Analyzing the Impact of the Interactive Whiteboard on Reading Comprehension

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Analyzing the Impact of the Interactive Whiteboard on Reading Comprehension

by

Amanda Martin

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A thesis submitted to the Department of Education and Human Development of the State University of New York College at Brockport in partial fulfillment of the requirements for the degree of Master of Science in Education
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Reading Comprehension

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# Table of Contents

Chapter I: INTRODUCTION

- Background of Problem ........................................... 1
- Problem Statement .................................................. 3
- Significance of Problem ............................................ 4
- Rationale ............................................................... 5
- Definition of Key Terms ............................................ 6

Chapter II: LITERATURE REVIEW ........................................ 7

- Reading Comprehension .......................................... 7
- Approaches to Reading Comprehension ....................... 13
- Technology and Multimedia Learning ......................... 20
- Impact of the Interactive Whiteboard on Student Learning ........................................ 24

Chapter III: APPLICATIONS AND EVALUATIONS ............... 36

- Introduction .......................................................... 36
- Participants ............................................................ 36
- Procedures ............................................................. 37
- Instruments of Study ............................................... 38

Chapter IV: RESULTS .................................................... 40

Chapter V: CONCLUSIONS AND RECOMMENDATIONS .......... 48

References ................................................................... 55

Appendices ................................................................... 58

- Appendix A... Student Questionnaire ....................... 58
- Appendix B... Reading Comprehension Assessments ...... 59
- Appendix C... Student Interview Questions .................. 67
List of Tables

Table 1: Average Weekly Scores for Group 1 and 2 When Using the Interactive Whiteboard ..................41

Table 2: Average Weekly Scores for Group 1 and 2 When Using Paper-and-Pencil Tasks ..................41

Table 3: Comparison between Group and Activity .............................................................................42
Chapter I: INTRODUCTION

Background of the Problem

From the moment students begin their educational careers, they are introduced to the world of literacy. It begins with letter and sound identification and moves to learning how to blend letters together to make words, putting words together to read sentences, and finally, using sentences to read whole texts. During my undergraduate studies, I remember a professor saying that students learn to read in the primary grades, and as they get older, they read to learn. As a fifth grade special education teacher, this statement enters my mind daily as I step into the classroom and prepare reading lessons that focus on the instructional levels and individual needs of the students I teach that continue to struggle with reading.

I believe that classrooms today are filled with students with diverse abilities and needs, and because of this, individualized reading instruction is very important. Durkin’s study (1979) found that across America in grades three through six, comprehension is assessed, but rarely taught (Palumbo and Loiacono, 2009). Teaching students comprehension strategies and choosing high interest reading material that will keep students motivated to want to continue reading can be difficult, but it is extremely important. Data gathered from the National Assessment of Educational Progress indicates that the number of students reading at or above the basic reading level has decreased from 80% in 1992 to 73% in 2005 (Palumbo & Loiacono, 2009). There are numerous interventions, resources, and programs that focus on reading comprehension, but what works best? It does not matter how well
individuals can read the words off of the page; if they do not understand what is written, then how are they going to learn?

Even before 2005, reading deficits have been evident throughout the United States. In 1997, Congress asked that a panel be created to assess the current research on reading instruction and the numerous approaches used to teach children to read (National Institute of Child Health and Human Development, 2000). According to the document published by the National Reading Panel in 2000, the five best-practice domains for reading instruction are as follows: phonemic awareness, phonics, fluency, vocabulary, and text comprehension. Numerous research-based studies were reviewed by the National Reading Panel using strict methodological guidelines, and the following themes for text comprehension were found. First, in order to comprehend what is being read, the reader must have had vocabulary instruction. Without vocabulary instruction and development, the reader will be unable to participate in this cognitive process. Second, while reading, the reader must be actively engaged in thought and mindful of what he or she is reading. Finally, in order for students to be successful in using reading comprehension strategies, teachers must actively seek out reading comprehension strategies and be competent in teaching the strategies (National Institute of Child Health and Human Development, 2000).

Teaching reading comprehension has many components. When students learn comprehension strategies, they develop the skills needed in order to independently and automatically carry out the reading strategies. This teaches the students to be thoughtful readers and ultimately improves their reading
comprehension. Therefore, reading comprehension instruction is critical not only for the success of the student in reading class, but across all of the content areas.

Problem Statement

As a fifth grade special education teacher, it is my job to modify grade level material to accommodate and meet the needs of the exceptional learners I teach. The students I focus on throughout the day range in ability and have numerous strengths and areas in need of improvement, each one a little more different than the other. In my opinion, reading is the most important time of the day, but also the time when my students struggle the most. This sense of frustration and exasperation does not just occur while the students are in my room for reading group, but while they are in math trying to read the Student Reference Journal, in language arts when they are trying to read the fifth grade shared reading story, in social studies when they are reading the textbook, and in science when they are reading their experiment workbook pages.

My students struggle with reading every day, and they are faced with the obstacles of having to read. It is important for me to modify the reading material so that it is at their reading level, but does not compromise the content. I am also faced with the challenge of bringing these struggling readers up to the grade level reading standards. With this challenge, it is important for me to create engaging, motivating, and highly effective reading instruction at my student’s independent level and teach them the strategies necessary to be able to read and comprehend on their own.

This past fall, an interactive whiteboard was installed in my classroom. The interactive whiteboard, also known as the SMARTBoard, is an educational technology tool that has a wide range of capabilities. So far, the interactive
whiteboard has been a wonderful tool utilized across all content areas. It has been useful in social studies when teaching latitude and longitude, in language arts when researching about the Presidents, and additionally, it has been a wonderful way to show the life cycle of a plant during science. During my reading group, I have used the interactive whiteboard to scan in our Daily Language Review worksheets so that we can go over as a whole group the editing lesson. I also post our center rotations on the interactive whiteboard and use the board to review spelling words. I have yet to use the interactive whiteboard as a tool to teach reading comprehension. It is very exciting to have such a wonderful piece of technology located in my classroom and for my use every day; however, up until now, I have not had the opportunity to maximize the whiteboard in my instruction of reading. My goal is to use the interactive whiteboard to create creative and engaging experiences that get my students “hooked” on reading and wanting to read. Ultimately, I want to use the interactive whiteboard as a tool to teach reading comprehension strategies in order to improve my students’ reading comprehension.

Significance of the Problem

This study is important to me because it will hopefully show improvements in students’ reading comprehension and their ability to use reading comprehension strategies independently. This will not only benefit my students while reading books in reading class, but across the content areas. By integrating technology into the instruction of reading comprehension strategies, students will be better prepared for the 21st century because of the skills they have gained from interacting with the technology. This study will also allow me to be a reflective teacher and improve my
own instructional methods and the way that I teach. More importantly, it will help me meet the demands of a classroom filled with diverse learners.

*Rationale*

This study will not only help my students improve their comprehension of the texts they encounter, but it will also provide me with important information about the instructional approaches I choose to use to teach reading comprehension strategies. This will help me focus my instructional techniques, which will ultimately impact my students because their instruction will become more individualized based on their needs.

This study will also allow me to share the results, strategies, materials, and resources with my colleagues. This information is not only pertinent for the other special education teachers in my school district, but also the general education teachers, reading specialists, speech and language pathologists, principals, and curriculum coordinators. Not only might this study improve the instructional practices and methods of the teachers at school, but also provide information for parents and what they can do at home to practice reading comprehension strategies with their students. This home-school connection would provide students with consistency and practice on a daily basis. With a strong home-school connection and additional practice of the strategies at home, students will hopefully begin to use the strategies automatically. Of course, this optimistic view of the impact may not happen immediately, but with consistent comprehension strategies being taught throughout the school, year after year, the likelihood that students will begin to use these strategies automatically and outside of school becomes greater.
Definition of Terms:

**Reading comprehension**: the ability to read and understand the meaning of a given text

**Comprehension strategies**: methods or plans to aid comprehension, including (but not limited to) questioning the text, wondering about the text, noticing something about the text, picturing something about the text, predicting what is going to happen next, etc.

**Exceptional learners**: students who exhibit diverse needs in a classroom setting and may be receiving special education services or gifted and talented instruction based on their abilities

**Educational technology**: technology that is used as an instructional tool

**Interactive whiteboard**: a wall-mounted interactive display that is connected to a computer and projector where the user uses a finger or pen to write or interact, also known as a SMARTBoard or Promethean and often referred to in this study as an IWB

**Before-reading activity**: a pre-teaching activity that occurs before the student read the book, this activity may include an introduction to the topic, discussion about background knowledge, vocabulary lesson, introduction to the strategy and skill going to be used while reading

**During reading activity**: an activity that occurs while the student is reading the book; this may include stopping to write a question on a Post-It® note, noticing clues in the text, talking with a partner about a connection that may have been made, etc.
**After-reading activity:** an activity that occurs after the student has read the book, this may include practicing the skill or strategy taught, writing a journal entry, drawing a picture of what occurred in the story, writing an alternate ending, etc.
Chapter II: LITERATURE REVIEW

Reading Comprehension

As language and communication have developed and become more complicated throughout the years, the ideas of reading comprehension have emerged. Researchers Dewitz, Jones, and Leahy (2009) cited several past studies about reading comprehension skills, strategies, and programs. According to Gray (1925) as cited in Smith (1986), 19th century authors suggested that readers should answer reading comprehension questions or state the main idea of a passage after it has been read. The ideas of teaching reading comprehension skills surfaced during the 1930s and 1940s when teachers were asked what their students needed in order to comprehend content material. In a study by Chall and Squire (1991), the researchers stated that by the conclusion of World War II, the repertoire of reading comprehension skills had increased, and specific comprehension instruction started to occur. From there, the use of core reading programs increased and taught readers how to find the main idea, determine the author’s purpose, draw conclusions, distinguish between fact and opinion, and compare or contrast what was read.

