>
<td>43.4</td>
</tr>
<tr>
<td>Specialist</td>
<td>6</td>
<td>2.7</td>
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<tr>
<td>Doctoral</td>
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<td>.9</td>
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<tr>
<td>Total</td>
<td>221</td>
<td>100.0</td>
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</table>

Table 4

### Frequencies of Grade Level of School

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<thead>
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<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
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<tr>
<td>K</td>
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<td>13.3%</td>
</tr>
<tr>
<td>1</td>
<td>152</td>
<td>13.3%</td>
</tr>
<tr>
<td>2</td>
<td>152</td>
<td>13.3%</td>
</tr>
<tr>
<td>3</td>
<td>152</td>
<td>13.3%</td>
</tr>
<tr>
<td>4</td>
<td>150</td>
<td>13.1%</td>
</tr>
<tr>
<td>5</td>
<td>131</td>
<td>11.5%</td>
</tr>
<tr>
<td>6</td>
<td>104</td>
<td>9.1%</td>
</tr>
<tr>
<td>7</td>
<td>75</td>
<td>6.6%</td>
</tr>
<tr>
<td>8</td>
<td>75</td>
<td>6.6%</td>
</tr>
<tr>
<td>Total</td>
<td>1143</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 5
Results

This study was a non-experimental, quantitative study investigating whether a statistically significant relationship existed between fourth and eighth grade math achievement on the MCT2 and interactive whiteboard use, attitudes and perceptions of interactive whiteboards and interactive whiteboard professional development. This study used primary data collected through surveys of teachers in the Mississippi Gulf Coast area who teach Kindergarten through eighth grade and archival achievement data collected from the Mississippi assessment and accountability system hosted on the Mississippi Department of Education (2011) website.
To assess whether a relationship existed between the dependent variable and the independent variables, this study used Pearson correlation analysis to determine the relationships between the dependent variable, MCT 2 fourth and eighth grade math mean scale scores, the use of interactive whiteboards and professional development. Teacher attitudes and perceptions of interactive whiteboards implemented by Mississippi’s public school systems were also examined. The independent variables of teacher response score, gender, grade level of school, grade taught, and experience were examined. The dependent variable examined was fourth and eighth grade math achievement. Fourth grade and eighth grade math scores were selected because this was the school year after the benchmark assessment year.

Data Analysis

Questions 1-5 identified the frequency of respondents’ demographic information as shown in Table 1-5. Shown in Table 6 descriptives questions 6-9 of the survey instrument identified frequency and descriptives of interactive whiteboard use. Questions 10-25 identified frequency and descriptive of attitudes and perceptions of interactive whiteboards, and questions 26-30 identified frequency and descriptive of professional development of interactive whiteboards. Several of the questions on the survey instrument were constructed to measure the same variable.

Scores from the sets of questions from the survey instrument (see Appendix A) were averaged and used in the model. The first section of the survey identified use of interactive whiteboards. Frequency was measured by the use in questions 6-9, attitudes and perceptions in questions 10-25, and professional development in questions 26-30.

As shown in Table 6 descriptives, Part II interactive whiteboard use question 6, M= 3.46 measured how often interactive whiteboards are used for computer assisted
instruction, question 7, M=3.32 measured interactive whiteboard use for integrated learning, question 8, M=3.10 measured interactive whiteboard use for simulations and the software that teaches higher order thinking, and question 9 with a M=2.98 measures interactive whiteboard use with components for immediate feedback for lesson design and programming of activities.

Table 6

*Interactive Whiteboard Use*

<table>
<thead>
<tr>
<th>Interactive Whiteboard Use</th>
<th>n</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>IWB use for computer assisted instruction.</td>
<td>221</td>
<td>3.46</td>
<td>.95</td>
</tr>
<tr>
<td>IWB use for integrated learning.</td>
<td>220</td>
<td>3.32</td>
<td>.94</td>
</tr>
<tr>
<td>IWB use for simulations and software that teaches higher order thinking.</td>
<td>219</td>
<td>3.10</td>
<td>1.01</td>
</tr>
<tr>
<td>IWB use for immediate feedback for lesson design and programming of activities and skills.</td>
<td>220</td>
<td>2.98</td>
<td>1.05</td>
</tr>
</tbody>
</table>

Note. IWB denotes Interactive Whiteboard. Scales are as follow: Very often (4); Often (3); Rarely (2); Not at all (1).

Shown in Table 7, Part III attitudes and perception question 17 identified a high percentage of teachers that believe interactive whiteboard use makes learning enjoyable for students which yielded a M=4.50, question 10 identified a high percentage of teachers believe interactive whiteboard use has improved engagement in class with M=4.48, question 14 use of interactive whiteboard contributes to increased participation in class with a M=4.42, question 12 use of interactive whiteboard has improved learning in class with a M=4.41, and question 25 use of the interactive whiteboard enhances curriculum
with a $M=4.40$. Question 11, 20, and 21 fell below the mean of 3.99 with question 11 identifying use of the interactive whiteboard has improved student behavior in class with $M=3.99$; question 20 use of the interactive whiteboard contributes to students mastering objectives more quickly with $M=3.90$; and question 21 use of the interactive whiteboard minimizes the need and use for many instructional materials and other resources with $M=3.72$.

