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The effects of computer assisted instruction for students with learning disabilities in a self-contained social studies setting

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THE EFFECTS OF COMPUTER ASSISTED INSTRUCTION FOR STUDENTS WITH LEARNING DISABILITIES IN A SELF-CONTAINED SOCIAL STUDIES SETTING

By

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Dedications

I would like to dedicate this thesis to my wife, Donna Keane, and my two sons, Connor and Ian Keane. To my wife, thank you for always believing in me and encouraging me to take on this challenge. For being my second set of eyes, proofreader, motivator, and all around best friend. To my sons, you have been my inspiration to take make myself better. I hope that you have seen and learned that any goal is obtainable if you work for it and dedicate yourself to something that you love.

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Abstract

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This study was designed to assess the effects of the Computer Assisted Instruction (CAI) program, Achieve3000, with students with disabilities. The focus of the study was to: (a) assess the effects of the program on the students' text-based reading comprehension, (b) critical thinking comprehension, and (c) how satisfied students were with the program. Seven students, two females and five males, participated in the study. All of the students receive special education services through an Individualized Education Program. A single subject ABAB design was utilized. In the baseline phase participants were asked to read expository text, presented to them on paper, and then asked to answer ten questions based upon the reading. The questions were both text-based and critical thinking. In the intervention phases the participants were asked to read expository text, presented through the online computer program, and asked to answer seven to eight questions based on the text. These questions were also a mix of text-based and critical thinking. Participants were then asked, at the end of the study, to fill out a survey about their experience and how satisfied they were with the use of the program. The results of the study show that the participants' critical thinking comprehension scores increased through the use of the Achieve3000 program. Conversely, the study also shows that the participants' text-based comprehension scored decreased. The majority of participants responded that they were satisfied with the use of the program.

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Chapter 1

Introduction

With the increased pressure on schools to achieve high levels of performance on standards-based tests it is no surprise they are putting more resources into increasing student test scores. An area where many students have shown to be less than proficient is reading comprehension (McFarland et al., 2017). Due to the increasing pressure for schools to perform well on standards-based high stakes tests, students are required to perform at a higher level than ever before. For example, the Common Core State Standards in literacy for social studies require students to interact with informational text using a higher level of thinking than what is needed to comprehend narrative text (Berkeley, Mastropieri, & Scruggs, 2011). Students are expected to summarize, analyze text structure, compare and contrast, and evaluate points of view (Singleton & Filce, 2015). However, the reading scores for American students in grade eight suggest little progress between 2002 and 2015 (McFarland et al., 2017). In 2002 only 33% of students scored at or above proficient in reading, and this increased by only one percent by 2015. The most troubling data shows that the scores of twelfth graders dropped in the same time period. Students scoring above basic dropped by two percent, while students scoring below basic increased by two percent (McFarland et al., 2017).

One strategy to increase student reading comprehension is the use of computer-assisted instruction (CAI), instruction where students are taught reading strategies on a computer and assessed on their progress (Stetter & Hughes, 2011; Jenks & Springer, 2002). Twenty-first century students have been born into a world of technology. They have never known of a world without instant access to information and are constantly

connected to some form of technology (McFarland et al., 2017). These students are skilled in using technology and are able to access the computers operating systems, programs, and internet with ease. In a study conducted by Hoffman and Vance (2005), incoming college freshman were found to have the ability to: send and receive emails, access attachments in emails, participate in discussion boards, work with files and folders, and create word documents and presentations. Teachers may be able to use these technology skills as a vehicle for reading instruction by making the use of computers an avenue to generate motivation to learn (Guthrie et al., 2006).

Statement of the Problem

A study by the National Center for Education Statistics (2017) on the condition of education in the United States reveals that today's students have experienced differing levels of internet and computers usage over the past decade. The report shows a dramatic difference between use of the internet in homes (86%) and schools (65%) for students aged three to 18 years old. The data indicate that while students are interested and able to access the internet, schools are falling behind in their use of technology to enrich education. As the age group is narrowed down to only secondary education students, 15 – 18 years old, internet usage increases to 69% within the schools (McFarland et al., 2017).

Public school enrollment has increased in the past decade and with that, the number of students receiving services in special education has also increased. In the 2014 – 2015 school year, there were 6.6 million students ages 3 – 21 receiving special education services. Of these students, 35% were receiving services in special education for specific learning disabilities (McFarland et al., 2017). The trend in special education

has turned from sending students out to specialized schools, to bringing these students back into their home districts (Snyder, Brey, & Dilloew, 2016). With this trend, schools must use every tool available to educate students with a wide range of abilities. The use of computers has become the tool many schools are using to satisfy student needs (Bouck, Meyer, Satsangi, Savage, & Hunley, 2015).

