The Effects of Technology on the On-Task Behavior and Reading Achievement of 5th Grade Learning Disabled Students

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Abstract

The purpose of this study was to determine whether students benefit from technology embedded instruction, in terms of on task behavior and reading fluency. The measurement tools utilized were Voyager Passport level F running records. This study was quasi-experimental in design and involved the use of a pre-tests and post-tests to compare data from March of 2009 before the intervention was administered to data from June of 2009 after the intervention was complete. Gains in reading achievement were not significant. However, the perceived rate of on task behavior of students involved was greatly improved. Research in the area of technology and reading intervention should continue given the influx of tools available to students and teachers.

CHAPTER I

INTRODUCTION

By all accounts the United States of America is currently undergoing an economic crisis. All involved are looking for ways to cut back financially. Students are lagging behind other nations with regards to academic achievement, putting more pressure on schools to bring about great gains. At the same time, students with disabilities are being included in general education classrooms in record numbers. Therefore, the level of differentiation required is changing (Bempechat, 2008).

There are also generational factors to consider. Long gone are the skill and drill, textbook only lessons of yesteryear. Students spend a large amount of time each day being stimulated by video games, text messaging, the Internet and television. They seek similar levels of cognitive load at school in order to remain engaged. (Steere, 2002).

These two opposing factors create the need for a balancing act for school administrators. Administrators must determine the amount of technology needed, its benefit in increasing student achievement, and its cost effectiveness.

The research reviewed in preparation for this study shows mixed results in regards to the efficacy of technological intervention. Overwhelmingly, the quality of technology has proven more important than the quantity (Lei & Zhao, 2007). There is also much information regarding technology's relationship to student engagement and motivation but very little on its actual impact on reading. That said, if a student is engaged and on task during a lesson, he/she is most likely learning.

Special Education Students and Reading

Students with learning difficulties struggle with the prerequisite skills necessary to demonstrate lesson outcomes. Bempechat (2008) notes insufficient memory and listening comprehension skills, as well as problems with general organization and difficulty constructing realistic goals as characteristic of these children. Friend and Bursuck (2002) suggest that this often affects a student's ability to follow classroom directions, remain on task and manage his/her time.

Such issues can shape student experiences beyond the scope of language arts classes. Reading and writing are skills embedded in the other content areas as well. McCormick (2007) discusses the presence of "maps and graphs,…specialized vocabulary, …broad and abstract concepts,…[and] explanations of technical processes" (p.383) within social studies, math and science materials. Thus, students with learning difficulties have a higher probability of experiencing failure across subjects.

Ongoing and unilateral frustration with school can cause a vicious cycle of effort met with disappointment which can lead to decreased motivation. Students in such situations, at times appear unmotivated or lazy, which can in turn affect peer and teacher relationships not to mention self concept and generalization into a self fulfilling prophesy. The term "learned helplessness" is often applied to the common phenomenon resulting in students believing that they are incapable of succeeding (McCormick, 2007).

Technologies to Support Reading

With the onslaught of technology now available to reading educators, a new theory has been developed to describe its impact on learning processes. This theory is called "Cognitive Theory of Multimedia Learning." Schmid (2008), summarizes the theory by stating that multimedia, by definition, presents multiple forms of sensory and learning stimulation at one

time, and for students to find such presentations beneficial, they must interact with it. This includes activating prior knowledge and melding it with reflections on new concepts. While adding visuals and sounds to text can be helpful in the learning process, students can also experience cognitive overload as a result of too much stimulation given at one time.

Schmid (2008) further cited the research of Plass et al., which demonstrated that low-verbal and low-spatial ability students had a harder time recalling information presented in a multimedia format than did high-verbal, high-spatial students. Though no specific mention of learning disabled students or struggling readers was included, learning disabled students do tend to have problems with language-based activities and, therefore, may be part of the low-verbal group (Friend & Bursuck, 2002).

Schmid's (2008) personal investigation involved the use of an interactive white board in classroom activities. The study noted several benefits and pitfalls to educational usage of this technology. The benefits included increased student engagement, attention to task and class participation as well as support for multiple learning styles. However, some students experienced cognitive overload because of the pacing of information presented. In addition, some educators felt students were being "spoon-fed" information and were concerned that the lack of effort required to learn information would lead to lazy learners. The instructor involved in the study also noted that the hyperlinks embedded into instruction decreased his need to activate student participation.

Voyager Intervention Program

Much of the research used for this researcher's study suggested that fluency was the most important pre-requisite skill to focus on for increased reading achievement. This is because the more effort one spends on decoding, the less mental energy is available for comprehension. Better students decode individual words, and subsequently have a higher fluency rate. This fluency goal is the target skill for Voyager.