Table 7

*Attitudes and Perceptions*

<table>
<thead>
<tr>
<th>Attitudes and Perceptions</th>
<th>Samples</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>IWB use makes learning enjoyable.</td>
<td>216</td>
<td>4.50</td>
<td>.72</td>
</tr>
<tr>
<td>IWB use has improved student engagement.</td>
<td>221</td>
<td>4.48</td>
<td>.80</td>
</tr>
<tr>
<td>IWB use has increased participation.</td>
<td>220</td>
<td>4.42</td>
<td>.83</td>
</tr>
<tr>
<td>IWB use has improved student learning.</td>
<td>221</td>
<td>4.41</td>
<td>.78</td>
</tr>
<tr>
<td>IWB use enhances curriculum.</td>
<td>219</td>
<td>4.40</td>
<td>.78</td>
</tr>
<tr>
<td>IWB use offers more opportunity for diverse methods of teaching than traditional teaching methods.</td>
<td>220</td>
<td>4.39</td>
<td>.74</td>
</tr>
<tr>
<td>IWB use has improved student attentiveness.</td>
<td>221</td>
<td>4.35</td>
<td>.83</td>
</tr>
<tr>
<td>IWB use increases student participation and student achievement.</td>
<td>220</td>
<td>4.33</td>
<td>.78</td>
</tr>
<tr>
<td>IWB use exposes students to wider varieties of instructional strategies.</td>
<td>220</td>
<td>4.31</td>
<td>.80</td>
</tr>
<tr>
<td>IWB use allows for more thorough instruction.</td>
<td>220</td>
<td>4.29</td>
<td>.85</td>
</tr>
</tbody>
</table>

Table 7 (continued)
IWB use compared to the dry erase or chalk board students are more willing to come to the IWB. 219 4.26 1.00

IWB use makes it easier to teach objectives. 220 4.19 .98
IWB use encourages students to complete lessons eagerly. 220 4.04 .92
IWB use has improved student behavior during class. 221 3.99 1.01
IWB use contributes to students mastering objectives more quickly. 220 3.90 1.00
IWB use minimizes the need and use for many instructional materials and resources. 218 3.72 1.21
IWB use compared to the dry erase or chalk board students are more willing to come to the IWB. 219 4.26 1.00

Note. IWB denotes Interactive Whiteboard of Attitudes and Perceptions. Scales are as follow: Strongly Agree (5); Agree (4); Disagree (3); Strongly Disagree (2); Neither Agree nor Disagree (1).

Table 8 shows the Part IV professional development question 30 with a M= 4.04 measured total attendance of interactive whiteboard professional development; question 29 with M= 3.61 identified interactive whiteboard professional development related to the basic use and function of interactive whiteboards; question 26 with M= 3.37 identified interactive whiteboard professional development related to designing lessons that incorporate the use of the interactive whiteboard to promote student learning; question 28 with a M= 2.79 identified professional development related to customizing and personalizing learning activities to address students’ diverse learning styles; and question 27 with a M= 2.62 identified interactive whiteboard professional development designing lessons that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own
learning, and assessing their own progress. These items were entered into the regression model.

Table 8

*Professional Development*

<table>
<thead>
<tr>
<th>Professional Development</th>
<th>Samples</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD total for any interactive whiteboard participated in.</td>
<td>219</td>
<td>4.04</td>
<td>1.83</td>
</tr>
<tr>
<td>PD for the basic use and function of IWB.</td>
<td>219</td>
<td>3.61</td>
<td>1.80</td>
</tr>
<tr>
<td>PD for designing lessons that incorporate the use of IWB to promote learning.</td>
<td>219</td>
<td>3.37</td>
<td>1.81</td>
</tr>
<tr>
<td>PD related to customizing and personalizing learning activities to address students’ diverse learning styles.</td>
<td>219</td>
<td>2.79</td>
<td>1.74</td>
</tr>
</tbody>
</table>

Note. PD denotes Professional Development. Scales are as follows: Three or more full days (6); Two full days (5); One full day (4); Half day (3); Less than ½ day (2); No professional development (1).

As Shown in table 9, descriptive statistics pertaining to research questions 6-9 showed the highest mean with interactive whiteboard use in student engagement in class. Questions
17-25 showed the highest mean of attitudes and perceptions of interactive whiteboards in use of the interactive whiteboards make learning more enjoyable. Questions 26-30 showed the highest mean interactive whiteboard professional development participated in related to designing lessons that incorporate the use of the board that promotes student learning.