Many students within the United States are classified as having a learning disability and the majority of these students struggle to read and comprehend text at grade level (Kim, McKenna, & Park, 2017). With these difficulties, many students with disabilities have not had positive interactions with reading interventions (Compton, Miller, Elleman, & Steacy 2014). Many of these students have experienced failure in their classes and are unmotivated due to past failures to achieve success (Unrau & Schlackman, 2006). The use of computers to increase student motivation and participation in reading instruction has proven to be an effective strategy (Cuevas, Sussell, & Irving, 2012; Guthri et al., 2006; Margolis & McCabe, 2004). While motivation alone is not a strategy to increase reading comprehension, it may be a method to engage students in the learning process, allowing for educational opportunities for students who do not feel as though they can succeed.

Achieve3000 is a reading comprehension module which has been designed to increase reading comprehension in students at all grade levels. Achieve3000 measures students' abilities and represents their growth through the use of lexile gains (Achieve3000, 2014). The program differentiates the lessons by allowing students to read at their lexile reading level. By allowing students to have access to reading material at their reading level, students can be assessed on their comprehension skills through

multiple choice activities. As students build skills and score higher on the multiple choice activities, they are presented with a higher lexile level and more challenging questions (Achieve3000, 2014). The stated motivator for the program is to have students research future careers they may be interested in and see what lexile is needed for that career (Achieve3000, 2016). The incentive for schools to incorporate Achieve3000 into their curriculum is twofold. As reported by the company, the program improves student reading comprehension, and allows teachers to dive deeper into their curriculum without increasing demands on instructional time or planning (Achieve3000, 2016).

Cuevas, Russell, and Irving (2012) investigated the use of computer-assisted reading modules to increase reading comprehension and found that students who participated in computer based Independent Silent Reading (ISR) though a computer module outperformed students who received no silent reading, and students who participated in textbook-based ISR. While Cuevas et al. (2012) found no statistical significance in the gains reached by students; the study did suggest gains in reading comprehension of students using the computer based ISR for individual reading assignments. The study suggests the tools provided in the computer module assisted students in reading comprehension and the use of computers alone may have been a motivating factor.

Significance of the Study

There is a wealth of research investigating the effects of reading interventions on students in elementary grades (e.g., Gyovai, Cartledge, Kourea, Yurick, & Gibson , 2009); Rafdal, McMaster, McConnell, Fuchs, & Fuchs , 2011; Begeny, Laugle, Krouse, Lynn, Tayrose, & Stage, 2010; Kim, Samson, Fitzgerald, & Hartry, 2010) and multiple

interventions are on the market to increase reading comprehension (e.g. Achieve3000, Early Reading Intervention, Peer-Assisted Learning Strategies, Great Leaps, and Read 180), but few studies have focused on using CIA to increase student reading comprehension at the secondary level. Secondary students have been generalized into the adult reader category, and as a result, their needs in the area of reading comprehension have been largely overlooked (Cuevas, Russell, & Irving, 2012).

High school may be the last formal education many of our students with special needs receive for the rest of their lives. In today's competitive climate and pressure to be college and career ready, it is vital for educators to effectively assess and intervene when students are not performing to the best of their ability. Through the use of CAI, secondary schools may be able to implement supports that are tailored to each student's unique needs. Students who have a history of repeated failure with reading comprehension may be able to build their reading skills due to the motivation they have using computers and teachers may be able to track their progress through the use of technology such as Achieve3000. This study will build upon the research of Cuevas et al. (2012) and aims to expand upon the research of the use of computer-assisted reading modules to increase reading comprehension and motivation amongst secondary education students.

This study will also build upon the study reported by Achieve3000 and the positive gains it reports to have for students who struggle with reading comprehension. There are, at this time, no peer reviewed articles which can validate the claims of the creators of the program. There are three reports posted in EBSCO host, none of which have gone through the peer review process. The three published reports all claim that the

use of Achieve3000 resulted in reading comprehension growth within their individual schools.

Purpose of the Study

The purpose of this study is to investigate the effect of using Achieve3000 CAI reading comprehension modules on (1) student reading comprehension and (2) student motivation to read. Participants will include high school students with learning disabilities receiving special education World History instruction in a self-contained classroom.