Voyager (Voyager Expanded Learning, 2007) is designed for students in grades K-5 who are 1 to 2 years below grade level in their reading achievement. The 5th grade focuses on expository text to prepare students for the reading found in content areas. Lessons are divided into two sections "Word Works" and "Read to Understand" and are embedded with decoding strategies, sight word vocabulary, repeated readings and basic comprehension. There are also extra practice opportunities provided for special education and at risk students.

Statement of the Problem

The purpose of this study was to investigate whether or not technology increases the on task behavior and reading achievement (fluency) of 5th grade students with learning disabilities.

Hypothesis

The on task behavior and reading achievement (fluency) of fifth grade learning disabled students will increase given technological intervention.

Operational Definitions

Learning disabled students in this study are defined as fifth graders whose disability affects their reading achievement, as noted on their Individualized Education Plans (IEP).

The *reading intervention* being utilized for this study is the Voyager Passport Program designed for grade 5.

The *technology intervention* used in this study comes in two portions. First is increased access to the "Ticket To Read" interactive website, provided by the Voyager program. In addition to the website, the technology intervention will include lessons on an interactive white board. Voyager scripts will be presented in the form of games, self-checklists and self-checking spelling tests for classes to work on together. Students will be asked to participate in board manipulation on a regular basis.

Reading achievement is measured by performance on running record assessments provided by, and as scripted by, the Voyager program administered pre, during and post adventures.

On task behavior is measured by teacher and student rating scales within the areas of eye contact with presentation materials, levels of following directions and responding to questions, as well as teacher prompting.

CHAPTER II

REVIEW OF THE LITERATURE

According to the North Central Regional Educational Laboratory (2008), current literacy research supports three components to the definition of reading. First, reading involves learning to pronounce written words. Next, it involves understanding what those words mean. Finally, part of this understanding must also include what meaning the reader brings to the text (i.e. prior knowledge). Obviously, there is much that goes on, or does not go on, throughout a person's life to encourage reading development. Much of this, however, comes embedded within the context of the classroom.

This said, it is widely believed that there are five key elements of reading instruction. These include "phonemic awareness, phonics, fluency, vocabulary and text comprehension" (Armbruster, Lehr & Osborne, 2003, p.iii).

The first skill listed, phonemic awareness, is the ability to manipulate sounds in spoken words. When exhibiting this skill, learners can identify, compare, and contrast sounds within a given word or set of words, blend separate sounds together and segment words into separate sounds. They can also deduce syllables in spoken words and produce or identify oral rhymes. (Armbruster, et. al., 2003).

According to the National Reading Panel Report (NRP) (Langenberg, et al., 2000), phonemic awareness is one of the "best school-entry predictors [for] how well children will learn to read during their first two years of school" (p.2-1). Furthermore, phonemic awareness is effective and beneficial to most Pre-K to grade 6 learners, no matter their background variables, such as socio-economic status and reading level.

The second element within a balanced literacy program, phonics, is this same awareness but in written form. “It is designed for beginners in the primary grades and for children having difficulty learning to read” (Langenberg, et. al., 2000, p. 2-89).

When given phonics instruction, children learn the graphemes (letters) that go with the phonemes (sounds) of spoken language (Armbruster, et. al., 2003). For example, the sound of /f/ can come from the letter combinations of “f,” “ff” or “ph.” The NRP (2000) asserts that phonics is more successful when introduced early (before first grade), but that, ultimately, the objective should be to facilitate the acquisition and use of the alphabetic code in a sequential and explicit manner.

Once children have learned a base of individual words, they need to work on the next element of literacy, fluency. Fluency is the ability to read with minimal error and with appropriate speed and conversation-like expression. This skill is the connecting thread between word identification and understanding what is read because those who read fluently can focus on comprehension instead of struggling to decipher individual words (Armbruster, et.al., 2003).

According to the NRP (2000), fluency was the most overlooked reading skill of the twentieth century because researchers wrongly assumed that it came automatically with word recognition. More recent findings have shown that fluency is more precise and “involves the ability to group words appropriately into meaningful grammatical units for interpretation” with automatic use of punctuation (to promote expression), and the “determination of where to place emphasis or where to pause” when reading (p. 3-6).

The fourth portion of a balanced literacy program is vocabulary instruction. Armbruster et al. (2003), assert that there are four different types of vocabulary: listening (words that are comprehended when heard), speaking (words that are used in oral language), reading (words understood in text) and writing (words used in composition). They further state that “children

learn the meanings of most words indirectly, through everyday experiences with oral and written language" (p.35).

Although reading ability and vocabulary are intertwined, it is very difficult to prove that teaching vocabulary actually improves reading ability because the former is so situational. There are multiple definitions of vocabulary and, likewise, there are many different methods used to teach it (Langenberg, et. al., 2000). Either way, readers have difficulty understanding what they are reading if they do not know what the individual words mean (Armbruster et. al, 2003).

While vocabulary is comprehension based on individual words, text comprehension applies to entire stories, thoughts, ideas, sequences of events, etc. It is the ultimate purpose of reading (Langenberg, et. al., 2003).