Table 9

Means and Standard Deviations

<table>
<thead>
<tr>
<th>Use/Attitudes and Perceptions/Professional Development</th>
<th>Samples</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive Whiteboard Use</td>
<td>221</td>
<td>3.21</td>
<td>.89</td>
</tr>
<tr>
<td>Attitudes and Perceptions</td>
<td>221</td>
<td>4.25</td>
<td>.69</td>
</tr>
<tr>
<td>Professional development</td>
<td>219</td>
<td>3.28</td>
<td>1.53</td>
</tr>
<tr>
<td>Mean Score4</td>
<td>220</td>
<td>156.23</td>
<td>3.92</td>
</tr>
<tr>
<td>Mean Score8</td>
<td>220</td>
<td>155.85</td>
<td>3.43</td>
</tr>
</tbody>
</table>

Note. Score 4 denotes 4th grade math achievement. Score 8 denotes 8th grade math achievement.

The attitudes and perceptions questions were on a 5-point likert scale with strongly agree to 1 neither agree nor disagree. Attitudes and perceptions yielded a mean of 4.24. The professional development was on a 6-point likert scale with 6 being three or more full days of professional development and 1 as no professional development. Professional development yielded a mean of 3.28. The means of these independent variables seem to indicate that teachers reported greater attention to attitudes and perceptions of interactive whiteboards, secondly how often they are being used, and thirdly how much and what kind of professional development has been provided.
Data Findings

Statistical significance for each independent variable was set at 0.05, and a Pearson correlation was conducted. There was a significant relationship between the use of interactive whiteboards in fourth grade and math achievement. There was not a significant relationship between the use of interactive whiteboards in eighth grade and math achievement. There was not a significant relationship between attitudes and perceptions of interactive whiteboards in the fourth and eighth grade math achievement MCT2. There was a significant difference in professional development for fourth grade math achievement scores on the MCT2.

However, this study did not yield a significant relationship with MCT2 math fourth and math eight scores for use in eighth, not significant in attitudes and perceptions fourth and eighth, not significant eighth professional development.

Hypotheses Results

Hypothesis 1 was stated as follows: H1 There is a statistically significant relationship between fourth and eighth grade student achievement and the use of interactive whiteboards. This study did find a significant relationship in the use of interactive whiteboards and fourth grade math achievement \( r(220) = .215, p = .001 \). Therefore, the hypothesis was supported for the fourth grade math achievement in the use of interactive whiteboards. This study did not find a significant relationship in the use of interactive whiteboards and eighth grade math achievement \( r(2.20) = .017, p = .806 \). Therefore, Hypothesis 1 was rejected for the 8th grade.

Hypothesis 2 was stated as follows: H2 There is a statistically significant relationship between fourth and eighth grade student achievement and teachers’ attitudes and perceptions of the use of interactive whiteboards. This study did not find a
significant relationship in the attitudes and perceptions of interactive whiteboards and fourth and eighth grade math achievement \( r_4(220) = .110, p = .105 \) and \( r_8(220) = -.012, p = .861 \), respectively; therefore, hypothesis 2 was rejected for both grades.

Hypothesis 3 was stated as follows: \( H_3 \) There is a statistically significant relationship between fourth and eighth grade student achievement and interactive whiteboard professional development provided to teachers. This study did find a significant relationship in fourth grade math scores and professional development \( r_4(218) = .323, p < .001 \); therefore, hypothesis 3 was supported. This study did not find a significant relationship in eighth grade math achievement and professional development \( r_8(218) = -.037, p = .218 \); therefore, hypothesis 3 was rejected.

Summary

This study investigated whether a relationship exists between fourth and eighth grade math achievement in 21 Mississippi Gulf Coast schools as measured by the MCT2 assessment data and interactive whiteboard use, attitudes and perceptions of interactive whiteboards, and professional development of interactive whiteboards. A Pearson correlation analysis was used to identify significant relationships with MCT2 fourth and eighth grade math test. Upon receipt of the survey instruments, all were numbered and notations made for the identification of the school.

This study showed that the greatest relationship with student achievement was in fourth grade math achievement and interactive whiteboard use. This study also showed the greatest relationship with fourth grade math achievement and professional development. This study did not yield statistically significant relationships between eighth grade math achievement and interactive whiteboard use. Another area this study did not yield statistically significant relationships in fourth and eighth grade math
achievement is attitudes and perceptions. The last area this study did not yield statistically significant relationships were between eighth grade math achievement and professional development. Therefore, the null hypothesis was not rejected in eighth grade math achievement and use, fourth and eighth grade math achievement attitudes and perceptions, and eighth grade math achievement and professional development.