Research Questions

The research questions investigated follow:

1. Will the use of Achieve3000 impact responses to text-based comprehension questions by high school students with learning disabilities?
2. Will the use of Achieve3000 impact responses to critical thinking comprehension questions by high school students with learning disabilities?
3. Will students with learning disabilities be satisfied with the use of Achieve3000 for assisted instruction in a high school World History classroom?

Hypotheses

I hypothesize that students will score higher on text based comprehension questions after the use of Achieve3000.

I hypothesize that students will score higher on critical thinking comprehension questions after the use of Achieve3000.

I hypothesize that students will be satisfied with the use of Achieve3000.

Key Term

Computer assisted instruction. As stated by Beichner & Schwartz (1999) Computer-Assisted Instruction is defined as "a method of instruction in which there is a purposeful interaction between a learner and the computer device for helping the individual learner to achieve the desired instructional objectives" (Kim, McKenna, & Park, 2017, p. 234).

Chapter 2

Review of the Literature

Reading and Students with Disabilities

As students progress through their academic grades in school, the demand to read more complex text increases. Students are expected to extract main ideas and make connections between two ideas as early as kindergarten (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). When students enter middle school they are expected to read more expository text, and the need for students to comprehend expository text has increased in the last decade with the introduction of Common Core State Standards. Expository text is considered much more difficult for students to read because it is designed to convey information and help the students to learn new material (Berkeley, Mastropieri, & Scruggs, 2011). Students may have more trouble comprehending expository text than narrative text because it is usually dense with information. Expository text also has text structures which differ from narrative passages. These structures include compare and contrast, descriptive content, and sequence of events. Many students with disabilities have difficulty identifying text structure and implementing the proper strategy to comprehend expository text (Roehling, Hebert, Nelson, & Bohaty, 2017).

In order for students to comprehend what they are reading, they must possess two levels of information processing (Minguela, Sole, & Pieschl, 2015). First, students must have the ability to perform the process of phonological decoding and word recognition in order to understand the words they are reading. Second, students must begin the process of developing meaning of the text through a coherent representation of the material. In

order to actually build meaning from the text, students must be able to fluently understand the words that make up the sentences and be able to combine the words into coherent sentences to make meaning of the text (Mwoma, 2017). One concern about the use of computers to assist in instruction is that there are additional processes that must take place for students to make meaning of the text they are reading. The students are no longer only using their reading strategies to comprehend the text, they must also use technical skills in order to operate the computers and access the text (Keene & Davey, 1987).

Berkeley, Mastropieri and Scruggs (2011) conducted a study of students with learning disabilities and the effective use of reading comprehension strategies, along with attribution retraining. Attribution retraining was used to teach the students that their attributes are not negative to their learning, but can be used to increase their learning. The students were distributed into three groups: reading comprehension strategies and attribution retraining, reading comprehension strategies, and a control group. The data showed that there was a statistically significant gain for students in the two experimental groups in comparison to the control group. There was little statistical difference between the two experimental groups. Although there was improvement noted with the use of attribution retraining. This study highlights the need for students with disabilities in secondary education to receive reading comprehension strategy instruction. The need to comprehend increasingly difficult expository text may pose great difficulty to students who struggle to learn (Berkeley, Mastropieri, & Scruggs, 2011).

In a study conducted by Saenz and Fuchs (2002), the researchers examined the reading comprehension of students with learning disabilities when presented with

narrative text and expository text. The research compared student reading fluency and reading comprehension when reading the two text formats. The researchers further investigated if the question format had any influence on student comprehension scores. In order to achieve this comparison, Saenz and Fuchs (2002) asked both text based and inferential question. The results of the study indicate that students with learning disabilities have a lower reading fluency with expository text than they do with narrative text. This suggests that students struggle to read the expository text and this can hinder their comprehension of the information (Saenz & Fuchs, 2002). When comparing the use of literal and inferential questions, the data suggested that students' scores were comparatively similar between narrative and expository texts when the questions were text-based. When questions were inferential, the students scored dramatically lower when reading expository text. This data suggests that students with learning disabilities have much more difficulty with the inferential comprehension of expository text (Saenz & Fuchs, 2002). Saenz and Fuchs (2002) also suggests the student difficulties stem from their unfamiliarity with the structure of expository text and with the use of unfamiliar multisyllabic words common to this form of text.