In the 1970's, there was a fundamental twist in the approach to comprehension. It came to be "seen not as a passive, receptive process but as an active one that engaged the reader" (Langenberg, et. al., 2003, p. 4-39). This is because of the prior knowledge the reader brings to the text. In other words, two readers may have two very different conclusions about what was read based on their own, very different life experiences. Comprehension is also considered an active process because of the intentional thinking that happens during reading and in which meaning is constructed.

Comprehension strategies are specific procedures that guide students to become aware of how well they are understanding as they attempt to read and write. These can happen both independently and through direct classroom instruction (Langenberg, et. al., 2003).

Generational Trends

McCormick (2007) asserts that there have been swings in educational philosophies throughout the ages and that the metaphorical pendulum often goes from one extreme to the

other. She asserts that it is important to know this theoretical history, and the pros and cons of each theory, before accepting new speculations or throwing out old ones.

Prior to the 1800's, "the alphabetic method of reading instruction [was] used almost exclusively" (McCormick, 2007, p.17). From there educators experimented with phases of emphasis on silent reading, kinesthetics, whole-language, and so forth. In this 21st century, the emphasis is now on early identification and intervention.

Legislation fueling this change in perspective was the No Child Left Behind Act of 2001 and its partner bill, Reading First (Four Pillars, 2004). The four pillars of the first bill were: stronger accountability for both students and schools, more flexible spending of federal funds for states and communities, instruction using research-based education methods, and more choices to parents in low performing districts. The Reading First bill allocated money for state agencies to implement new, and most importantly, research-based reading programs (United States Department of Education, 2008)

This drastic change in reading assessment and funding was due to several generational changes in student and national population trends, which had led to an outdated education system. According to the Center for Public Education (Crouch, Banks Zakariya, 2007), because of recent fertility and immigration patterns, the United States will soon be a nation of minority groups, with no longer a majority Caucasian culture. As of yet, teaching methods have remained unchanged, leading to a gap in achievement not as noticeable up until now.

Unfortunately, the school system has had a relatively short time to figure out that there are gaps in instruction and then discern ways to remedy the situation (Crouch, & Banks Zakariya, 2007). These gaps in achievement, i.e. high school graduation and college completion rates, denote a lack in student-preparedness for what has become a very global, survival-of-the-fittest economy.

As early as 1978, Wagschal, as quoted in Alvermann's article *Future Trends in Reading Assessment and Instruction in the Middle Grades* (1982), suggested that the educational system needed to move beyond the "three R's" of school (reading, writing and arithmetic) and start aspiring for knowledge, communication, and wisdom, ultimately utilizing whatever means are necessary for those ends. Obviously, given the current gaps in achievement, previous educational efforts were misguided by faulty assumptions.

Alvermann (1982) stresses that schools need to implement reading programs that utilize the best of what technology has to offer while maintaining the noteworthy features of printed materials. This view is now shared by many in the reading world, including the International Reading Association, which published a brochure entitled *Integrating Literacy and Technology in the Curriculum* (Steere, 2002). In it, the association insists that "literacy educators have a responsibility to effectively integrate these technologies into the…curriculum in order to prepare students for the…future they deserve" (p. 1). This future involves an ever growing collection of "word processors, web editors, presentation software, email" (p.1) and online communication forums.

Means and Olson (1995) suggest that the challenge to today's classrooms is to move beyond instruction in isolated skills and make connections to real-world thinking via authentic tasks. Authentic is then defined as something that is intrinsically motivating to the student rather than just fulfilling the need for a grade. The authors advocate that this increases motivation while creating a climate of deeper understanding of individual skills embedded in context. They also advise that although technology does not inherently make a task authentic, it does tend to enhance projects' authenticity. They note that students seem to engage more in activities utilizing technology because of their positive perceptions of its real world uses.

Learning Disabilities in Reading

According to Friend and Bursuck (2002), "students with learning disabilities are students who achieve less academically because they have trouble processing, organizing, and applying academic information…[but] are of normal intelligence" (p.205).

The National Institute of Health (2008), notes that 1 in 7 Americans has some form of a learning disability. Although one can have a learning disability (LD) in reading, writing or math, 80-90% of students with a LD are so labeled due to their problems in reading (McCormick, 2007).

A common side effect for students who struggle with reading is learned helplessness. Friend and Bursuck (2002) suggest that this problem is one of self-image and that students with learned helplessness often do not recognize the relationship between hard work and success because they have experienced so much failure.

Valas (2001) found that LD students who received special education instruction, "showed more helplessness than other low achieving (LA) children. They also reported lower academic expectations [for themselves] and lower self-esteem" (p. 101). In his research, Valas found that LD and LA students "repeatedly experience failure in the core subjects…possibly despite considerable work" (p. 103) and that learned helplessness may be a self-protective strategy. This seems to be somewhat remedied when the student spends only some of the school day within special classes and the rest in general education with non-disabled peers.