It was not until the late 1980s and early 1990s that reading comprehension strategy instruction was integrated into basal reading programs along with the use of reading comprehension skills. Afflerbach, Pearson, and Paris (2008) differentiated between reading comprehension skills and reading comprehension strategies. The authors stated that reading comprehension skills are thought to be well-learned and automatic mental acts, and reading comprehension strategies are thought to require
controlled and intentional effort on the part of the reader (Dewitz, Jones & Leahy, 2009).

Over the years, many research studies about the effectiveness of reading comprehension skills and strategy instruction have been conducted. Before highlighting specific instructional practices as described in the research, it is important to first take a closer look at the findings of the National Reading Panel, as previously mentioned in the introduction. Although phonemic awareness, phonics, fluency, and vocabulary are all critical aspects to reading instruction, the focus here will be on text comprehension. The findings of the National Reading Panel break text comprehension down into four main parts: vocabulary instruction, text comprehension instruction, teacher preparation and comprehension strategies instruction, and computer technology and reading instruction (National Institute of Child Health and Human Development, 2000).

The research completed by the National Reading Panel posited that vocabulary instruction did lead to gains in reading comprehension; however, the methods of instruction used must be age appropriate and based on the ability of the reader. The panel also found that vocabulary instruction should be taught directly and indirectly, while repetition, multiple exposure to words, and learning within rich contexts are beneficial and enhance reading comprehension (National Institute of Child Health and Human Development, 2000).

In his study *Children's Immediate Understanding of Vocabulary: Contexts and Dictionary Definitions* (2007), Gardner looked at the ways children immediately understand vocabulary within the text they are reading. Gardner highlights the vast
amount of research about vocabulary instruction and states that there is some
evidence that a combination of two methods have a positive impact on vocabulary
learning. These methods include contextual exposure and dictionary definitions. The
results of the study conducted by Gardner showed that upper elementary students
were able to use contextual clues, dictionary definitions, or a combination of the two
to improve their immediate understanding of unfamiliar words. The study also
highlighted the importance of revised dictionary definitions that allowed students to
re-write dictionary definitions in a more meaningful way (Gardner, 2007). Gardner’s
study also emphasized the importance of taking students’ reading skills into
consideration. It was suggested that teachers adjust their vocabulary instruction in
order to appropriately meet the needs of their students. Therefore, using a
combination of both contextual exposure and dictionary definitions to improve
students’ vocabulary understanding may need to be considered.

The National Reading Panel also highlighted the research that focused on text
comprehension instruction. Through explicitly teaching students reading
comprehension strategies, reading comprehension skills can be improved and students
will be better equipped to actively problem solve and engage in thinking processes as
they are reading. With explicit instruction and teacher modeling, it is the hope that
students will relate to the ideas that they are reading in print and construct new mental
representations in their memory. The following are seven instructional strategies that
the study suggests improve reading comprehension for non-impaired readers: 1.)
comprehension monitoring, when readers are aware of the material they are reading;
2.) cooperative learning, when readers learn reading strategies together; 3.) the use
of semantic and graphic organizers; 4.) question answering, when readers answer
topics discussed in the reading and note important points; 5.) question
generating, when readers ask themselves questions about the text; 6.) story structure;
and 7.) summarization. The reading strategies learned will help students when they
encounter difficulties in their understanding of what is being read. However, the
National Reading Panel emphasizes the importance of finding out which strategies
are most effective for which age group, specific genres, and level of difficulty. The
panel also suggests that more information is needed about the ways to teach teachers
how to use and teach these comprehension strategies. It is also important to
recognize that teaching the comprehension strategies in the context of an academic
area is critical (National Institute of Child Health and Human Development, 2000).

A great resource for teachers is Nancy Boyles’ book entitled *Constructing
Meaning Through Kid-friendly Comprehension Strategy Instruction*. Boyles
emphasizes the importance of “teaching the reader, not the reading”. She states that
in order for students to improve their comprehension, teachers must teach them how
to think while they are reading (Boyles, 2004). This teacher-friendly book introduces
teachers to six reading comprehension strategies: connecting, picturing, wondering,
noticing, guessing, and figuring out.

However, before teachers can effectively teach reading comprehension
strategies, they must be prepared and competent with the strategies themselves.
Teachers must understand which strategies are most effective and which strategies are
used best for different content areas. The National Reading Panel compilation of
research studies over the past 20 years has found that first, teachers teach one strategy...
at a time and then teach several strategies in combination. This can be problematic if teachers are not skillful and proficient. The investigation led by the National Reading Panel highlighted two distinct approaches to reading comprehension strategy instruction: direct explanation and transactional strategy instruction. The direct explanation approach is when teachers explain explicitly the reasoning and mental processes involved in successful reading comprehension. Teachers do not specifically teach strategies, but help students view reading as a problem-solving task that utilizes strategic thinking. The transactional strategy approach is when teachers provide explicit instruction of thinking processes and facilitate student discussions. Together, the students then form joint interpretations of the text and acquire a deeper understanding of the mental and cognitive processes involved in comprehension (National Institute of Child Health and Human Development, 2000). In her text, Nancy Boyles also emphasizes the importance of teaching students about metacognition and what it means to think about thinking (Boyles, 2004). It seems important to note that if teachers are unable to think critically about what they are teaching, then students are going to be unable to think critically about what they are learning.

Finally, the National Reading Panel discusses the implications computer technology has had and will continue to have on reading instruction. The following computer functions have had a tremendous impact on reading comprehension: speech recognition capabilities, multi-media presentations, and the Internet. The panel focuses on the fact that computer technology cannot be studied independent of instructional content, and computer technology is not an instructional method.
Instead, computer technology is a tool by which instruction is delivered. Studies reviewed by the National Reading Panel found that there were positive results for speech to computer presented texts, the use of hypertext, where highlighted text is linked to an underlying definition, and the use of the computer as a word processor due to the fact that reading instruction is effective when combined with writing instruction. The panel still has many questions about the use of the computer technology and its instructional applications (National Institute of Child Health and Human Development, 2000).

In my opinion, vocabulary and text comprehension instruction are crucial in being able to comprehend text, but arguably, the most important aspects of reading comprehension instruction are the preparations made by teachers in utilizing strategies that are appropriate for their students and the effectiveness with which they teach the strategies. Without competent, well-trained teachers who understand their students’ needs, vocabulary instruction, text comprehension instruction, and strategy instruction are meaningless.

*Approaches to Reading Comprehension Instruction*

The National Reading Panel highlighted two reading comprehension instructional approaches, direct explanation and transactional strategy instruction; however, there are additional research studies that discuss other instructional approaches to teaching reading comprehension. McKeown, Beck, and Blake (2009) investigated two instructional methods for teaching reading comprehension: the strategies approach and the content approach. The study took place over the course of two years, and the goal of the study was to gain a better understanding of which
instructional method, strategies or content, enhances students’ comprehension of the
texts they are being taught. The study revolved around the before-reading, during-
reading, and after-reading framework. The focus of the study was on the during-
reading component, and the researchers investigated the strategies approach and the
content approach, while the basal reading curriculum was used as a control group
(McKeown, Beck & Blake, 2009).

The authors define the strategies approach to comprehension as the direct
teaching of specific procedures such as summarizing, making inferences, or
generating questions. The strategies approach encourages students to think about
their mental processes, execute strategies, and then use the strategies while reading
text. McKeown, Beck, and Blake highlight the research of Palinscar and Brown
(1984) that investigated the strategies approach and then developed reciprocal
teaching, an approach that directly teaches young students to apply strategies to their
reading. The transactional strategies instruction method also derives from past
researchers, Baron (1985) and Sternberg (1979, 1982), where teachers explicitly
explain and model the strategies for students and then use the strategies to guide and
model the text. These past researchers believed that by providing students with
strategies to employ while reading, their comprehension could be improved
(McKeown, Beck, & Blake, 2009).

In the article Shared Readings: Modeling Comprehension, Vocabulary, Text
Structures, and Text Features for Older Readers (2009), authors Fisher, Frey, and
Lapp describe the most common reading comprehension strategies that are modeled
by teachers: activating background knowledge, evaluating, making inferences,
summarizing, predicting, clarifying, questioning, visualizing, monitoring, synthesizing, and connecting. The authors also emphasized the importance of modeling more than one strategy and not just focusing on one strategy, as utilizing only one strategy at a time is not truly authentic to the process of reading, and incorporating multiple strategies teaches students to automatically use the strategies. Fisher, Frey, and Lapp (2009) also highlight the importance of following modeling with opportunities to practice and apply the strategies.