Proficient readers use many metacognitive strategies as they read in order to make meaning out of text. These strategies include: asking questions, summarizing, and looking back at the text (Saenz & Fuchs, 2002). Many students with learning disabilities do not naturally learn these strategies and must be explicitly taught how and when to use them (Saenz & Fuchs, 2002). Many students with disabilities do not recognize when questions are asking them to infer information, use their prior knowledge, or integrate the text into the response (Saenz & Fuchs, 2002). These students are unaware of their need

to employ many different strategies as they read and attempt to answer critical thinking questions (Berkeley, Mastropieri, & Scruggs, 2011). Furthermore, students with learning disabilities have difficulty generalizing strategies from one setting, or task, to another (Berkeley et al., 2011). Students with learning disabilities need to be explicitly taught how to transfer skills from one task to another. In order to support students with disabilities to comprehend expository text, one of the strategies with the strongest research foundation is summarization (Berkeley, Mastropieri, & Scruggs, 2011; Garjria & Salvia, 1992; Jitendra, Hoppes, &Yan, 2000; Swanson & De La Paz, 1998). In general education classrooms, students are expected to read information dense text, extract main ideas, and support them with information from the text. By learning to summarize, students will increase their ability to develop meaning from the text (Rinehart, Stahl, & Erickson, 1986). Another strategy, which leads to greater student comprehension, is for students to look back into the text to find information. Garner et al. (1984) studied the look back strategy with 25 subjects. Garner and colleagues trained half of the participants to look back at the text when they could not recall the correct answer to a question. Garner and colleagues found that many students did not believe they were allowed to look back at the text and relied solely on their initial read through (1984). The results suggest that when students are explicitly taught to look back at the text, when recall is not sufficient, students perform better on comprehension questions (Garner et al., 1984). These findings align with the findings of Swanson and De La Paz (1998) that by teaching students to look back into the text, student comprehension scores increased, and continued to increase after intervention.

Comprehension Assessment

In a study conducted by Andreassen and Braten (2010), the researchers focused on the use of multiple choice questions to measure the effect of word recognition and working memory on student reading comprehension scores. Multiple choice questions have been used by researchers, and educators, to measure student comprehension ability. The variables that were investigated were the ability of readers to look back at the text, the length of the text, and they type of questions that were asked (Andreassen & Braten, 2010). Results indicate that word recognition plays a decreasing role in reading comprehension as students increase in age. Conversely, results suggest that working memory plays an increasing role in student comprehension as age increases (Andreassen & Braten, 2010). Some factors that may contribute to this increase in the need for working memory may be: the increase in complex tasks at high grade levels, the increased difficulty of the text, the amount of information within the text, and the increase in the expository texts students are expected to read. Furthermore, the results of this study suggest that word recognition, intrinsic motivation, strategic competencies and working memory play a significant role in student ability to answer multiple choice questions and reading comprehension (Andreassen & Braten, 2010). The study also suggests that when readers are not allowed to look back at the text, that working memory plays a much more significant role in student achievement. The implications of this study include the need for researchers to take great care in the development of their methodology and take many factors into consideration when developing their assessment questions (Andreassen & Braten, 2010).

Computer Assisted Instruction

Computer assisted instruction has been introduced to many academic settings in order to increase student reading skills. The use of computer assisted instruction programs has shown mixed results and the areas of intervention studied cover a wide range (e.g. reading fluency, vocabulary, reading accuracy, comprehension, motivation, phonetics, and decoding) (Aydemir & Ozturk, 2012; Cuevas, Russell, & Irving, 2012; Kim, McKenna, & Park, 2017; Sorrell, Bell & McCallum, 2007). Much of the literature has emphasized the belief that teachers do not feel prepared, or do not feel the need, to explicitly teach reading strategies (Campbell & Kmiecik, 2004; Park & Osborne, 2006; Roehling, Hebert, Nelson, & Bohaty, 2017). Students who are struggling to read the more complex text that secondary schools require are not being supported through direct instruction of comprehension strategies (Saenz & Fuchs, 2002). Due to the need for explicit instruction in comprehension strategies, computer assisted instruction has been implemented in many school districts to supplement traditional teacher instruction in the content areas.