When it comes to teaching students with LD, research seems to show that students can improve their reading achievement scores (commensurate with their IQ), given proper remediation (Manset-Williamson & Nelson, 2005). How long these effects will last post-intervention, however, is up for debate. (Alexander & Slinger-Constant, 2004). That said, there are several facets of reading instruction that have been continuously highlighted.

Chard, Vaughn & Tyler (2002) synthesized the research of 24 studies regarding repeated reading to see what works best for LD students. In their research they found various methodologies being utilized, including repeated silent reading, reading with a partner, reading with a taped model of fluent reading and reading with a teacher model.

The researchers noted that the most beneficial interventions involved a teacher model, who performs the initial reading aloud. This may have been "because it allowed students to focus initially on the content of the passage before they read it themselves" (Chard et al., 2002, p. 402). Chard et al. also cited O'Shea, Sindelar, and O'Shea who found that seven readings of a text were more effective than three or only one. Chard et al.'s study ultimately summarized the research by suggesting that "re-reading text many times and to many different people and providing progressively more difficult text with feedback and correction for missed words may be the components essential to improving fluency" (p.403).

Chard et al. (2002) also noted that "a common core problem [for students with learning disabilities] is the ability to read sight words [and] decode words" (p.386). In their synthesis of research, they found that drilling students with individual words on flash cards was less effective, regarding overall fluency, than drilling students in phrases of connected text.

Lewandowski, Begeny, & Rogers (2006) agreed with Chard's assumption and added that wide-spread deficits in sight word vocabulary lead to poor reading scores on statewide achievement tests, putting students at risk for academic failure. "Given the large number of phonetically irregular words…in the English language, there are some advantages in whole-word approaches that pair one phonemic code with one printed word" (p.396).

Lewandowski's team of researchers experimented with the presentation of sight words. Their findings suggested that when words were presented via a human tutor or a computer program, students' fluency rates significantly improved across first through fifth grade passages.

This suggests that a combination of repeated reading with individual word practice would work best.

Unfortunately, sight word recognition did not generalize to other words with similar phonetic patterns, most likely because the students practiced individual words and did not focus on blending the sounds that make each word up (Lewandowski, et. al, 2006). This gap is remedied via direct instruction in phonics, as well. Dombey, as cited in *Perspectives on the Teaching and Learning of Phonics* (Cook, 2002), concurs with this notion by requesting a "truly balanced approach" to reading instruction, built around a solid base of instruction in phonics alongside authentic texts and analysis thereof, as appropriate.

As previously mentioned, with increased fluency usually comes greater comprehension. However, Manset-Williamson and Nelson (2005) noted that LD students tend to utilize inefficient comprehension strategies in inefficient ways and are incompetent with the spontaneous use of said strategies. They advocated for explicit instruction (in which the teacher explains, models and then gradually scaffolds the students into independent use) of strategy application citing that "the more explicit the comprehension strategy and self-regulatory instruction, the higher the likelihood that older children with reading difficulties will make significant gains in comprehension" (p.71).

In their study, a mnemonic device was used to help students remember the strategies. The strategies were taught in order and lessons were paced via student performance rather than a pre-determined time-based schedule.

While the NRP (2000) did not present much research on this specific strategy, it did include the following two citations that suggest agreement with the above information. The first citation, by Duffy, states, "the best way to pursue meaning is through conscious controlled use of strategies" (p.223). The second citation indicating agreement with this strategy cites Rosenshine,

Meiser, and Chapman as they state, “the data suggests that students at all skill levels would benefit from being taught [comprehension] strategies” (p.201).

Recommendations for Interventions

Alexander and Slinger-Constant (2004) noted that time spent in a reading intervention was crucial to success. More intensive programs with daily, one-on-one and small group instruction were more effective than those with less time. They verified the progress made in Torgesen’s 2001 study, in which students spent 5 days a week, 100 minutes per day within one-on-one instruction, on top of their usual special education (and presumably general education) classes.

The students in this study made remarkable initial progress. However, this progress declined for more than half of the students 2 years later. This suggests that this level of intervention time must be maintained throughout the school experience because the results may not last for very long after graduation.

Some argue that quantity matters little over quality of instruction. While Valas’ (2001) recommendations referred specifically to time spent in special classes, other researchers have found similar findings in related areas of study. Lei and Zhao (2005), for example, measured the amount of time spent on computer-based activities (many of which were based on reading or writing-related objectives) and its overall effects on student grades in school. In the end, students who spent more than 3 hours per day on computer-based activities suffered a dramatic decrease in grades. Fewer than 3 hours per day, however, led to a positive correlation with increased grades. These findings might suggest that too much of a good thing is overkill.