Kletzien (2009) describes in her article Paraphrasing: An Effective Comprehension Strategy how the strategy of paraphrasing can be used to monitor and increase comprehension. Students may be able to read fluently, accurately, and with appropriate rate and good expression, but if they are unable to retell what they just read, they will have difficulty answering questions about the text. Paraphrasing is when students make connections to what they already know by putting the content of what they just read into their own words. This is often confused with summarizing or retelling, but paraphrasing is different. When paraphrasing, students do not need to decipher between the important and unimportant details. They strictly put what they read into their own words. Meijer et al (2006), as cited by Kletzien (2009), stated that paraphrasing is the monitoring aspect of metacognition (thinking about one’s thinking). Paraphrasing the text allows readers to monitor their comprehension and encourages them to access what they already know about a topic. Paraphrasing makes it very clear that understanding is the goal of reading (Kletzien, 2009).

In a study conducted by Dewitz, Jones, and Leahy (2009), the researchers examined comprehension curriculum in five major core reading programs. The
researchers conducted the study to find out which skills and strategies made up core reading curriculums, how the core reading programs direct teachers to teach these skills and strategies, and whether or not the core reading programs were designed to follow the release-of-responsibility model that students learn to apply these skills and strategies. The foundations for this study have derived from the work of many other research studies that support the instruction of comprehension strategy instruction. Dewitz, Jones, and Leahy (2009) have summarized the works of many authors and have found that skilled readers do engage in strategic processing which allows students to engage in the process of comprehending.

Although the study suggests that using comprehension strategy and skill instruction can be beneficial, the researchers Dewitz, Jones, and Leahy (2009) did discuss limitations that were found in the study. For example, they found that the skills and strategies were not often clearly defined. Sometimes, the definitions of reading comprehension skills and strategies were interchangeable. The researchers also determined that the instruction in the core reading programs lacked guided practice with teacher modeling, lacked a time for students to practice the skills and strategies independently, and direct instruction was often missing a focus on thinking processes. Overall, the researchers found that the programs failed to teach the skills and strategies with the intensity research suggests.

In contrast to the strategies approach to teaching reading comprehension, the content approach is defined as focusing students’ attention toward the content of what they are reading and working through the text to create an understanding of the ideas through discussion. The content approach attempts to engage the reader in the
process of attending to ideas and building mental representations about the text without direct consideration of the mental processes being utilized. As the alternative approach to teaching strategies, the content approach has students constantly reading for meaning by organizing the important aspects of the text and relating them to a greater whole. The content approach works when students participate in collaborative discussion about the text focusing on a theme or relevant issue. Researchers have found that having discussions about texts can promote problem-solving, comprehension, and learning. When discussions occur, there is an increase in open questioning, student control of interpretive authority, more student talk than teacher talk, and teacher responses that are based on student responses (McKeown, Beck, and Blake, 2009).

McKeown, Beck, and Blake (2009) also discuss the limitations of both strategies. When utilizing the strategies approach, it is important to know which strategies to use and how to teach the strategies. The researchers have found that the different strategies and activities that are used to practice the strategies are not clearly defined. This makes it difficult for teachers to decide which strategies are going to be taught and how they are going to be taught. The effectiveness of the content approach greatly depends on the active participation of students in the discussion and on the quality of the discussion, as well as how competent teachers are in questioning and responding to student contributions.

The results of the study lead by McKeown, Beck, and Blake (2009) were consistent over the course of the two years. The researchers concluded that both of the instructional approaches provided adequate comprehension, and a small but
consistent pattern of difference occurred that favored the content approach over the
strategies approach. Although both the strategies approach and content approach
encourage active processing, it was discussed that strategy prompting did not lead
students to consider the text content directly, but was indirectly taking them first
through a strategy routine. In contrast, the content approach allowed teachers to
encourage students to express and integrate what they understood from the text by
selecting what was important and then connecting those ideas to build understanding.
However, the results do not provide teachers with the “right” way of how to teach the
strategies approach or content approach. The researchers were left questioning
whether student ability or cognitive functioning might affect the results. The results
of the study might have been different if the comprehension skill was measured when
a text was read independently by the student or after a certain amount of time had
passed.

As students enter the middle school grades, the emphasis on reading
transitions from learning how to read to reading in order to learn. As texts that
students are presented with become increasingly more difficult and content-rich,
students that struggle with reading become frustrated with the process. In the article
*Going Beyond the Fab Five: Helping Students Cope with the Unique Linguistic
Challenges of Expository Reading in Intermediate Grades* (2008), Fang discusses
how the five crucial aspects to the reading process (phonemic awareness, phonics,
fluency, vocabulary, and comprehension strategies) as identified by the National
Reading Panel focus on a set of basic skills that in the intermediate grades needs to be
elaborated on. In the article, the author compares and contrasts a primary text and
expository text in order to show the stark difference between the two. Fang discusses how in the expository text about Genes and DNA, background knowledge about everyday life is removed and there is no learning through social interactions. It was also discussed how when read silently, the expository text was more difficult to process and comprehend, and the language of the text sounded less like everyday language. In order to help students comprehend content-rich texts, Fang suggests providing students with specific instruction specifically for reading expository texts (Fang, 2008).

In the article *Four Facets of Reading Comprehension Instruction in the Middle Grades* (2008), authors Graves and Liang discuss the importance of providing middle school-aged students with age-appropriate instruction. Teachers are realizing that more and more of their students need additional support in reading, and in order to meet their students’ needs, teachers need to look beyond a primary grade curriculum. According to the authors, this age-appropriate instruction includes continuing instruction in vocabulary, a rich writing program, reading a range of fiction and non-fiction texts, and instruction in a variety of study strategies. Additionally, a strong comprehension program involving the following four attributes, fostering learning from texts, nurturing response to literature, teaching comprehension strategies, and promoting higher-order thinking are noted as important.

The authors suggest that in order to improve comprehension, these four components must occur. Students must understand the purpose for reading and must be given a “Scaffolded Reading Experience” with before, during, and after-reading
activities. The students must also be engaged in the reading and gather information in order for it to be meaningful. Students must be given explicit explanations of reading comprehension strategies, but then be given the opportunity to practice the strategy at an appropriate time. Teachers must also push students to think beyond the literal meaning of the text in order to have in-depth discussions and engage students with appropriate activities that focus on creative and practical thinking (Graves & Liang, 2008).

Prior to conducting my study, it was important to consider what would work best for my students in terms of reading comprehension. Based on the information I learned from the research studies, I decided that using strategy-based instruction to teacher reading comprehension would be beneficial for my students. I also decided that it would be the best way to meet their needs. When creating the four lessons for my study, I took into consideration the possible reading comprehension strategies and skills that I could teach. In each of the four lessons I created, a reading comprehension strategy and skill was taught using direct instruction. These skills and strategies helped guide my decisions in choosing appropriate after-reading activities that the students would complete using either paper and pencil or the interactive whiteboard (IWB).

Technology and Multimedia Learning

In preparation for my study, it was equally as important to research similar studies that have been conducted that involve technology and learning to help project what I might discover in my own study. Many of the studies I discovered consisted of research that took place in school settings unlike my own (e.g., higher education,
science classrooms, etc). The results of the studies researched were surprising and
not what was expected when one considers the impact technology could have on
learning. Although these studies were not within the context of my study, useful and
insightful information about the impact of technology on learning was gathered and
synthesized to fit the circumstances of my study.

One study that has been conducted regarding multimedia learning is Richard
Mayer’s *Multimedia Learning: Are We Asking the Right Questions?* In this study,
Mayer discusses his Generative Theory of Multimedia Learning, a theory that stems
from the idea that learning is meaningful when learners select relevant information,
organize the information, and integrate what was just learned with previously learned
information. Mayer uses the ideas of dual coding theory to explain that learners
process using two different information systems, a visual system and a verbal system
(Mayer, 1997).

In the study, Mayer defines multimedia learning as “presenting explanations
visually as well as verbally” (Mayer, 1997, p. 1). Learners engage in multimedia
learning when they are presented with information in more than one way, for example
pictures and words (Mayer, 1997). Mayer looked at multimedia as both “presenting
computer-generated animations synchronized with computer-generated narration” and
“presenting illustrations next to corresponding text” (p. 1). At the close of his study,
Mayer notes that there is still research left to be done on how technology impacts
students’ learning, stating that “[t]he potential for computer-based aids to learning
remains high, although the current contribution of technology to pedagogic
innovation is frustratingly low,” echoing his earlier sentiment that the results of his
study “do not provide strong evidence of media effects” (p. 7) However, he does highlight some important theoretical concepts about the Generative Multimedia Learning Theory and explains that captioned illustrations and narrated animations help learners choose relevant visual and verbal information that aid in the organizing process when creating cause-and-effect relationships among the processed information. It is the hope that because educational technology usually consists of some kind of graphic (visual) and auditory (verbal) combination, students’ learning will be impacted due to the fact that the multimedia technology can help organize cognitive processes, though the study does not prove this positive impact.

Another multimedia-related study conducted by McTigue (2009) took the principles of Mayer’s multimedia learning theory and applied the ideas to students in the middle grades when reading science texts. Unlike Mayer’s study, McTigue’s does not directly discuss technology as a form of multimedia, but the findings of the study can be interpreted with technology in mind.

The main purpose of the research was to see if middle grade students’ comprehension of science text was impacted due to the use of diagrams within the text. Students were provided with text either about life-science or physical science. These texts were then manipulated: some had no illustrations while others had illustrations with parts labeled. Still others had illustrations with major process descriptions, and some consisted of illustrations with labels and descriptions.