The results from the study of the data indicated the highest mean in fourth grade math achievement in interactive whiteboard use and interactive whiteboard professional development. In Chapter V, implications from the findings of the qualitative research will be discussed as well as recommendations made for implementations in public education.
CHAPTER V
DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The primary purpose of this study was to determine if there were statistically significant relationships among MCT2 math fourth and eighth grade assessment scores, and interactive whiteboard use, attitudes and perceptions of interactive whiteboards, and interactive whiteboard professional development. Identifying those aspects of interactive whiteboards that show a statistical difference may assist administrators, and state policy makers when allocating funds for interactive whiteboards. It may also aid administrators to select professional development that will have a pedagogical value to the teachers. This chapter includes a summary of the procedures, discussion of the findings, conclusions, and future recommendations.

Summary of Procedures

The primary data for this study were obtained from 221 teacher-reported surveys from six school districts in the Mississippi Gulf Coast area. Twenty-one schools from this region participated in this study, which examined interactive whiteboard use, attitudes and perceptions of interactive whiteboards, and professional development of interactive whiteboards and its effects on fourth and eighth grade math achievement as measured by the Mississippi Curriculum Test, Second Edition (MCT2). A Pearson correlation analysis was used to determine whether relationships exist between the dependent variable, MCT2 math fourth and eighth mean scale scores, and the dependent variables of interactive whiteboard use, attitudes and perceptions of interactive whiteboards, and professional development of interactive whiteboards.
Before the study began, permission was gained from district superintendents and
The University of Southern Mississippi’s Institutional Review Board (IRB). From
November 28 to December 6, 2011, surveys were distributed to participating school main
office secretaries who in turn distributed, collected, and mailed the completed surveys to
the researcher. Data were compiled and analyzed by the researcher. To measure
reliability of items that were to be averaged for the regression model, a Cronbach’s alpha
test of coefficient reliability was performed on each of the sets of survey items.

Major Findings

The relationships between fourth and eighth grade math MCT2 achievement and
interactive whiteboard use, attitudes and perceptions of interactive whiteboards, and
professional development of interactive whiteboards were found to be statistically
significant in some areas, but not statistically significant in others. The area that had the
greatest relationship with achievement that was also stated in literature was the
relationship of fourth grade math achievement and interactive whiteboard use and fourth
grade math achievement and professional development.

Research Question 1: Is there a relationship between fourth and eighth grade
student achievement and the use of interactive whiteboards. This study did find a
significant relationship in the use of interactive whiteboards and fourth grade math
achievement. Dhindsa and Emran (2006) identified technology as a way of increasing
student comprehension in mathematics education. Ertmer (2005) suggests technology
creates a learning environment essential to the development of 21st century learners. This
study did not find a significant relationship in the use of interactive whiteboards and
eighth grade math achievement. The research of Becker (2001) describes most
technology in the classroom is already familiar to the students when it reaches the
classroom. Integration and use are equally important for the classroom, and without proper support and implementation interactive whiteboards can be difficult to use in the classroom for preparation of lessons.

Research question 2: Is there a relationship between fourth and eighth grade student achievement and teachers’ attitudes and perceptions of the use of interactive whiteboards. This study did not find a significant relationship in the attitudes and perceptions of interactive whiteboards and fourth and eighth grade math achievement. Wayne, Yoon, Zhu, Cronen, & Garet (2008) suggest simply outlining technology with instructional practices and finding relevance with high stakes testing will help improve the relevance and increase teacher’s skill of being more effective in the classroom.

Research question 3: Is there a relationship between fourth and eighth grade student achievement and interactive whiteboard professional development provided to teachers. This study did find a significant difference in fourth grade math scores and professional development. Researchers Birman, Desimone, Garet, & Porter (2000) and ISTE (2008) found that professional development must be beneficial for the teacher to satisfy the needs of the dynamics of the student and their classroom. This study did not find a significant difference in eighth grade math achievement and professional development. There is a great deal of literature on the types of professional development provided to teachers that create changes in instructional practices and the use of technology in the classroom. Although previous literature identified these areas of professional development and implementation practices as key factors to creating pedagogical changes in instructional practices that leads to increased achievement this study did not support previous findings for eighth grade math achievement and professional development.
Discussion

Many of the findings in this study are consistent with previous research. The relationship with fourth grade math achievement and interactive whiteboard use and fourth grade math achievement and professional development is consistent with the research of Marzano (2009a). Magana and Frenkel (2004) stated that one of the contributing factors to the success of the interactive whiteboard is that the software supports best practices of the curriculum and instruction which in turn effectively transforms classrooms. According to Marzano (2009b) the interactive whiteboard engages a wider variety of student learners and on a broader spectrum. The research of Marzano (2010) asserts that the use of interactive whiteboards will challenge the face of teaching and this technology will add a whole new set of instructional strategies that were never available before in conjunction with how teachers interact with students.

Researchers suggested interactive whiteboard use in mathematics teaching networked teachers, enhanced learning, and promoted collaboration in the classroom (Davison & Pratt, 2003; Miller, 2003).