Klenk and Kibby (2000) addressed the quality issue by pointing out that many students with reading difficulties are being taught by either paraprofessionals or volunteer tutors instead of certified teachers. This situation is true in 44% of Title I schools, in which each aforementioned tutor is working with an average of 25 or more children each day. Supervision

and training are limited due to funding, in many cases, which may be very detrimental to those involved. This is affecting high poverty schools (in which the most help is needed) and does not ensure the quality of reading instruction recommended by the International Reading Association.

A large body of reading research recommends explicit, direct instruction utilizing all five components of the reading process aforementioned in this paper. However, Swanson (1999) "found that regardless of the general model of instruction, only a few instructional components increased the predictive power of treatment effectiveness beyond what could be predicted by variations in methodology and age" (p. 522). These components were divided into two groups, comprehension and word recognition, as follows:

Comprehension	Word Recognition
• Directed response/questioning • Controlled task difficulty level • Additional information and explanations provided about concepts/procedures, etc. • Teacher modeling • Small group instruction • Strategy cues given	• Sequencing in instruction based on short activities, fading of teacher prompts and differentiation of instruction based on student needs • Segmentation – "breaking down the targeted skill into smaller units, breaking it into component parts, segmenting and/or synthesizing component parts" • Advanced organizers – student previews of material, teacher guidance through this process

(Swanson, 1999, p.522)

These findings can be used to focus further intervention study and everyday use. Future research should focus on these elements within different formats to see what works best for LD students, especially those resistant to current forms of remediation.

Summary

In summary, the reading abilities of students with learning disabilities can improve with proper remediation. One can assess progress in reading, via fluency measurements, as this skill is the culmination of prerequisite decoding and word recognition abilities.

Whether or not technology impacts reading ability has yet to be fully determined. Thus far, instructional success seems to have more to do with quality than quantity. That said, this generation of students requires more experience with technology and is more dependent on reading ability, than previous generations were, to keep up with the world economy. Much must be done to close the achievement gap that currently exists.

CHAPTER III

METHODS

The purpose of this study was to investigate whether or not technology increases the reading achievement and/or on task behavior of fifth grade students with learning disabilities.

Design

The study was quasi-experimental as all participants were chosen due to experimenter convenience and not statistical qualifications. The researcher was the usual special educator, though, due to part-time employment, responsibilities for instruction were shared with another special educator, as per classroom routines. All materials were assembled by the experimenter.

Participants

According to the *Maryland Report Card: 2008 Performance Report* (Maryland State Department of Education, 2008), the elementary school involved in this study met all of the Adequate Yearly Progress requirements for attendance, percent proficient on and participation in state assessments.

There was little diversity in race in the school. Out of 322 students, 3 were American Indian or Alaskan Native (.009%), 36 were African American (11%), 5 were Asian or Pacific Islander (.016%), 274 were White (85%) and 4 were Hispanic (.012%). Gender groups were almost evenly split (49% male, 51% female). Of the students in the school, 2.7% received special education services and 2% received free and reduced meals (Maryland State Department of Education, 2008).

The staff employed at the school was well seasoned, with 73.7% holding an advanced professional certificate and 21.1% holding a standard professional certificate. According to the

Maryland State Department of Education (2008), 89.5% of classes were taught by teachers deemed as "highly qualified."

Within the fifth grade intervention group there were 6 students. Two of the students did not qualify for special education services when tested the year before. They were, therefore, considered low achieving readers and, thus, not disabled. Consequently, their results were not utilized in this study.

As a result, for the purposes of this study there were 4 participants. Two of the students were labeled with a traditional Learning Disability. However, special education services were also given under the umbrella of Other Health Impairment (specifically Attention Deficit Disorder) for one student and Speech and Language Impairment for another.

Of the 4 students participating in the study, 3 were Caucasian and 1 was African American. None of the 4 received free or reduced meals, which would have indicated a lower socio-economic status.

Regarding reading ability, all students had been formally evaluated using the Woodcock-Johnson III Tests of Achievement (Woodcock, McGrew & Mather 2001) within the past 3 years. Broad reading scores were collected and ranged from 81-88 (see table below).

Student Reading Levels – Woodcock Johnson

Student	Evaluation Date	Standard Score
5T	12/14/06	83
5C	11/14/06	83
5M	10/30/08	81
5B	10/30/08	88

Instruments

The intervention used in this study was the Voyager Passport Program, level F (Voyager Expanded Learning, 2007) which was designed for grade 5. The optional assessment lesson 5 was omitted due to limited time.

The assessments being utilized were a part of the Voyager program. Pre and post fluency and retell checks, provided by Voyager, were used to determine reading achievement. Fluency and retell ability were evaluated via running records, which depicted a reader's correct words per minute and types of errors made.

Procedures

The group utilized in this study was previously established and had been accessing the Voyager Intervention for approximately 5 months.

A letter of participation was sent home to parents and guardians 1 week before the study began. Pre-testing was administered and procedures discussed with the students and teachers involved. Said pre-testing consisted of completing a running record and utilizing Voyager progress monitoring retell checks. The students were assessed using the selection "The Lost Temple."