Students then either read standard text or text that cued them to access the diagrams. The results of the study indicate that the diagrams in science texts did not benefit students’ comprehension. McTigue recommends that in order to truly help
young readers that struggle to comprehend text, it is important to continue to
research the multimedia learning theory using younger populations and within the
setting of the classroom. As demonstrated by Mayer’s study, continuing research in
multimedia learning should explore the potential impact of technology.

Yılmaz-Soylu and Akkoyunlu (2009) conducted a study that investigated the
effect of learning styles on achievement in different learning environments. The
authors of the study used both Kolb’s Learning Style Model and Mayer’s Generative
Theory of Multimedia Learning as a framework for their research. The research was
focused around three major questions: 1.) What is the effect of learning styles on
success in text-based learning environments? 2.) What is the effect of learning styles
on success in a narration-based learning environment? 3.) What is the effect of
learning styles on success in computer-mediated (narration + music + text + static
picture) learning environments? The results of the study found that the achievement
of students in different learning environments is not affected by the different learning
styles of the students. However, the authors of the study do point out that it is not the
type of media being used in the learning environment; it is the time and place of the
media use that is important.

Across these three studies, the dominant theme is that multimedia/technology
does not impact students’ learning, a surprising conclusion based on the fact that
technology is “up-and-coming” and widely used in today’s classrooms. Because
technology is the most popular form of multimedia today, it is important that more
research take place in this domain, especially considering McTigue’s point that
elementary school-aged children have not been researched as a population. In order
to better influence teachers’ instructional practices, it is important that such research takes place. Based on these conclusions, then, a logical thought of teachers could be why bother incorporating technology in the classroom? However, these studies did not include other important aspects of learning such as the emotional aspects, motivation, engagement, attention, etc.

Impact of the Interactive Whiteboard on Student Learning

As pre-service teachers complete their program requirements, they learn about the educational theories and best practices for delivering instruction. There are a variety of methods and techniques that teachers can employ in order to create meaningful learning environments. It is then the decision of the teacher, based on his or her knowledge of his or her students, to decide how the instruction will be delivered. These instructional activities should be engaging, meaningful, and highly motivating, especially when teaching students who struggle with reading.

With an increasing amount of educational technology becoming available to teachers, these educational technology tools are becoming more popular. However, it is important for teachers to understand both the positive and negative impact that the educational technology, specifically the interactive whiteboard, can have on students. The following research studies and case studies aim to understand how the interactive whiteboard influences the instructional practices of teachers and how the technology impacts students’ learning.

Shenton and Pagett (2007) investigated how interactive whiteboards (IWBs) were being used in primary classrooms for teaching literacy in England. Teachers were observed using the IWB during a literacy lesson. Following the lesson, the
teachers were interviewed about the current lesson and previous lessons taught using the IWB. Students were also interviewed about their perceptions on using the IWB during the lesson. The researchers were mostly interested in finding out how the IWB was used in primary school literacy classrooms, how the IWB use was being supported and resourced in the primary school literacy classroom, how IWB use was impacting classroom practice, and which area(s) of literacy practice the IWB impacted the most.

The qualitative study found that teachers were using the IWB in a variety of ways in their literacy classrooms. Three specific examples from the study include how teachers were able to prepare split screens that provided students with scaffolded and modified writing tasks. Teachers were also able to use “SMART Tools” to highlight text on the IWB in color or magnify the text in order to provide a more visually appealing display. Finally, teachers were able to get their students interacting with the board by coming up to write a sentence or participate in a game that was being played (Shenton and Pagett, 2007).

The study also found that many of the teachers participating in the study had little training in using the IWB. The training that the teachers had completed consisted of a brief overview of the basics by a representative from the company that installed the IWB. Most of the teachers were creating their own materials day by day, and only one school had established specific support in using the IWB set-up for the teachers. However, when asked about the impact of using the IWB on their teaching, one teacher responded by saying that the IWB was “allowing me to experiment, to be creative” (p.132). Teachers also noted that IWB use was effecting
their students’ motivation toward learning. Specifically, “[o]ne teacher described her pupils as being ‘totally motivated, totally interested and focused’ when she taught using the IWB” (p. 133). Another teacher discussed how the IWB was appropriate for “visual learners – it helps them remember more, maybe it helps them understand more” (p. 133). The results also indicated that students themselves felt motivated to learn. The students participating in the study described their experiences as enjoyable, exciting, and fun when using the IWB. The students also commented on how the IWB allowed them to see and hear better because of the enlarged screen and amplified sounds (Shenton and Pagett, 2007).

Overall, the results of the study show that the IWB supports classroom literacy instruction as well as a cross-curricular approach. The study also found that the IWB raises the level of student engagement and that the “IWB can offer a multimodal approach to teaching literacy” (p. 134). However, it is important for teachers that use the IWB in the classroom to create lessons that give students the opportunity to engage with the IWB in order to maximize student motivation, engagement, and learning.

In another study that focused on the use of the IWB in a primary classroom, the researcher recorded her experiences using the IWB through a self-study. Through the use of journaling, artifacts, daily lesson plans, video footage, and email correspondence, Hodge was able to gather insight on the challenges and difficulties in using an IWB in the classroom, what ways in which the IWB impacted her ways of teaching, and what personal observations were made of the impact on learners in her classroom (Hodge and Anderson, 2007).
Hodge and Anderson (2007) highlight the positive and negative outcomes of using the IWB in a primary school classroom. Hodge describes how her students were captivated by the IWB and notes that it held their complete attention. She suggests that this might be due to the fact that images are enlarged and games are more interesting because they are interactive. She also notes that students were able to learn and practice a variety of skills such as Interactive Classroom Technology (ICT) skills, thinking skills, software applications, and general learning skills (e.g., note-taking). Through access to the World Wide Web, these skills were worked on and practiced simultaneously and spontaneously. Hodge also discussed how the use of the IWB impacted her overall teaching. The IWB served as an effective tool in her daily planning. She was able to find better visual resources and found that she was more thoughtful in constructing lessons, and the IWB supported learning in small groups or independently when a skill needed to be re-taught.

On the other end of spectrum, Hodge and Anderson (2007) found that due to limited training in using the IWB, most of the activities using the IWB involved the teacher manipulating the board. She also noticed that when using the IWB, students were sitting for longer periods of time and that the electronic books took longer to get through than regular big books. She mentions that the IWB should not be used for whole group managing and that teachers need to be conscious of time frame and level of engagement for each lesson. With regard to her use of the IWB, Hodge states: “As I became more skilled, I turned my attention increasingly to the children’s access to the IWB” (Hodge and Anderson, 2007, p. 276).
As in the Shenton and Pagett (2007) study, Hodge and Anderson (2007) also highlight some of the same positive and negative aspects to using the IWB in the classroom setting. Both indicate that students’ motivation to learn and increased attention are positive effects on students’ engagement and learning. However, both point out that it is important that teachers be trained on how to use the IWB effectively and that when creating lessons that use the IWB, it is important to make sure that students are involved and interacting with the board. Using the board as a whole group teaching method with the teacher manipulating the board might not be the most effective way to increase student learning.

In a case study published by SMART Technologies in March 2006 entitled *Interactive Whiteboards and Learning: Improving Student Learning Outcomes and Streamlining Lesson Planning*, some of the same themes emerge in supporting how the interactive whiteboard can impact student learning, including by raising the level of student engagement, increasing motivation, and promoting enthusiasm for learning. This case study includes research from the United States, the United Kingdom, and Australia.

The study begins by offering suggestions of how the IWB can be used in the learning environment. These suggestions include the following: manipulating text, making notes in digital ink that can be saved and accessed again, viewing websites as a group, demonstrating the use of software, creating digital lesson activities with templates, images, and multimedia, writing notes over educational video clips, showcasing student presentations, and using presentation tools that are included with the whiteboard software that can enhance learning materials. The case study
emphasizes how the IWB allows the entire class and teacher to remain engaged as a group unlike computer stations where students are engaged in an isolated situation. The IWB provides a large hands-on space that everyone can see at the same time. It also allows for the development of classroom activities that are engaging, which leads to greater focus, participation, and interaction, ultimately improving student learning (SMART Technologies, 2006).

This case study also discussed the impact that the IWB can have on teaching students with diverse learning needs and learning styles. Researchers from the United States commented on how the IWB helped the multi-sensory learning needs of students. Some of these examples include visual learners benefitting from the opportunity to manipulate pictures and symbols, while kinesthetic and tactile learners benefitted from being able to touch the IWB and move around. Visually impaired students were able to manipulate objects because of the enlarging objects capability. The use of multiple senses when interacting with the IWB extends students’ level of engagement, which leads to deeper understanding (SMART Technologies, 2006).

The case study Applying SMARTBoard Technology in Elementary School Classrooms: Investigation of a School-Wide Initiative, by the Health and Education Research Group: Faculty of Education at the University of New Brunswick (2008), also took a closer look at the impact of the interactive whiteboard on students’ learning. This was a school-wide initiative that looked at the use of the IWB in elementary classrooms in grades Kindergarten through five. This initiative was implemented in five phases. Phase one included the installation of the IWBS into classrooms. Phase two was the development of a conceptual framework for the
project. Phase three included the organization and execution of data collection activities. Phase four included the analysis and synthesis of project data. Phase five included the preparation of the final project report. Results from the report came from three key areas: the focus group interviews, classroom interviews, and post-initiative educator surveys. The results for each of these areas will be discussed separately.