Previous research of Wenglinksy (2000) claimed students scored higher on the test when their teacher had technology professional development training and support. Pitler, Hubbell, Kuhn, and Malenoski (2007) indicated that the implementation of technology in the classroom had positive affects when the implementation was applied effectively. This study concurred with the literature that professional development gave teachers opportunities to collaborate on activities that were meaningful to the teacher.

This study did not find significant relationships between eighth grade math achievement and interactive whiteboard use, 4th and 8th math achievement and attitudes and perceptions, and 8th grade math achievement and professional development. There is
a great deal of literature that support researchers who believe the core elements to ensuring conditions to academic success before instruction begins are the elements of mastery learning, pre-teaching, high quality group based instruction, regular assessments, and high quality corrective feedback in instructional models (Guskey, 2009; Marzano, 2009b; Rosenshine, 2009). The research of Schlechty (2001) describes a classroom environment where students are actively engaged in the learning environment. This also requires teachers to restructure by changing quality of learning experiences in the classroom in order to improve student achievement. Although this study did not find significant relationships between eighth grade math achievement and use, fourth and eighth grade math achievement and attitudes and perceptions, and eighth grade math achievement and professional development, this study did concur with literature proving that in order to enhance instructional technologies the evidence needed to impact instruction is effective professional development, direct application, daily incorporation, specific feedback, collaboration, real world learning, and effective integration with all stakeholders (ISTE, 2008).

Limitations

Generalizations of this study’s findings were limited by some factors. This research did not ask specifically how much time was spent in each type of learning activity for the use of the interactive whiteboard. Moreover, this study did not ask specifics of how, when, and what the interactive whiteboard was used for. These questions may have alluded to differences in the teacher’s attitudes and perceptions of the interactive whiteboard. In addition the study did not ask specifically the types of professional development nor did it incline to specifics of the trainings in each area. Therefore, this study is limited in its ability to recommend specific types and amounts of
training that teachers should receive to achieve the greatest effect on student achievement.

Recommendations for Policy and Practice

The relationship between fourth and eighth grade math achievement, interactive whiteboard use, attitudes and perceptions, and professional development identified in this study presents a question for educators in this state. As Cuban, Kirpatrick, and Peck (2001) found minimal support for the idea that technology of any kind transforms the teachers’ instructional practices. Moreover, contrary to satisfying the needs of the teacher classroom and dynamics, this technology can transform teachers’ attitudes and perceptions of interactive whiteboards. However, researchers Birman, Desimone, Garet, & Porter (2000) and ISTE (2008) found that professional development must be beneficial for the teacher to satisfy the needs of the dynamics of the student and their classroom.

Stakeholders and policymakers need to examine and identify how money is spent on technology and the quality of professional development. Restructuring of time spent for teachers to plan lessons and evaluate the curriculum objectives required to be taught may help identify the needs of the classrooms at each grade level. Moreover interactive whiteboards appear to be as engaging as the lessons created and as engaging as the teacher who is presenting the lesson. Additionally, researcher Desimone (2009) stated teachers need continuous training for students to have the best learning outcomes.

Lastly, consistent messages and goals should be provided among stakeholders and policymakers that align with and support direct impact on teacher’s instructional practices. This study is reminiscent of researcher Desimone (2009) which suggests that policy makers may need to schedule and align professional development with days set aside throughout the year in which teachers can incorporate opportunities that support a
focus on core content, teacher modeling strategies, and the opportunity to collaborate with colleagues.

Recommendations for Future Research

Further studies should help define the reasons for the differences in fourth and eighth grade math achievement based on interactive whiteboard use, attitudes and perceptions, and professional development.

1. Future studies should focus on the instructional practices used with the interactive whiteboard and its software components.

2. Future studies should survey the questions that measured teachers’ attitudes and perceptions and should be rewritten to gain a greater variability of responses that is needed for the teacher’s pedagogical values.

3. Lastly, future studies should focus on identifying the characteristics, quality, quantity and implementations of the professional development provided to teachers.

Summary

The primary purpose of this study was to determine if there were statistically significant relationships among fourth and eighth grade math achievement on the Mississippi Curriculum Test 2nd Edition (MCT2) and the independent variables interactive whiteboard use, attitudes and perceptions, and professional development. Previous literature has linked these variables to increase student achievement.

Primary data was obtained from teacher-reported survey instruments that were administered in 21 schools that serve K-8 grade student populations in the Mississippi Gulf Coast area. A Pearson correlation analysis was used to determine whether relationships existed between the dependent variable, MCT2 fourth and eighth grade
math mean scale scores and the independent variables: the use of interactive whiteboards, attitudes and perceptions, and professional development. The relationship between variables was found to be significant in only fourth grade math MCT2 and interactive whiteboard use and fourth grade math MCT2 and professional development but not statistically significant in others.