Each group was exposed to one unit (or adventure) with technology and one without technology. On March 30, the first adventure began without technology. In this unit, only dry erase board and paper-pencil or manipulative activities were allowed. During the 10th assessment lesson, progress monitoring fluency checks ("Bent's Old Fort") were administered. At the conclusion of this unit, students and both instructors involved were asked to complete a survey regarding student performance.

The second unit was next implemented using Smart Board and Ticket to Read technology. Smart Board presentations were presented in slide format, with each slide

representing a different section of the lesson. As all lessons in Voyager require the same format, the only changes made to said slides at each lesson were the words and sounds used.

During this unit, the Voyager website (www.tickettoread.com) was greatly promoted, as well. Students were given additional in-school access to the website during morning work time, once per week for approximately 20 minutes. On this website, students had their own user names and passwords. They were led into a "clubhouse" filled with interactive activities related to fluency, comprehension and vocabulary. The more points earned, the more they could decorate their clubhouse, play games, etc.

Reports of progress were available for teachers to review. Prizes were given each week to reward extra at-home use. Again, lesson 10 served as a post-assessment, in addition to a fluency check ("The Ocean Floor") and a survey for students and teachers was administered. (See attached.)

With or without technology, the students received instruction using the Voyager scripted lesson and routine format for 30 minutes every day, an average of 4 days per week, dependent on homeroom schedules. All "re-teach" options of the program were included. Because of this pacing, it took approximately 1 full school week to get through two lessons and therefore, approximately 5 weeks to teach one "adventure" or instructional unit.

CHAPTER IV

RESULTS

The purpose of this study was to determine the effects of technology on reading fluency and on-task behavior. Pre- and post-test scores in errors, percent correct, words per minute and fluency were compared for both the lessons using and not using white board technology. A t-test for paired subjects was used to analyze the results which are presented in Table 1 below.

Table 1: Pre and Post Test Results for Non-Technology Unit

		Mean	Number	Standard Deviation	T-Score	Significance
Non Tech Errors[1]	Pre	4.75	4	1.50	0.45	0.68
	Post	5.50	4	1.92		
Non Tech % Correct	Pre	92.5	4	2.51	0.10	0.93
	Post	92.25	4	3.10		
Non Tech WPM	Pre	59.00	4	13.89	0.97	0.41
	Post	66.75	4	23.49		
Non Tech Fluency	Pre	19.75	4	9.61	6.09	0.01[2]
	Post	31.50	4	11.90		

[1] Yellow boxes indicate positive increases, though not considered statistically significant.
[2] Significant P=0.01

Table 2: Pre and Post Test Results for Technology Unit

		Mean	Number	Standard Deviation	T-Score	Significance
Tech Errors	Pre	5.50	4	1.92	0.23	0.84
	Post	5.25	4	2.50		
Tech % Correct	Pre	92.25	4	3.10	1.41	0.25
	Post	93.25	4	2.87		
Tech WPM	Pre	66.75	4	23.49	0.70	0.53
	Post	72.25	4	8.77		
Tech Fluency	Pre	31.50	4	11.90	0.54	0.67
	Post	35.25	4	9.07		

Ultimately, the hypothesis that the on-task and reading achievement of learning disabled students would increase more with technological intervention, as compared to those without, was not supported. The pre- and post- test results for fluency were significant for the non-tech instruction, suggesting that fluency will increase more without technological intervention.

CHAPTER V

DISCUSSION

The experiment conducted involved two instructional units. The first was considered "non-tech," and involved only paper and pencil or manipulative tasks as provided by the Voyager Intervention program. The second "tech" unit utilized an interactive white board for instruction, as well as access to the Ticket to Read website.

Post-test results in the experiment conducted were higher than pre-test results, with the exception of non-tech fluency. However, statistical analysis proved the results not significant. This said, the original hypothesis (that the on task behavior and reading achievement of fifth grade learning disabled students will increase given technological intervention) was proven true but not to the extent expected. In actuality, students made more fluency gains without the technology.

Answers to the student survey highlighted several key differences between the tech and non-tech units. The tech unit scored, on average, at least a point higher (i.e. was considered "more true") in the areas of: student confidence in reading skills, level of lesson challenge and student preference of lesson format.

Questions regarding the influence of lesson format on perception of individual fluency and sight word skill were also included in the survey. Students believed that the tech unit was better for these tasks by an average .5 and .2 points respectively, on a 5 point scale. Contrary to all other notes of preference, students believed that the non-tech unit better helped them with vocabulary development by .2 points.

The experimenter observed many of these student findings to be true (with the exception of vocabulary development). Students seemed to be much more engaged and motivated during the tech unit. Behavior problems also decreased as students appeared to enjoy the activities more.