The focus group sessions served as a way for researchers to gain insight and feedback from teachers on the implementation and outcome of the initiative. During the initiative, two focus group sessions occurred in an interview style format. From the data collected, the following themes surfaced:

1.) Project Readiness: Diverse Needs and Strengths Related to Technology – Teachers felt that at the beginning of the initiative, some teachers had no background, training, or experience in using the IWB and others did have background, training, and experiences in using the IWB. Teachers noted that having access to the IWB in the classroom allowed them to collaborate, share, and actively participate in the initiative.

2.) Skill Enhancement with SMARTBoard Technology: Individualized Tutorial Support and Staff Membership – Teachers were able to practice their skills due to the individualized tutorial training that was offered.

3.) Best Practice Orientation and Professionalism – With all staff members participating in the initiative, collaboration allowed innovation and change to occur in improving best practices and student learning.
4.) Changes in Instructional Practices – The following changes were highlighted as a result of having an IWB in the classroom every day: increased use of online resources and other educational technologies, demonstration of student learning using the SMARTBoard (e.g., multimedia presentations), increased use of virtual and interactive methods, timely responses to information gaps and student questions (being able to immediately access online material), enhanced professional motivation and innovation, impact on student learning (increased engagement of all students in learning activities, increased academic engagement of students with specific learning needs, enhanced student knowledge and use of technology) (University of New Brunswick Health and Education Research Group, 2008).

Throughout the initiative, three observations occurred. These observations were across grade levels and subject areas. The observations usually lasted between 15 - 30 minutes. The results from the observations highlight six major findings:

Learning Routines and Interactions – In the majority of the classrooms visited, well-developed and structured classroom routines were present in conjunction with the SMARTBoard activities. This promoted a pro-social learning environment that taught students behaviors like turn-taking. A wide variety of classroom arrangements were also utilized such as traditional rows, small grouping flexibility, or stations. The researchers noted that when desks were set up more traditionally, the SMARTBoard was used more like an overhead projector.

Curriculum-focused applications were also noted in the research section. The researchers found that primary grade classrooms used the SMARTBoard to develop reading fluency through cooperative reading. Numeracy strategies were also
enhanced by using multi-sensory approaches with the calendar, time, and odd and even numbers. Also in the primary grades, it was noted that vocabulary and grammar skills were reinforced and aided by visual cues.

When teachers transitioned from one curricular topic to another, it was done effortlessly with the use of the SMARTBoard. It was also noted that with the use of the SMARTBoard in the classroom, teachers were “‘making the most’ of a teachable moment” (p. 14). Student Attention and Engagement during Learning Activities was also noted in the results section. Researchers found that across all grade levels, students had positive responses when lessons were presented in the style of a webpage, the SMARTBoard delivered and supported learning activities that incorporated both visual and tactile methods, and the SMARTBoard sustained student attention compared to a teacher-led demonstration. The researchers also found that students’ attention in the earlier grades was sustained longer because teachers used the SMARTBoard as a tool to randomly choose students to answer questions.

The last finding dealt with Students with Specific Learning Needs. Throughout the classroom observations, researchers found that students with challenging learning needs were often working with a teaching assistant on an independent task while the class interacted with the SMARTBoard. It was also found that SMARTBoard activities that omitted multi-sensory learning components were identified as not effective for engaging students with evident attention and behavioral difficulties (University of New Brunswick Health and Education Group, 2008).

The final area that was reported on included results from the Post-Initiative Educator Surveys. The survey consisted of both open-ended questions and rating
scale questions. By the end of the initiative, 90% of the teachers felt confident in their use of the SMARTBoard as an instructional tool in their classrooms. 95% of the teachers reported that they used the SMARTBoard daily in their lessons to present instructional content or to engage students in learning. When discussing instructional benefits, 81% of the teachers strongly agreed that students are more engaged in the learning process when the SMARTBoard is used, and 71% of teachers strongly agreed that their ability to teach is enhanced via the SMARTBoard. About 75% of the teachers strongly agreed that SMARTBoard technology should be part of an overall framework for better practices in inclusive education. The final section of the survey looked at teachers’ ability to differentiate instruction. When asked if access to SMARTBoard technology has enhanced their ability to differentiate instruction, 52% of the teachers reported “very much” (University of New Brunswick Health and Education Group, 2008). Based on the results from these three key areas, it can be concluded that using the IWB or SMARTBoard can greatly impact the way that teachers teach and the way that students learn.

The results from these research-based studies and case studies show that the use of IWBs can have a positive impact on how teachers are able to create meaningful, engaging, and interactive lessons that can meet the diverse learning needs of all students. The studies also show that because the IWB provides students with a multi-sensory experience, students are more engaged during the lesson and are better able to pay attention. The use of the IWB in the classroom also improves students’ motivation to learn. Motivation is a critical aspect to the learning process. If
students are not motivated to learn, then no matter what is being taught or how it is being taught, the chances of students thriving is decreased.

Many of the studies highlighted the positive way that the IWB can impact students’ learning and the way teachers teach, but it is equally important to consider the ways that the IWB could potentially limit students’ learning and teachers’ teaching. The studies and case studies emphasized the importance of teachers receiving proper training and professional development on how to use the technology; this way, valuable teaching time will not be taken away because of problems when utilizing the technology. This training and professional development would also provide teachers with time to prepare appropriate and meaningful lessons for their students. The studies also discussed the importance of not using the IWB for whole group teaching for extended periods of time. Many of the studies noted that the IWB was more effective when the students were actually interacting with it. It is important for teachers to be aware of these concerns in order to prevent similar issues from occurring in their own classrooms.

As the teacher and primary investigator of this research study, it was important for me to consider the information learned about the uses of the IWB in the classroom and the impact that the technology has on student learning. When creating my own study, it will be important for me to keep in mind some of the aspects of the IWB that have proven negative. For example, it will be extremely important that I allow my students to interact with the IWB and that I do not just stand in front of the classroom and do all of the interacting. My students will need opportunities to
interact with the whiteboard themselves, and the activities I create should revolve around student use. My research study was created with these ideas in mind.
Chapter III: APPLICATIONS AND EVALUATIONS

Introduction

This research study entitled *Analyzing the Impact of the Interactive Whiteboard on Reading Comprehension Strategy Instruction and Student Learning* was conducted to determine what effect technology has on students learning and using reading comprehension strategies. More specifically, strategies were taught and applied using both paper-and-pencil tasks and the interactive whiteboard (SMARTBoard). Another important aspect of this study was to find out if integrating technology into reading comprehension instruction improves students’ reading comprehension and motivation to learn reading comprehension strategies. By using the SMARTBoard as an instructional tool, students were provided with a different mode for practicing the reading comprehension skills and strategies taught in class. Through the utilization of the SMARTBoard as an engaging and motivating tool, the study will hopefully show that students will be able to apply the skills and strategies that they have learned in class through guided practice on their own when they are reading independently and that it will ultimately improve their reading comprehension.

Participants

The study took place in a rural school district thirty minutes south of Rochester, New York. The participants in the study consisted of six fifth grade students between the ages of ten and eleven. All six of the students had an Individualized Education Plan (IEP) and received special education services groups throughout the day for English language arts. The six students were part of two
separate inclusion classrooms in the fifth grade. The study took place during reading group time. Reading group occurred every day for an hour. The primary investigator (special education teacher) taught the reading group consisting of ten students total. Throughout the study, a teaching assistant was also present. The six participants throughout the study will be referred to as Student A, Student B, Student C, Student D, Student E, and Student F.

Procedures

The six participants in the study were split into two groups of three. Both groups were read the same story, taught the same lesson about a reading comprehension skill and reading comprehension strategy, and participated in the same activities before and during reading. For example, before reading the story, the teacher asked the students to predict what they thought the story was going to be about based on the title and the picture on the front cover. The teacher also taught the students vocabulary words that were going to be in the story. A mini-lesson about the reading comprehension strategy and skill was also taught before the story was read. During reading, the teacher modeled how to use the comprehension strategy that was the focus of the day and discussed the comprehension skill at length using examples from the story. The students also had a worksheet to fill out that served as guided practice for the comprehension skill.

When the students participated in the after-reading activity and were focusing on practicing the reading comprehension strategy and skill, one group of three participants (Group 1 – Students A, B, and C) used the interactive whiteboard, and the other group of three participants (Group 2 – Students D, E, and F) completed a
worksheet or task that required paper and pencil. At the completion of the lesson and all activities, students were given the same assessment testing their reading comprehension and use of the strategy and skill.

This process took place four times with four different stories. Each time a new story was read, a new reading comprehension strategy and skill were taught. The two groups of participants switched roles each time. Each group was able to use the interactive whiteboard twice and complete an activity using paper and pencil twice.

*Instruments of Study*

Participants in the study were observed by the investigator during the after-reading activity portion of the lesson. The investigator took anecdotal notes while students were using the SMARTBoard or completing the paper-and-pencil task. The participants’ actions, reactions, and dialogue were noted during these observation times. Participants also filled out questionnaires pertaining to the use of the interactive whiteboard or the paper-and-pencil task at the completion of the lesson. The questionnaire consisted of four short-answer response questions. The participants completed a total of four questionnaires throughout the study. The purpose of the questionnaire (see Appendix A) was to gather insight from the students with regard to how the interactive whiteboard helped, motivated, or hindered them in their learning of reading comprehension strategies.