The area that this study identified as having the greatest relationship was that of fourth grade math MCT2 and interactive whiteboard use and fourth grade math MCT2 and professional development. This finding was consistent with the research of Marzano (2010), Wood and Ashfield (2007), and Watson and De Geest (2005). These researchers all embarked on the elements that teachers’ knowledge of curriculum, technology and professional development availability, and positive attitude are key elements for the classroom to accomplish its goal.

Although this study had some limitations, recommendations for policy makers were made which could include revaluation of the time spent for teachers to plan lessons and incorporate the technology for the objectives required to teach. Recommendations for policy makers also include aligning the professional development schedules to support direct impact on teacher’s instructional practices. These recommendations will ensure teachers the opportunity to collaborate and focus on core content and teaching strategies that will assist with the technology that is provided in the schools.

Recommendations for further research included using further studies to help define and focus on the instructional practices with the use of technology such as the interactive whiteboard, iPods, laptop, tablets, or e-readers. Another recommendation is to survey teachers to gain a variety of responses for the need in which technology can impact direct instruction. Conclusively, another recommendation was to identify the
characteristics, quality, and implementations of technology through meaningful professional development that correlate with instructional practices.
APPENDIX A

INTERACTIVE WHITEBOARDS SURVEY

Directions: The following questionnaire is divided into four parts. The first part contains questions about you as an educator; the second part is about interactive whiteboard use; the third part is about your attitudes and perception of interactive whiteboards; and the last part is about professional development provided for interactive whiteboards.

Part I: About You

1. Gender: _____Male _____Female

2. What is the grade level of your school? (Check all that apply)

   ____K ____5
   ____1 ____6
   ____2 ____7
   ____3 ____8
   ____4

3. What grade do you teach? (Check all that apply)

   ____K ____5
   ____1 ____6
   ____2 ____7
   ____3 ____8
   ____4

4. How many years of teaching experience do you have?

   _____2 years or less _____11 – 15 years
   _____3 – 5 years _____16 – 20 years
   _____6 – 10 years _____21 years or more

5. What is your highest degree earned?

   _____Bachelor’s Degree
   _____Master’s Degree
   _____Specialist’s Degree
   _____Doctoral Degree
Part II: Interactive Whiteboard Use

Please answer all the questions. Check the answer that most closely reflects your use of interactive whiteboards.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Very often (4)</th>
<th>Often (3)</th>
<th>Rarely (2)</th>
<th>Not at all (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. How often do you use interactive whiteboards in your classroom for computer assisted instruction?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>7. How often do you use interactive whiteboards for integrated learning?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>8. How often do you use interactive whiteboards for simulations and the software that teaches higher order thinking?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>9. How often do you use interactive whiteboard components for immediate feedback for lesson design and programming of activities and skills?</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Part III: Attitudes and Perceptions

Please answer all the questions. Circle the number that closely reflects your attitude and perceptions toward each statement.

Strongly Agree (5)  Agree (4)  Disagree (3)  Strongly Disagree (2)  Neither Agree nor Disagree (1)

<table>
<thead>
<tr>
<th>Statements</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Use of the interactive whiteboard has improved student engagement during class.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Use of the interactive whiteboard has improved student behavior during class.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Use of the interactive whiteboard has improved student learning in class.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Use of the interactive whiteboard has improved student attentiveness during class?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Use of the interactive whiteboard contributes to increased student participation in class, i.e., raising hand.</td>
<td></td>
<td></td>
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<td>15. When using the interactive whiteboard students are more willing to come to the interactive whiteboard compared to coming to the chalk board or dry erase board.</td>
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<td>16. Use of the interactive whiteboard increases student participation and student achievement.</td>
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<td>17. Use of the interactive whiteboard makes learning enjoyable for students.</td>
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<td>18. Use of the interactive whiteboards allow for more thorough instruction.</td>
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<td>19. Use of interactive whiteboards makes it easier to teach objectives that meet district and state standards.</td>
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<td>20. Use of the interactive whiteboard contributes to students mastering objectives more quickly.</td>
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<td>21. Using the interactive whiteboard minimizes the need and use for many instructional materials and other resources.</td>
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<td>22. Use of the interactive whiteboard allows students to complete lessons eagerly?</td>
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<td>23. Use of the interactive whiteboards exposes students to a wider variety of instructional strategies.</td>
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<td>24. Use of the interactive whiteboard offers more opportunity for teaching than traditional teaching methods.</td>
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<td>25. Use of the interactive whiteboard enhances curriculum.</td>
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</tbody>
</table>

Part IV: Professional Development
Please answer all the questions. Circle the number that closely reflects the professional development you have been provided.