Cuevas, Russell, and Irving (2012) conducted a study of secondary students with the use of computer assisted instruction. The researchers found that secondary students were spending little time reading from the textbooks and even less time reading at home. They noted that, with limited time spent reading, students will show little improvement in their reading skills. In order to increase student reading and comprehension skills, Cuevas et al. (2012) researched the use of computers to increase students' motivation to read and to increase their exposure to text. The researchers also noted that the use of sustained silent reading (SSR) has been the common strategy to increase in-school

reading time, however, the need for secondary schools to teach a large range of standards does not lend itself to taking time out of the academic day to have students read literature of their choosing. Instead, the researchers used independent silent reading (ISR). ISR allows teachers to assign the reading and motivate the students to read the material because they will be assessed on it (Cuevas et al., 2012). Because this study was being conducted on secondary students, they chose to use ISR as their intervention. The researchers also used the Adult Motivation for Reading Survey to measure students' motivation to read.

The study consisted of 145 students in a 10th grade literacy class in an urban school district. The three groups consisted of students participating in ISR from a textbook, ISR through a computer module, and the third did not participate in any ISR. The results of the research suggest that the use of independent silent reading increases student comprehension (Cuevas et al., 2012). The students in the textbook ISR group performed better than the computer-based ISR group, and both ISR groups outperformed the control group. The use of the computer module further increased student comprehension scores, in comparison to the control group. There was no significant statistical difference between the two experimental groups. The students in both of the experimental groups improved on the standardized tests used to measure growth but the computer-based ISR group performed better on each of the individual reading assignments. The data suggests that the use of the computer-based ISR does increase student comprehension of individual reading assignments but the growth did not generalize to broader assessments (Cuevas et al., 2012). Cuevas and colleagues (2012) did suggest that the use of the computer modules increased students' motivation to

participate in the reading exercises, but did not directly impact the students' comprehension.

Aydemir and Ozturk (2012) found contradictory and confirmatory results of the use of computer assisted instruction for reading comprehension. The study consisted of 60 fifth grade students in public education split into two groups with each given three narrative passages and three expository passages. The experimental group was assigned to read the passages from a computer and the control group was given the passages on paper. The results of the study revealed no statistical significance between the group reading paper versus computerized narrative text passages (Aydemir & Ozturk, 2012). Contradictory to the findings of Cuevas and colleagues (2012), however, Aydemir et al. (2012) also reported that when reading expository text, the group reading from a computer had a higher comprehension score. The researchers postulated that because narrative texts are longer in nature, that student comprehension begins to suffer when asked to read this format on a screen. Further, the structure of expository texts is more complex, which may lead to the higher level of comprehension from the computer screen than from the printed page (Cuevas et al., 2012). Further research investigating this theory is needed.

Jones, Staats, and Bowling (2005) found results contradictory to Cueva et al. (2012), specifically that computer assisted instruction has some positive impact on student reading comprehension. Jones and colleagues conducted a study of computer assisted instruction in West Virginia. The study included 150 students in grades six through eight divided into experimental and co-ntrol groups. The experimental group consisted of 116 students and the control, 35 students. The experimental group

participated in two 45 minute computer assisted instructional program sessions per week which consisted of: Accu-Reading, Vocabulary Fitness, and Grammar Fitness (Jones et al., 2005, p. 181). The results of the study suggest that participation in the computer assisted instruction increased students' vocabulary and reading comprehension scores on standardized tests (Jones et al., 2005). This study differs from the studies of Cuevas et al. (2012) and Aydemir et al. (2012) in that the use of the computer instruction was used concurrently with standard classroom instruction. The results are not clearly a result of the computer instruction, but may have been influenced by teacher instruction, as well (Jones et al., 2005). The students were not only receiving reading instruction from the computer program, but were also participating in standard ELA curriculum instruction, concurrently. Further, many of the participants did not receive the reading comprehension module of the program. Only a select group of students, chosen by the classroom teachers, were permitted to participate in the extra reading comprehension module.

Keene and Davey (1987) studied the effects of displaying expository text on a computer screen versus using paper formats. The study focused on 51 high school students with learning disabilities. Keene and Davey (1987) studied the students' reading comprehension, strategic behaviors while reading, completion time, and attitudes towards reading. The students were randomly assigned to one of the two experimental groups, one reading from a printed page and the other from a computer screen. While this study was conducted 30 years ago, results align with the conclusions of Cuevas and colleges (2012) suggesting that the use of computers did not increase student comprehension. One factor which may have contributed to these findings, which were similar in both studies,

is that the reading passages were written at the grade level of the student participants in the study. Keene and Davey (1987) studied fifth grade students and the reading passages were written at a fifth grade level, while Cuevas et al. (2012) studied 10th grade students and the writing was written at a 10th grade level. Reading passages were not differentiated based upon the students' reading level, which may have made the passages difficult to comprehend by struggling readers.