The participants also took a comprehension assessment (see Appendix B) based on the book read during the lesson. The participants took a total of four reading comprehension assessments. These assessments were created, in part, from the reading resource subscription website *Reading A-Z* at [www.readinga-z.com](http://www.readinga-z.com). The
leveled assessments were created by the company based on the story and consisted of ten multiple choice questions.

The participants were also part of two interview sessions. The interview consisted of specific questions related to the use of the interactive whiteboard or the use of the paper-and-pencil tasks during the lesson (see Appendix C). It was also geared toward understanding students’ feelings about learning and motivation when using the interactive whiteboard compared to the paper-and-pencil tasks. The interview was conducted by the investigator and took place in her classroom after school. Dialogue during the interview was recorded using an audio tape. All of the participants agreed to be a part of the interview and were taped. After the interview, the tapes were transcribed into notes to be used for the data collection process.
Chapter IV: RESULTS

The purpose of the study was to see what effect educational technology, specifically the interactive whiteboard, had on student learning of reading comprehension strategies and skills. Six fifth grade students were split into two groups and taught reading comprehension strategies and skills using four third grade level texts. Over the course of four weeks, students alternated using the interactive whiteboard and paper-and-pencil tasks to practice the reading comprehension strategies and skills that were taught.

At the end of each week, when the students had completed all aspects of the lesson including the before, during, and after-reading activity, each student took a ten question multiple choice assessment based on the book that was read. Each student’s assessment was scored. The average scores were found for Group 1 (Students A, B, and C) and for Group 2 (Students D, E, F) based on the weeks they used the interactive whiteboard and the weeks they used the paper-and-pencil tasks. Table 1, found on the next page, shows the averages for the weeks that the groups used the interactive whiteboard.
Table 1

Average Weekly Scores for Group 1 and 2 When Using the Interactive Whiteboard

<table>
<thead>
<tr>
<th></th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>63%</td>
<td></td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
<td>67%</td>
<td></td>
<td>53%</td>
</tr>
</tbody>
</table>

Table 2 shows the average weekly scores for the weeks the groups used the paper-and-pencil tasks.

Table 2

Average Weekly Scores for Group 1 and 2 When Using Paper-and-Pencil Tasks

<table>
<thead>
<tr>
<th></th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td></td>
<td>80%</td>
<td></td>
<td>63%</td>
</tr>
<tr>
<td>Group 2</td>
<td>67%</td>
<td></td>
<td>57%</td>
<td></td>
</tr>
</tbody>
</table>

According to Tables 1 and 2, Group 2 (67%) performed better than Group 1 (63%) on Week 1’s assessment after using the paper-and-pencil task. Group 1 (80%) performed significantly better than Group 2 (67%) on Week 2’s assessment after using the paper-and-pencil task. In Week 3, Group 1 (83%) performed better than Group 2 (57%) using the interactive whiteboard, while in Week 4, Group 1 (63%) performed better than Group 2 (53%) when using the paper-and-pencil task again. These results indicate that Group 1 performed better than Group 2 on the assessments
three out of four weeks, with Group 2 only performing better than Group 1 on the assessment one out of the four weeks.

When looking at Table 1 and Table 2, the results also indicate that three out of the four weeks, the group using the paper-and-pencil task outperformed the group using the interactive whiteboard. This occurred during Week 1 (Group 2 – 67% and Group 1 – 63%), Week 2 (Group 1 – 80% and Group 2 – 67%), and Week 4 (Group 1 – 63% and Group 2 – 53%), while during Week 3, Group 1 (83%) outperformed Group 2 (57%) while using the interactive whiteboard.

The following table is an overall average for both groups taken from students’ scores on the assessments. Each group has an overall average for the two weeks they used the interactive whiteboard and an overall average for the two weeks they used the paper-and-pencil task.

Table 3

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive Whiteboard Weeks</td>
<td>73%</td>
<td>60%</td>
</tr>
<tr>
<td>Paper-and-Pencil Task Weeks</td>
<td>72%</td>
<td>62%</td>
</tr>
</tbody>
</table>

When looking at Table 3, Group 1 outperformed Group 2 on the assessments when using both the interactive whiteboard and paper-and-pencil tasks. Group 1 had an overall average of 73% (63% and 83%) on their assessments for the weeks they
used the interactive whiteboard and an overall average of 72% (80% and 63%) on their assessments for the weeks they used the paper-and-pencil tasks. In comparison, Group 2 had an overall average of 60% (67% and 53%) on their assessments for the weeks they used the interactive whiteboard and an overall average of 62% (67% and 57%) on their assessments when they used the paper-and-pencil tasks.

Table 3 shows that there is a difference between Group 1 and Group 2’s overall performance on the assessments when using both the interactive whiteboard and the paper-and-pencil tasks. However, it is important to note that when comparing the overall averages for the assessments after using the interactive whiteboard and the paper-and-pencil tasks, the within-group differences are minimal.

After students had completed the assessment for the week, they then completed a four question questionnaire. The questionnaire had students write their responses. After analyzing students’ responses to the four questions, it was noted by the Primary Investigator that the information gathered was irrelevant to the current research study. As a result, the data collected from the questionnaires is not being included in this results section.

Students also participated in two interview sessions. The interview sessions occurred at the end of Week 2 and at the end of Week 4. The interview sessions provided students with an opportunity to freely discuss their views and opinions about using the SMARTBoard and the paper-and-pencil tasks. This was another medium through which the students could express themselves, as many of the students struggled with clearly explaining themselves in a written format. (See Appendix C
for the questions that were asked during the interview sessions.) The following were some of the responses during the interview sessions. Some of the responses were the same; therefore, only different responses are noted across both interview sessions.

**Question 1: What tools and resources do you need to be a successful student?**

Most of the students responded that paper and pencil was a tool or resource they needed every day in order to be a successful student, while some elaborated to say that their math journal, dictionaries, calculator, ruler, and protractor helped them be successful. Only two students mentioned that computers or the SMARTBoard was a tool that they needed to be successful.

**Question 2: If you had a choice between using the SMARTBoard or paper and pencil, which would you rather use? Why?**

Three out of the six students stated that they would rather use the SMARTBoard. The following responses indicate some reasons as to why they would like to use the SMARTBoard over paper and pencil. One student stated, “I get to touch things when answering questions.” Another student replied, “Because it helps you learn just like using a computer. [You can] use fingers and hand. It can talk to you — you can click on a question, and it will read to you. It makes font really big and the markers are colorful and you can change the color.” Another student stated, “It’s more funner. You get to draw on it.”

Two students stated that they would rather use paper and pencil over the SMARTBoard. One student stated that “[b]ecause sometimes when I work on the
SMARTBoard, lots of people are talking and I can’t concentrate and people mess around sometimes. Not all the time.” The other student stated that with paper and pencil, “[y]ou can get work done faster.”

The response of using both paper and pencil and the SMARTBoard was stated by one student. This student’s justification for using both forms was “you can still use your hands and fingers for both.”

For this results section, responses for questions three and four will be combined together.

**Question 3 and 4: Does the SMARTBoard help you learn? How does it help you learn?**

Five students responded “yes” that the SMARTBoard does help them learn, and one student responded “kind of”. Two students stated that the SMARTBoard helps them learn because “when you answer a question it can tell you if you are right or wrong”. One student stated that the SMARTBoard “helps me learn because you can do it with people.” One student gave the following response, “Say [the teacher] was up at the SMARTBoard, and she brought up [SMART] Notebook and she could teach us what we were learning, like fractions with not the same denominator. It helped me with a lot.” (Prompt by Primary Investigator – “Because of what?”) “You can write on it. It is bigger and you can see it better from your desk.”

**Question 5: Does the SMARTBoard help you pay attention? If so, how does it help you pay attention?**
Two students responded “yes” to this question. Their explanations revolved around the fact that they have to look at the SMARTBoard, and that helps them understand what they are learning. Three students responded “no” it does not help them pay attention. One student responded that the SMARTBoard did not help with keeping attention because “when people mess around I sometimes mess around too. [It’s] hard to concentrate.” The other student responded, “No. It’s really actually distracting when people are up at the SMARTBoard sometimes playing games. I like to just watch and then I don’t get my work done.” One student responded “yes and no” to this question. This student elaborated by saying, “It kind of does distract me. If someone is playing a game on the SMARTBoard, I tend to want to play it too. [It is not distracting because] it is interactive with kids. [The SMARTBoard] is not just writing – that gets boring after a while. You don’t have to just do work. You can play on it and get up and move around.”

**Question 6: Is the SMARTBoard distracting at any time?**

Four students agreed that the SMARTBoard was distracting. Three students cited their explanation from question five as their explanation for question six as well. One student responded, “Yeah, when people are playing on it and we are doing work. I like to look at it and not do my stuff [classwork].” One student responded that “sometimes” the SMARTBoard could be distracting. This student did not provide an explanation as to why the SMARTBoard was only sometimes distracting.

**Question 7: What do you like/dislike the most about using the SMARTBoard?**
One student stated, “I like the SMARTBoard because it is interactive with kids and adults. It helps you learn and at all ages you can learn on it. It’s really fun to play games, draw, and write. You can operate it with your hands or the computer.” Another student stated that “[y]ou sometimes get to play games and get to play with your friends. You are in a group and your friends are sometimes in your group.” Two students responded that they liked using the SMARTBoard when it was being used for math.