<table>
<thead>
<tr>
<th>Three or more full days (6)</th>
<th>Two full days (5)</th>
<th>One full day (4)</th>
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</thead>
<tbody>
<tr>
<td>Half day (3)</td>
<td>Less than ½ day (2)</td>
<td>No professional development (1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statements</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
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<tbody>
<tr>
<td>26. Interactive whiteboard professional development related to designing lessons that incorporate the use of the interactive whiteboard to promote student learning.</td>
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<td>27. Interactive whiteboard professional development related to designing lessons that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress.</td>
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<td>28. Interactive whiteboard professional development related to customizing and personalizing learning activities to address students’ diverse learning styles.</td>
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<td>29. Interactive whiteboard professional development related to the basic use and function of interactive whiteboards.</td>
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<td>30. Total attendance of any and all interactive whiteboard professional development participated in your entire career.</td>
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</table>

End of Survey
THANK YOU!!!
😊
Dear Superintendent,

I am currently a doctoral candidate at the University of Southern Mississippi. I will be conducting research on student achievement and interactive whiteboards. I am interested in teachers’ use of interactive whiteboards, teachers’ attitudes and perceptions of interactive whiteboards, and the professional development of interactive whiteboards as they contribute to students’ achievement on the Mississippi Curriculum 2nd edition test.

I would like your written permission to survey K-8 teachers in your district. In addition to the questionnaire responses I will be using the school districts’ 4th and 8th grade MCT2 2010-2011 test scores from MAARS. It should take no more than 10 minutes. The questionnaire contains 4 questions on interactive whiteboard use. There are 16 questions on attitudes and perceptions of interactive whiteboards. There are 5 questions about professional development and 5 demographic questions. A copy of the survey instrument and directions are attached for your reference.

The data collected from the completed questionnaires will be compiled and analyzed. The data collected is anonymous. Upon completion, this information will be shared with my dissertation committee. The questionnaire will contain a participant’s letter explaining the study and the participant’s consent. Respectfully, I request that teachers refrain from writing their name or any identifying information. All information gathered will be kept completely confidential in the researcher’s home. Upon completion of this research study, I will shred all surveys. As the researcher, I would be very grateful for your participation.

Information provided by classroom teachers can provide a valuable source of information about student achievement and interactive whiteboards. The data provided will be used by me, the researcher, to add to the bank of research on interactive whiteboards.
Should you have any questions please contact: Tenneille Terrell Lamberth, email: tlamberth77@gmail.com, or at tenneilleterrell@eaglemail.com. This research is under the supervising Professor, Dr. David Lee, University of Southern Mississippi, email: david.lee@usm.edu.

This research will be reviewed and approved by the Human Subject Protection Review Committee, which ensures that all research fits the federal guidelines for involving human subjects. Any questions or concerns about rights as a research subject should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.

Sincerely,

Tenneille Terrell Lamberth, M.Ed.
Doctoral Candidate
The University of Southern Mississippi

Consent to Participate in Interactive Whiteboard Survey
As superintendent of _________________________ District, I give Tenneille Terrell Lamberth permission to conduct educational research at the following schools:

_____________________________ (schools will be listed here).

This research will be conducted on interactive whiteboards and student achievement. Permission is granted to survey K-8 teachers. I understand participation in this survey is voluntary. All responses will be kept confidential. No individuals will be identified in any of the reports.

_____________________________________
Superintendent’s Signature

________________________
Date
APPENDIX C
ADULT CONSENT FOR RESEARCH FORM

University of Southern Mississippi
118 College Drive #5147
Hattiesburg, MS 39406-0001
(601)266-6820

Consent to Participate in a Research Study

Date: Spring, 2012

Title of Study: Interactive Whiteboard Use: The Catalyst of Student Achievements

Research will be conducted by: Tenneille Lamberth (228) 547-4545
Email Address: tlamberth77@gmail.com

Faculty Advisor: Dr. David Lee

What are some general things you should know about research studies?

You are being asked to take part in a research study. To join the study is voluntary.

You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty.

Research studies are designed to obtain new knowledge. This new information may help people in the future. You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.

Details about this study are discussed below. It is important that you understand this information so that you can make an informed choice about being in this research study.

You will be given the first three pages of this consent form and the researcher will keep the fourth sheet, which contains your signature. You should ask the researchers named above, or staff members who may assist them, any questions you have about this study at any time.

What is the purpose of this study?

The purpose of this research study is to examine interactive whiteboard use.
How many people will take part in this study?

If you decide to be in this study, you will be one of approximately 100 people in this research study.

How long will your part in this study last?

You will be asked to sign a consent form and fill out a questionnaire, which will last no longer than 10 minutes. A report of my findings will be made available to you upon request at the conclusion of this study by emailing me at tlamberth77@gmail.com.

What will happen if you take part in the study?

You will be asked to sign a consent form and fill out a questionnaire. The researcher will collect data from the questionnaire. Throughout the process of analysis, the researcher will keep the questionnaire in a locked box. The questionnaire and consent form will be shredded upon completion of this project.

What are the possible benefits from being in this study?