The results of the study conducted by Keen and Davey (1987) suggest that students that read the text on a computer screen increased use of the comprehension strategy of looking back in the text for evidence. These findings may be due to the fact that the students were presented with reading strategy reminders and checklists during their reading. The assessment questions were both text-based and inferential and were presented to the students on a printed paper. The study also concluded that the use of computers was a motivating factor for students and increased their attitudes of the reading tasks (Keene & Davey, 1987). Much like Cuevas and colleagues (2012), the study suggests that the use of computers may only increase student motivation and attitude towards reading. This finding suggests that computers do have a place in reading comprehension instruction. Keene and Davey (1987) and Cuevas et al. (2012) added to the body of knowledge, that the students who took part in the study have used computers in the past for instructional purposes, which suggests that the computers were not novel to them and the novelty of using the computers was not a motivating factor.

The research conducted by Sorrell, Bell, and McCallum (2007) examined effects of computer displayed reading assignments and paper based assignments on elementary age students who were identified as below grade level for reading. The study consisted

of 12 students in an after-school program. One experimental group participated in sustained silent reading from a textbook and the other read their chosen material from a computer screen. The experimental group with the computers had the additional accommodation of having the text read to them while they read along. The study found results consistent with Cuevas et al. (2012) and Keene and Davey (1986). The data suggests that students reading comprehension was not affected by the use of computers in instruction. Sorrell, Bell, and McCallum reported that the use of the text-to-speech function of the computer program did increase students' reading rate when the student began with a low reading rate score. Contradictory, Sorrell and colleagues (2007) found that the students who began the study with higher reading rates decreased their reading rate after reading from a computer screen.

In a study conducted by Srivastava and Gray (2012), 14 students classified with a language learning disability (LLD) and 25 typical language development (TLD) students were assessed on their reading comprehension with computer-based reading versus paper. The researchers were interested in the use of nonlinear texts, which are common in the digital world, and how textbooks are arranged. Nonlinear text consists of a main body of information and many different supplemental passages the learner may reference while they read. In the digital media, this takes the form of hypertext; external links to supplemental text. In textbooks there is a main body of text and supplemental readings, graphs, pictures, or diagrams embedded into the pages. With the addition of supplemental text, the reader may become distracted from the main body of text and thus hinder their comprehension (Srivastava & Gray, 2012). Srivastava and Gray (2012) note that many students with disabilities have difficulties with word recognition, listening

comprehension, or both. As a result, students with disabilities have difficulty with decoding, vocabulary, background knowledge, grammar, and comprehension monitoring. When students have a combination of these difficulties, it is believed that a majority of their mental capacities are focused on reading the words on the page, rather than on comprehending the text (Srivastava & Gray, 2012).

With the concern of adding additional cognitive processes to struggling readers by introducing reading assignments on computers, Srivastava and Gray (2012) postulated that the students with disabilities would be overwhelmed with the digital media. Much like the previous studies mentioned (Cuevas et al., 2012; Keene & Davey, 1987; Sorrell et al., 2007), the reading passages were chosen at the grade level of the students participating in the study, and no differentiation was considered. All of the students were assigned the same reading passages, based on their current grade level, not their reading ability. The assessment questions were presented in multiple choice format, but the level of questioning was not discussed. The researchers were interested in the effect of nonlinear text on a computer and tried to assess this by presenting the supplemental material in hyperlinked pages. The design of the assessment questions did not make it a necessity for the students to actually read the hyperlinked pages to correctly answer the assessment questions. As students were participating in the digital reading environment, the researchers noted that students with LLD were not viewing the hyperlinked pages, and therefore were not overloaded by the additional cognitive load (Srivastava & Gray, 2012).

The results of the study support the findings of Cuevas et al. (2012), Keene and Davey (1986), and Sorrell et al. (2007). Students with LLD predictably scored lower on

the reading comprehension assessments than their TLD classmates. There was, however, little statistical difference between the paper-based and the computer-based reading. The researchers did note that the difference in scores between the LLD students and the TLD students may be based on the fact that the LLD students completed the reading assignments and the multiple choice assessments in the same amount of time as their TLD classmates. As noted before, the LLD students did not take advantage of the hyperlinked text, but the TLD students did. The researchers questioned if the LLD students did not know that they needed additional time to process the questions or if they chose not to take the additional time they needed.