One student in particular had previously been suspected of suffering from depression, with daily symptoms of fatigue and extreme pessimism. During the tech-unit, he seemed to come out of his shell, consistently raising his hand and wanting to join in conversation.

Likewise, the teacher survey suggested a preference for lessons in the tech-unit. Those surveyed rated these tech unit lessons as more fun to teach (by 2 points). Perception of student on-task behavior and motivation during this unit was also valued at 2 points higher than the non-tech unit.

Ironically, teacher perceptions of academic achievement (i.e. fluency) remained the same across both units. In addition, the experimenter who completed a teacher survey did not like the amount of planning and preparation that was required of the tech-unit, stating overwhelmingly, with a 4 point difference in rating, that the non-tech unit was much easier to set up.

Implications

Although participants' reading fluency did not make any huge statistical increases due to the technology, the great strides in classroom atmosphere were hard to ignore. Teachers had more fun teaching (once the planning was finished) and students were more on-task with fewer behavior problems. Students also expressed more confidence in reading given the technology.

These results have definite repercussions for education. As Bempechat (2008) notes, "children's developing beliefs about their academic competence have a profound influence on the extent to which they will seek challenge, persist in the face of difficulties, and recover from setbacks and failure" (p.88).

The addition of technology in lesson presentations affected more than the individual lesson but also the psychological and emotional foundations for the students involved. They assisted in the social-emotional connections between teacher and student as was deemed necessary for decreasing the student drop-out rate by Crouch et al. (2007).

Obviously this level of technological involvement may not be possible or necessary for all reading lessons provided. However, its benefits should be tapped into for future research and instruction.

Threats to Validity

There were several aspects of the experiment that could have negatively impacted its findings. The first was the low number of participants. With only 4 students involved, minor score variations could have greatly skewed the results. Also, among these pupils there was a wide range of ability and variety in the root cause of their disability in reading. For example, the student with ADHD may have had a different fluency or on-task reaction to the intervention than the student with a speech and language impairment. Likewise the amount of reading gains might be decreased based on the nature of a traditional learning disability.

Also, it should be noted that 1 out of the 4 students was incredibly unmotivated throughout the experiment. Although he acted more energized when the technology lessons were being taught, he continuously complained about hating technology and consistently stated that it was “boring.” As a result, he may have responded inappropriately on his student surveys.

Another threat to validity was the implementation of instruction. There were two teachers involved in the units, due to part time employment. Therefore, the students were instructed by someone other than the experimenter some of the time. On two occasions, neither the experimenter nor the other teacher was in the building and a substitute teacher was required. This teacher was not able to access the computer system on which the tech-unit lesson plans were created due to password protection.

Last but not least, due to the time constraints of state testing and the preparation required for said exams, the experiment was conducted at the end of the school year. The students involved were in the fifth grade and were about to transition to middle school. Therefore, there was a notable sense of lethargy throughout the entire fifth grade, across curricula.

Reflections on Past Research

Resulting from their review of many studies within the field of reading research, Klenk and Kibby (2000), noted that "children learn to read through engagement in a variety of age-appropriate and developmentally appropriate print-related activities" (p.673). For intermediate students, technology is often a common interest, so it stands to reason that it would be an appropriate lesson format. Schmid (2008) noted in her study that many participants found it easier to concentrate on presentations involving technology due to its "attractiveness" (p.1559).

Lei and Zhao (2007) observed that technology is just an instrument to be utilized and not a means to an end in and of itself. Ultimately, too much technology actually had a negative impact on student performance. This, in combination with the findings from this experiment, suggests that a balance between tech and non-tech instruction needs to be achieved for maximum impact.

Suggestions for Future Research

It would be advisable to repeat this study with a larger population, as the findings may prove more statistically significant if there are more fluency rates to average. Utilizing multiple grade levels, especially those affected by the transition from elementary to middle and middle to high school would lead to significant insights. Also, repeating this study format across multiple reading intervention programs would add to the depth of technology research.

A study comparing technology's impact on the different aspects of reading would be beneficial, as well. For instance, a study could determine if there is more of a difference in the influence of technology on comprehension or vocabulary development versus fluency. Likewise, there may be more of an impact on non-fiction texts such as those found in science and social studies versus the easier-to-read fiction texts often found in language arts lessons. If there is a limit to the amount of time that should be spent utilizing technology, researchers should pinpoint in which content area this time should be spent.

Finally, it would be helpful to know what kinds of technology and activities are most helpful. For example, researchers could examine if student research activities are more powerful than online games or if SmartBoards are a better tool than laptops.

As previously stated, reading is a skill that affects many activities of daily life. Technology is also an increasingly ever-present force that needs to be reckoned with. The combination of the two within the school system is a new but undeniably important phenomenon that should be closely monitored and celebrated at the same time.