The benefit of the study will be the contribution of the findings to a better understanding of the instructional technology such as the interactive whiteboard. The study will provide insights for teachers, administrators, and policymakers for the need of 21st century technology, teacher’s attitudes and perceptions of interactive whiteboard and professional development needed for instructional programs and strategies. The results may better enable educators and policymakers to address the issues of accountability. Participants should request a summary from tlamberth77@gmail.com.

What are the possible risks or discomforts involved from being in this study?

There are no risks with obtaining test scores from MAARS. This information is made public and viewable at http://www.mde.k12.ms.us/. A superintendent letter will be mailed asking for permission to use their school districts 4th and 8th grade MCT2 2010-2011 test scores from MAARS and have teachers complete a questionnaire explaining It should take no more than 5 minutes to complete. The superintendent letter will explain that the questionnaire contains 4 questions on interactive whiteboard use, 16 questions on attitudes and perceptions of interactive whiteboards, 5 questions about professional development and 5 demographic questions.

The risks are that the respondents may not feel comfortable answering questions regarding their attitudes and perceptions of interactive whiteboard use, how they use the interactive whiteboard in their classroom, and the professional development provided. These concerns may be allayed by the assurances of confidentiality for respondents that will be provided. Only the researcher and faculty advisors will view the participant responses. All responses will be kept secure and locked in the researcher’s home. Questionnaires and consent forms will be destroyed after one year.
How will your privacy be protected?

Participants will not be identified in any report or publication about this study. Questionnaires will be collected and placed in a lock box. Only researcher and faculty advisors will view these questionnaires. Questionnaires will be kept secure and locked in the researcher’s home. Questionnaires and consent forms will be shredded after a year.

What if you have questions about this study?

You have the right to ask, and have answered, any questions you may have about this research. If you have questions, or concerns, you should contact the researchers listed on the first page of this form.

What if you have questions about your rights as a research participant?

This project has been reviewed by the Human Subjects Protection Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.

Title of Study: Interactive Whiteboard Use: The Catalyst of Student Achievement

Principal Investigator: Tenneille Lamberth
Participant’s Agreement:

I have read the information provided above. I have asked all the questions I have at this time. I voluntarily agree to participate in this research study.

_________________________________________________  _______________
Signature of Research Participant                     Date

_________________________________________________
Printed Name of Research Participant

_________________________________________________  _______________
Signature of Research Team Member Obtaining Consent  Date

_________________________________________________
Printed Name of Research Team Member Obtaining Consent
PARTICIPANT LETTER

Dear Participants,

I am currently a doctoral candidate at the University of Southern Mississippi. I am conducting a research study on teachers’ use of interactive whiteboards, teachers’ attitudes and perceptions of interactive whiteboards, and the professional development of interactive whiteboards as they contribute to students’ achievement on the Mississippi Curriculum 2nd edition test. Please take a few moments of your time to complete the enclosed questionnaire. The survey should take no more than 10 minutes to complete. Upon completion, this information will be shared with my dissertation committee.

The data collected from the completed questionnaires will be compiled and analyzed. All data collected is anonymous. All information gathered will be kept completely confidential. To ensure confidentiality of the school and teachers, no one will be identified by name including the school district, the location of district, or the name of the school. Upon completion of this research study, I will shred all surveys. As the researcher, I am very appreciative for your participation; your completed questionnaire will serve as your consent to participate as well as the consent form. However, you have the option to decline to participate if you so wish. If you decide to withdraw from participation at any time there is no penalty or risk of negative consequence.

As a part of this study, I will be asking approximately 100-150 teachers to complete a survey to gather data that can provide valuable information on interactive whiteboard and student achievement. I will use the data you provide to add to the research bank on interactive whiteboards and student achievement. Should you have any questions please contact: Tenneille Lamberth, email: tlamberth77@gmail.com; phone: 228.547.4545. This research is conducted under the supervision of Dr. David Lee, University of Southern Mississippi, email: david.lee@usm.edu.

This research project has been reviewed and approved by the Human Subjects Protection Review Committee, which ensures that all research fits the federal guidelines for research involving human subjects. Any questions or concerns about rights as a research subject should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.

Sincerely,

Tenneille Lamberth

APPENDIX E

INSTITUTIONAL REVIEW BOARD APPROVAL LETTER
NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the 'Adverse Effect Report Form'.
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 11102604
PROJECT TITLE: Interactive Whiteboard Use: The Catalyst of Student Achievements
PROJECT TYPE: Dissertation
RESEARCHER(S): Tenelle Terrell Lamberth
COLLEGE/DIVISION: College of Education & Psychology
DEPARTMENT: Educational Leadership and School Counseling
FUNDING AGENCY: N/A
IRB COMMITTEE ACTION: Exempt Approval
PERIOD OF PROJECT APPROVAL: 11/17/2011 to 11/16/2012

Lawrence A. Hosman, Ph.D.
Institutional Review Board Chair
REFERENCES


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Bell, M. A., (2002). Teachers’ perceptions regarding the use of the interactive electronic whiteboard in instruction, Teachers.net. from
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