Motivation

One of the key factors that determines a student's ability to interact with text and comprehend the material is their motivation to read. While reading motivation takes on many different facets, it has been shown to be a key factor in student achievement (Guthrie et al., 2006; Andreassen & Braten, 2010). Motivation of each student is different and based upon the context of the reading (Wigfield & Guthrie, 1997). Motivation to read can be broken down into five subcategories: intrinsic motivation, extrinsic motivation, self-efficacy, interest, and social. Each of these categories plays a key role in a student's ability to achieve at a reading task. Secondary students tend to believe that if they have to put forth a substantial amount of effort to achieve a goal, they do not have the ability to succeed (Stipek, 1993). By increasing a student's motivation, teachers may increase student achievement (Kingston et al., 2017).

Guthrie, Wigfiels, Humenick, Perencevich, Taboada, and Barbosa (2006) conducted a study concerning situational interest as a motivating factor to increase

reading comprehension. The research was conducted with 98 elementary aged students, of which 18 percent were classified with a learning disability. The students were divided into two experimental groups, one group received a high number of hands-on activities linked to reading assignments and the other did not participate in the hands-on activities. The students were also questioned about their motivations for reading before, during, and after the intervention phase. The study utilized four key theories of motivation: self-determination theory, expectancy-value theory, sociocognitive theory, and activity theory. With the use of these theories, students are expected to: increase their belief in their own abilities, find value in the activities they engage in, feel as though they contributed to the decision-making process, and develop collaborative supports (Guthrie et al. 2006). The results of the research suggest students who participate in interesting experiences increase their situational interest in the topic, therefore increasing their motivation to read. The findings also suggest that by increasing students' situational interest in a reading assignment, reading comprehension scores will also increase (Guthrie et al., 2006).

Feedback

Students who receive constant feedback on their progress tend to improve their reading comprehension. This feedback is believed to increase the students' self-efficacy, in other words, the belief that they can achieve and increase their motivation to participate in reading assignments (Berkeley, Mastropieri, & Scruggs, 2011). Furthermore, when students have high motivation to read they are more likely to recognize when comprehension begins to break down and employ strategies to fix the problem. Readers who have a clear purpose to read and internalize their motivation to

read are more likely to find meaning in the text they read, and are more likely to take on the difficult task of reading for meaning.

Wolters, Barnes, Kulesz, York, and Francis (2017) were interested in finding out how student motivation impacts reading comprehension. The researchers tried to replicate teacher praise through brief motivational comments to students prior to them performing a reading task. The researchers noted that many studies have been conducted on reading comprehension and reading motivation, but few have focused on adolescents. The study participants were 60 ninth-grade students assigned to an experimental group and a control group. The participants were selected from a pool of 172 students who scored between the 20th and 50th percentile on the achievement tests. The researchers were interested in finding how the feedback intervention would generalize to standardized assessments. In order to collect data, the researchers administered the Gates-MacGinitie Reading Comprehension subtest, Gray Oral Reading Test, and the Woodcock-Johnson III Test of Achievement. The students were also asked to fill out a motivation survey and self-report on their motivation to read. Students in the control group were asked to read a short passage and answer questions on what they read. The experimental group received the same conditions but were also given positive feedback on their previous reading assessment. The results of this study suggest that the short positive feedback did not increase the students' reading comprehension scores between the pre and post tests (Wolters et al. 2017). The significant difference between the control and the experimental groups was that the experimental group did report higher motivation in the post-motivation survey. While the study suggests that brief motivational feedback does not generalize to standardized assessments, it did suggest that

these forms of motivators can be influential for individualized assignments (Wolters et al. 2017).

Achieve3000

Achieve3000 is a computer based reading intervention system that has been marketed to schools as a comprehensive learning platform to increase student reading skills. The program itself is broken down into six separate products, each geared towards different grade levels. The belief behind the programs is that if students can read at a particular Lexile level, they will be college and career ready. The program developers have partnered with Reuters news services in order to create the content. Students are presented with current news articles which have been differentiated based upon their individual Lexile levels (Keck &Kenney, 2005). Students' Lexile levels are determined by a level-set assessment at the beginning of implementation and each month that the student regularly participates in the program, their Lexile is adjusted based upon their performance.