One student responded, “[I dislike the SMARTBoard] sometimes when it freezes up on you when you’re doing an assignment, or it shuts down when you are working on an assignment.” One student noted that “[s]ometimes, it’s kinda like frustrating when you click on something and it doesn’t work,” while another student mentioned that it can be frustrating when the SMARTBoard “freezes and shuts off.” One student also commented “I dislike [the SMARTBoard] when it distracts me and I don’t get my work done.”
Chapter V: CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to investigate the impact that educational technology, specifically the interactive whiteboard, has on students’ reading comprehension. The study analyzed students’ reading comprehension scores, motivation to learn, and willingness to use the educational technology compared to learning with and using paper-and-pencil tasks. With the installation of a SMARTBoard in my classroom this fall, I wanted to see if there was a difference in how students used and learned reading comprehension strategies and skills and if this new technology improved or hindered their reading comprehension. My goal was to determine what kind of impact the educational technology has on students’ learning.

After implementing four reading lessons, collecting data, and analyzing the data, the results of the study show that using the educational technology did not impact students’ reading comprehension scores based on the assessments given. When Group 1 (three students in fifth grade with exceptional learning needs) is compared to Group 2 (three different students in fifth grade with exceptional learning needs), Group 1 performed better on the assessments three out of the four weeks regardless of the instructional tools used: SMARTBoard or paper-and-pencil tasks. Since there was consistency in Group 1 outperforming Group 2, this result does not indicate that one method was better than the other. What this does indicate is that students in Group 1 were better at performing on multiple choice assessments than Group 2.

When I compared the assessment results within group, I found that both groups performed about the same when using both the SMARTBoard and the paper-
and-pencil tasks. The overall average for Group 1 when using the SMARTBoard was 73%, while the average was 72% when using the paper-and-pencil tasks. The overall average for Group 2 was 60% when using the SMARTBoard and 62% when using the paper-and-pencil tasks. Since the difference between the two methods is minimal for both groups, this indicates that neither method is better than the other when it comes to assessing students’ reading comprehension ability using multiple choice assessments.

What the results probably do indicate is that there was a difference between the make-up of the students in each group. In education, teachers cannot compare one student to another. Therefore, what might have impacted the groups’ performance on the multiple choice reading comprehension tests was not the fact that the group used the SMARTBoard or paper-and-pencil tasks, but that the learning profiles, needs, and abilities of each student within the group were different. The following are some of the factors that could have possibly impacted the difference between the groups’ performance: the students’ disabilities, cognitive development, academic achievement, prior exposure to the skills and/or strategies, background knowledge about the topic, motivation to learn, or want to perform well. These are only a few of the possible factors that could impact how a student learns, no matter what method or tool is being used.

Although the research did not show a difference in students’ reading comprehension scores when using the SMARTBoard compared to paper-and-pencil tasks, the interviews did show that there was an impact on student learning when using the SMARTBoard. The following themes were consistent throughout the
interviews with the six participants: the SMARTBoard helped students learn, motivated them to learn, was engaging, helped to focus attention, became a distraction, was user-friendly or difficult to use, provided social interactions, and provided positive learning experiences. It was not surprising that these outcomes were found because many of these same themes are similar to the outcomes discussed in the research studies and case studies mentioned in the literature review such as Shenton and Pagett (2007) and Hodge and Anderson (2007).

An interesting finding is how most of the students did not consider the SMARTBoard as a tool or resource they could use to help them learn, but they did consider paper and pencil to be a tool or resource they used and helped them be a successful student. This may be due to the fact that from the beginning of their school career and in every subject, students always use paper and pencil. It is ingrained in students that educational tasks must be accomplished using paper and pencil. Another factor that could influence this finding might be the availability of SMARTBoards in classrooms. Not every classroom that these students go into is equipped with a SMARTBoard. Therefore, because it is not used in every classroom, students may not consider it a tool or resource they could use as much as paper and pencil.

It was extremely evident based on the interviews that students felt that using the SMARTBoard was more fun than using paper and pencil. Many of the students commented that the SMARTBoard allowed them to pay attention better, learn better, or helped them stay motivated to learn. They stated that the SMARTBoard was bigger and easier to see, they could use their hands, and they got to work with their
friends while using the SMARTBoard. The students were eager to get started with the activity when they were able to use the SMARTBoard, and they could not wait to touch the SMARTBoard or push a button. While the students were using the SMARTBoard during the lesson, it was evident that they were very excited to see if they got an answer right. When the answer was given and they saw that they got it correct, together, they celebrated the accomplishment. I often noticed that the students in the paper-and-pencil task group (the group not using the SMARTBoard) would watch the students who were using the SMARTBoard and often asked the group using the SMARTBoard to be a little quieter because they could not concentrate while trying to complete the paper and pencil task.

From the teacher’s perspective, I noticed that when a group was using the SMARTBoard, students were more willing to help their peers with an answer or sound out a word if it could not be read. In the interview, some of the students mentioned that they liked the SMARTBoard because they got to work with their friends. Even if students were not with their friends in the group, the students still worked well together. It did not occur to me in the beginning of the study that the students would also be developing and practicing social skills as well. The students had to wait their turn, be respectful if someone else was talking, be understanding if someone could not read a word or got the answer wrong, and had to encourage each other to do their best. At times, I did have to intervene because many of the students would be standing right in front of the board, and then other students could not view the SMARTBoard. This never took more than a few seconds, and then they were back to their activity.
Some of the students also mentioned that the SMARTBoard could be distracting at times. I found it interesting how truthful these students were to admit that at times, the SMARTBoard prevented them from paying attention. I do not think that the students felt that the SMARTBoard was distracting when they were specifically using it within their group. They were mostly distracted when the other group was using the SMARTBoard. This shows that students are excited to use the SMARTBoard, and when they are not using it, they seem to wish that they could be. In my opinion, this shows that students are motivated to learn when they are able to use the SMARTBoard. However, I do recognize that as students become more familiar with the SMARTBoard and continue to use it on a daily basis, their eagerness and interest to use the SMARTBoard might disappear.

Based on the results of my study, I did not find that students’ reading comprehension improved from using the SMARTBoard. On the other hand, I did gather valuable information about implementing and using the SMARTBoard from a teacher perspective. I found, as much of the research suggests, that teachers do need proper training and continuous professional development on how to use and create lessons when using the SMARTBoard. It took me many hours to find appropriate websites that were for the specific skills I wanted my students to practice. To practice making inferences, I had the group using the SMARTBoard go to the following websites: http://www.studyzone.org/testprep/ela4/o/makinginferencep.cfm, http://www.studyzone.org/testprep/ela4/o/charactersfeelingsp2.cfm, and http://www.studyzone.org/testprep/ela4/o/inferencep.cfm.
These websites allowed the students to read a short paragraph and then answer three questions. The students were able to use the scroll-down box to choose their answers. The websites also told the students how well they performed on the quiz. They liked the instant gratification of knowing if answers were correct or not. To practice sequencing events, the students using the SMARTBoard went to the following websites where they could read 5 - 9 short sentences and then number the sentences in the correct order. When students completed the sequencing activity, if they got all of the answers correct, a picture would appear to tell the students that they won. The sequencing websites were:

http://www.quia.com/pp/3896.html?AP_rand=1147794840,
http://www.quia.com/pp/1305.html?AP_rand=912546984, and

I also used the website http://pbskids.org/arthur/games/storyscramble/scramble.html because this only had students sequence three events. If a student found five or nine events to be too overwhelming, this website allowed that student to still participate with his or her group, get to use the SMARTBoard, and practice sequencing.

To practice making predictions, the student using the SMARTBoard went to http://www.harcourtschool.com/activity_collections_preview/predict_outcomes/3_predict.html. This website had students read a short paragraph and then make a prediction about what was going to happen next. The students were able to choose from three choices. The students knew their answers were correct if they got a piece of the puzzle. As they continued to work through the paragraphs, the students were
trying to answer the questions correct so that they could continue to get a piece of the puzzle. The website would also read the directions to the students.

I also had to create the slides for the SMARTBoard which helped me teach the before-reading and during-reading portions of the lessons. I do realize that now that I have these materials and resources created, I will not need to spend the time creating them again. Once materials are created, it does not take much time to create lessons and activities using the SMARTBoard; it is just challenging initially to find time in otherwise busy school days to start the lesson creation process.

Overall, I gained insightful information into the learning profiles of my students. Some of my preconceived notions were broken once I began the lessons and saw the groups interacting with the SMARTBoard. Some of the students I thought would “love” using the SMARTBoard actually preferred to use paper and pencil because it was not as stimulating and was familiar. Some of the students felt that they could complete their work faster when using the paper and pencil. The students I thought would not like using the SMARTBoard gravitated toward the technology and liked the fact that they got to work with a small group. Even though I did not find that the SMARTBoard improved students’ reading comprehension by using the SMARTBoard to learn and practice reading comprehension strategies, I did learn that when used the correct way and with proper training, the SMARTBoard can be an influential tool that can impact the way students learn.
References


Applying SMART board technology in elementary school classrooms:


Appendix A

Student Questionnaire

Date: ______________________

Title of the Story: ________________________________

Reading comprehension strategy: ____________________________

Reading comprehension skill: ____________________________

1. How did you complete the after reading activity? (circle one)
   I used paper and pencil. I used the SMARTBoard.

2. How did you complete the activity?
   Explain how you used the paper and pencil, or explain how you used the SMARTBoard.