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Appendix A

Student Post Non-Tech/Tech Unit Survey

Question	Completely Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Completely Agree
The materials used in this unit helped me learn vocabulary.	1	2	3	4	5
The materials used in this unit helped me read with greater fluency.	1	2	3	4	5
The materials used in this unit helped me read individual words.	1	2	3	4	5
The materials used in this unit made me feel more confident in my reading skills.	1	2	3	4	5
The lessons provided in this unit were appropriately challenging (not too hard, not too easy).	1	2	3	4	5
The lessons provided in this unit were interesting to be a part of.	1	2	3	4	5
I would like more lessons taught in this manner throughout my school career.	1	2	3	4	5

Appendix B

Teacher Survey

Question	Completely Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Completely Agree
The lessons in this unit were easy to plan for.	1	2	3	4	5
Students were on task and well behaved during this unit.	1	2	3	4	5
Students were generally motivated to participate in the lessons.	1	2	3	4	5
Lessons in this unit increased student fluency.	1	2	3	4	5
Lessons in this unit were fun to teach.	1	2	3	4	5

Was there anything that you particularly liked about this unit?

Was there anything you particularly disliked about this unit?

Appendix C

Individual STUDENT Answers On Task Survey

Question	Non-Tech Average	Tech-Average
The materials used in this unit helped me learn vocabulary.	4.5	4.3
The materials in this unit helped me read with greater fluency.	4	4.5
The materials in this unit helped me read individual words.	4.3	4.5
The materials in this unit made me feel more confident in my reading skills.	3.8	4.8
The lessons provided in this unit were appropriately challenging (not too hard, not too easy).	3.3	4.5
The lessons provided in this unit were interesting to be a part of.	4.3	5
I would like more lessons taught in this manner throughout my school career.	3.3	5

Individual TEACHER Answers On Task Survey

Question	Non-Tech Average	Tech-Average
The lessons in this unit were easy to plan for.**	5	1
Students were on task and well behaved during this unit.	2.5	4.5
Students were generally motivated to participate in the lessons.	2.5	4.5
Lessons in this unit increased student fluency.	4	4
Lessons in this unit were fun to teach.	3	5

**Only experimenter commented on this question, not helper.

Appendix D

Fluency Data

Student	**Pre-test Non Tech**	**Post-test Non Tech**	**Pre-test Tech**	**Post-Test Tech**
5T	Story: The Lost Temple Errors:3 Percent correct:95 WPM:54 Retell Fluency:13	Story: Bent's Old Fort Errors:7 Percent correct: 88 WPM: 49 Retell Fluency: 21	Story: Bent's Old Fort Errors:7 Percent correct: 88 WPM: 49 Retell Fluency: 21	Story: The Ocean Floor Errors:9 Percent correct: 89 WPM: 70 Retell Fluency:42
5B	Story: The Lost Temple Errors:6 Percent correct: 89 WPM:47 Retell Fluency: 16	Story: Bent's Old Fort Errors:3 Percent correct:94 WPM:44 Retell Fluency:25	Story: Bent's Old Fort Errors:3 Percent correct:94 WPM:44 Retell Fluency:25	Story: The Ocean Floor Errors:4 Percent correct:94 WPM: 61 Retell Fluency:22
5C	Story: The Lost Temple Errors: 6 Percent correct: 93 WPM: 79 Retell Fluency: 34	Story: Bent's Old Fort Errors: 5 Percent correct: 95 WPM: 88 Retell Fluency:48	Story: Bent's Old Fort Errors: 5 Percent correct: 95 WPM: 88 Retell Fluency:48	Story: The Ocean Floor Errors: 4 Percent correct: 95 WPM: 81 Retell Fluency: 37
5M	Story: The Lost Temple Errors: 4 Percent correct: 93 WPM: 56 Retell Fluency: 16	Story: Bent's Old Fort Errors: 7 Percent correct: 92 WPM: 86 Retell Fluency: 32	Story: Bent's Old Fort Errors: 7 Percent correct: 92 WPM: 86 Retell Fluency: 32	Story: The Ocean Floor Errors:4 Percent correct:95 WPM:77 Retell Fluency: 40

On Task Data

1=completely agree, 2=disagree somewhat, 3=neutral, 4=agree somewhat, 5=completely agree. 7 questions rated.

	On Task Non Tech – Average Answer Score/Total Score		**On Task Tech - Average Answer Score/Total Score**	
5T	Avg: 4.6	Total: 32	Avg:5	Total:35
5B	Avg: 3.6	Total: 25	Avg: 4.6	Total: 32
5C	Avg: 4.4	Total: 31	Avg: 4.4	Total: 31
5M	Avg: 3	Total: 21	Avg: 4.6	Total: 32

TeacherE	Avg: 3.2	Total: 16	Avg: 4	Total: 20
TeacherH	Avg: 3.25	Total: 13	Avg: 4.25	Total: 17

Teacher E=experimenter, survey had 5 questions. Teacher H=helper, survey had 4 questions as planning was not applicable. Same rating scale as student survey.