3. Did you like working with the paper and pencil OR the SMARTBoard? Why or why not? Explain.

4. How did using the paper and pencil OR using the SMARTBoard help you learn and practice the reading comprehension strategy and skill?
Appendix B

Reading Comprehension Assessments

First Day of School

Name ____________________________ Date __________________

Directions: Read each of the questions carefully and choose the best answer.

1. Who was Sarah?
   a. A new student at school
   b. Someone no one liked
   c. The new teacher, Ms. Parker
   d. Someone the principal liked

2. Why was Sarah nervous about the first day of school?
   a. She did now have new clothes
   b. She was new to the school
   c. She had not made any friends
   d. All of the above

3. Who did Sarah say really cared about her in the story?
   a. Kent
   b. The students
   c. Ms. Parker
   d. The teachers

4. Sarah had never been so apprehensive about school before. What does apprehensive mean?
   a. Happy
   b. Worried
   c. Confident
   d. Sleepy

5. How did Sarah’s stomach feel the morning school started?
a. As if she’d eaten unhealthy food
b. As if butterflies were inside it
c. As if her milk had gone bad
d. As if someone had made her laugh a lot

6. Why might Sarah have moved to a new house?
   a. To be close to Kent
   b. To be close to friends at school
   c. Because she started a new job
   d. Because she was not old enough to drive

7. What did Sarah do at school after the bell rang?
   a. She stood up and introduced herself to the class.
   b. She took her seat in the back of the class.
   c. She told everyone how nervous she was.
   d. All of the above.

8. What is most likely Kent’s relationship to Sarah?
   a. Kent is a teacher with Sarah.
   b. Kent is Sarah’s husband.
   c. Kent is the principal at Sarah’s school.
   d. Kent is Sarah’s dad.

9. What was wrong with Sarah’s clothes?
   a. Her skirt had creases down the sides.
   b. There was a brown stain on her shirt.
   c. The cuffs on her shirt were threadbare.
   d. All of the above.

10. Why might Sarah try to hide the waver in her voice when she introduced herself to the class?
    a. She wanted the class to like her.
    b. She did not want the class to know she was the teacher.
    c. She did not want the class to know she was nervous.
    d. All of the above.
This quiz is a product of Reading A-Z and has been adapted by Amanda Martin.

**Sweet Potato Challenge**

Name ______________________________ Date ________________

Directions: Read each question carefully and choose the best answer.

1. Why did Deon challenge LaTanya to a contest?
   a. To get her to make him some cupcakes
   b. To prove to her he was a good cook
   c. To see if she could cook anything
   d. To steal her recipes from her

2. Why did LaTanya set a timer when baking her dish?
   a. To wake her up from her nap
   b. So she would remember do to her homework
   c. To help her get the dish to her grandmother on time
   d. So she would remember to take the dish out of the oven

3. Which of the following steps did LaTanya take last?
   a. Measured the pecans
   b. Tossed the apples in a bowl
   c. Gently tossed everything together
   d. Packed the brown sugar in a cup

4. Why did Deon want to add chocolate chips to his pie?
   a. He told LaTanya his recipe had chocolate chips in it.
   b. He thought it would make his pie taste better.
   c. He thought the recipe called for them.
   d. He had bought them for the pie.

5. What is a tradition?
   a. A way of doing something
   b. A good thing to eat
   c. A new place to go
   d. A type of recipe
6. Why didn't either LaTanya or Deon care whose dish won the contest?
   a. They left early since they knew it would be a tie.
   b. They were too busy eating what they had made.
   c. They knew they would have another contest.
   d. They were getting ready to go out to dinner.

7. How did LaTanya's mother and Deon's father know each other?
   a. They were friends of Deon and LaTanya.
   b. They lived next door to each other.
   c. They were brother and sister.
   d. They were old friends.

8. Why did Deon want to make something with sweet potatoes?
   a. He made a sweet potato pie many times.
   b. He wanted to make his grandmother's sweet potato pie.
   c. He had a lot of sweet potatoes in his garden.
   d. All of the above.

9. What did LaTanya do before she put the dish in the broiler?
   a. Not watch the marshmallows melt
   b. Took the dish to Grandma's house
   c. Tried a bite of the sweet potato pie
   d. Arranged the marshmallows on top of the dish

10. Why did Deon think LaTanya's dish was better than his?
    a. There were marshmallows on top.
    b. It was Grandma's favorite recipe.
    c. She had put chocolate chips in.
    d. It had apples in it.

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The Little Fir Tree

Name ________________________________ Date ______________

Directions: Read each question carefully and choose the best answer.

1. When did the people come into the forest to take away trees?
   a. May
   b. Night
   c. Winter
   d. Summer

2. When did the fir tree feel lonely?
   a. When the family left the house
   b. When the family rushed past him
   c. When the family leaned him against a fence
   d. All of the above

3. What are adventures?
   a. Ways to travel far away
   b. When time seems to go very slowly
   c. Being determined and sure of oneself
   d. Activities that have risk and excitement

4. After the children opened their presents, what did they do?
   a. Played with their presents
   b. Drank hot chocolate
   c. Ate a big dinner
   d. Sang to the tree

5. What was the young fir tree’s wish?
   a. To be special
   b. To be an oak tree
   c. To laugh at other trees
   d. To be growing in a different place
6. Where did the people take the fir tree at the beginning of the story?
   a. To the mountain
   b. To the garden
   c. To their home
   d. To a store

7. What did the family put on the tree?
   a. Colorful lights
   b. Strings of popcorn
   c. Wood and glass ornaments
   d. All of the above

8. Why was the fir tree trembling while the people looked at him?
   a. He was nervous and excited.
   b. He wanted them to think he could dance.
   c. He wished they would go away and leave him alone.
   d. All of the above.

9. How did the fir tree feel in the spring when he was near the garden?
   a. Happy
   b. Worried
   c. Confused
   d. Disappointed

10. Which is not a reason the fir tree wanted to go back to the forest?
    a. He wanted to talk to the birds.
    b. He wanted to play in the snow.
    c. He wanted to tell the oaks what he had seen.
    d. He wanted to tell the evergreens what it was like to be with the family.

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Sharks

Name ___________________________ Date ______________

Directions: Read each of the questions carefully and choose the best answer.

1. Sharks are different from most fish because ________________.
   a. they have cartilage instead of bones
   b. they do not have scales on their bodies
   c. they grow teeth to replace lost teeth
   d. all of the above

2. Why is losing a tooth not a problem for a shark?
   a. When a shark loses a tooth, another tooth takes its place.
   b. Sharks don't get old enough to lose teeth.
   c. Shark teeth never fall out.
   d. Sharks die if a tooth is lost.

3. Which of the following is not a characteristic of most sharks?
   a. Good eyesight
   b. A powerful, streamlined body
   c. Several rows of sharp teeth
   d. A poor sense of smell

4. Why should humans not be afraid of whale sharks?
   a. Whale sharks only eat plankton.
   b. Whale sharks never come near shore.
   c. Whale sharks are afraid of people.
   d. Whale sharks only eat other sharks.

5. Extinction means _________________________________.
   a. being caught by a shark
   b. the balance of life in the sea
   c. the process by which a whole group of animals dies out
   d. hiding by blending into the surroundings
6. Which fin is on the back of a shark's body?
   a. Caudal fin
   b. Pelvic fin
   c. Dorsal fin
   d. Pectoral fin

7. Why do sharks sometimes bite electrical cables?
   a. Cables look like eels.
   b. Sharks hate electricity.
   c. Sharks are attracted to the electricity they sense in the cables.
   d. All of the above.

8. What is the main idea of the section of the book titled "Physical Description"?
   a. Even though there are many different kinds of sharks, they look similar in many ways period.
   b. The thresher shark has a long whip-like tail that it uses to kill or stun fish.
   c. Sharks are thought to be very dangerous to humans but actually do not attack humans often.
   d. Sharks eat many kinds of sea animals and plants, such as clams, crabs, sea lions, and plankton.

9. Why is it important that sharks continue to survive?
   a. Sharks eat many fish that are dangerous to people.
   b. Sharks are interesting for scientists to study.
   c. Sharks are important food for many people.
   d. Sharks are part of the balance of life in the ocean.

10. What is the main idea of this book?
    a. Sharks are interesting and unusual fish.
    b. Sharks can attack and eat many kinds of fish.
    c. Sharks are not found in all oceans.
    d. The swell shark can blow up its body up its body to protect itself.

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Appendix C

Student Interview Questions

1. What tools and resources do you need to be a successful student?

2. If you had a choice between using the interactive whiteboard/SMARTBoard or paper and pencil, which would you rather use? Why?

3. Does the interactive whiteboard/SMARTBoard help you learn?

4. How does the interactive whiteboard/SMARTBoard help you learn?

5. Does the interactive whiteboard/SMARTBoard help you pay attention? If so, how does it help you pay attention?

6. Is the interactive whiteboard/SMARTBoard distracting at any time?

7. What do you like/dislike the most about using the interactive whiteboard/SMARTBoard?