All readings within the module are non-fiction and every lesson has the same five steps. Step one is a before reading poll which is intended to begin the students' thought process and engage the learner. The poll is intended to stimulate the student's prior knowledge and prepare them for what they are about to read. Step two is the reading of a two page non-fiction article, that has been differentiated based upon the student's present Lexile level. Each article has been broken down to the readability level of each Lexile level. The intent is that students are presented with a reading passage which is neither too easy nor difficult for them to read. Step three is an assessment of multiple-choice questions. Again, the questions and multiple choice options have been

differentiated based upon the student's present Lexile level. At this step, the students have two chances to correctly answer the questions. Step four is an after reading poll; using the same questions as the first, to have students justify their initial answer or change their mind. The final step requires the students to answer a thought question, which consists of writing out an answer to the question, pulling information from the text to justify their response. The amount a student is required to write in this step is also dependent upon their current Lexile level, a student with a high Lexile may be required to write a five-paragraph essay, while a low Lexile level student would be required to write a two paragraph essay (Achieve 3000, 2016).

To date, there has been very little research done on this program, beyond the reports generated by the company itself. There has been no research published to date studying the effects of Achieve3000 on secondary students' comprehension, and the independent research that has been conducted has resulted in mixed results. The company published a research study titled The National Lexile Study, which assessed the program's ability to increase student reading skills. One of the key features of the program is the use of the LevelSet assessment. The assessment is designed to ask students to read passages and answer multiple choice questions. As the students answer the questions, the program adjusts the level of reading in order to establish a basal and a ceiling. From this point the student is assigned a Lexile number and their reading passages are differentiated based upon the student's score on the assessment.

From the research produced by the company, the program creates dramatic gains in the Lexile level of all students who participate in the program. Achieve3000 conducted the study with a sample size of over 700,000 students and reports significant

gains across grade levels. The methodology of the research used the LevelSet assessment within the program as a pretest, to establish the students' Lexile level. The post test of the intervention was the same LevelSet to determine student growth. According to the 2013-2014 National Lexile Study, collective student growth was over two and half times the expected growth of typical instruction. The expected growth was determined by a company called MetaMetrics and did not disclose the formula for determining this expected number. All grade levels, 2 – 12, reported at least a two times greater than expected increase in scores. These findings were consistent across all ability levels, including English Language Learners and struggling readers (Achieve3000, 2014).

Hill, Lenard, and Page (2016) conducted a study of elementary students, and the results were contradictory to the findings of the National Lexile Study (NLS) (2014). The study consisted of approximately 35,000 students in grades 2-5 in North Carolina. The study was a randomized control trial of the Achieve3000 program across two years. Students participated in the recommended time on the program, twice a week for 30 minutes. In contrast to NLS, this study used the district's records of student testing scores as a baseline of student ability. The results of the study suggest that the use of Achieve3000 to improve student reading skills did not show statistically significant improvement. The researchers did note that student gains increased during the second year of implementation, when students were spending more time using the program. These findings suggest that it is possible for Achieve3000 to help improve student reading skills with a longer period of intervention and greater use.

Furthermore, a report generated by the Magnolia Consulting, LLC (2015), resulted in mixed results in the comparative analysis of students using Achieve3000 and

those who did not on the Gates-MacGinitie Reading Tests - Fourth Edition (GMRT-4). The study focused on third, sixth, and ninth grade classes, but did not report the sample size. Participants reportedly came from school districts in three geographic regions of the United States and the schools in each district ranged from 21 - 23 schools. The methodology of the study consisted of students being randomly assigned to an experimental group using Achieve3000, and a control group which used traditional English Language Arts curriculum. The results of the study were reported using the LexileSet as a pre and post-test for the experimental group and the GMRT-4 as a pre and post-test for both the experimental and the control groups. The results of an average of the LexileSet and the GMRT-4 across all participants showed statistically significant gains by the experimental group over the control group. As an average of all participants, the experimental group reported significant gains on the LexileSet assessment, but non-significant gains on the GMRT-4. This data suggests that the results of the increased LexileSet assessment scores were not generalized to the standardized GMRT-4.

The report, then broke down the results by grade level. The results for the third-grade students alone showed that the students in the experimental group did not score significantly higher than the control group who used the typical literacy programs. The sixth-grade experimental group did show some gains over the control group, but were not great enough to be considered statistically significant. The ninth-grade experimental group also showed no statistically significant gains by the experimental group, over the control group. Additionally, the report included results from English Language Learners who participated in the experiment. The results also indicated that there were no

differences between the students using Achieve3000 and the students participating in the typical literacy curriculum.

Conclusions

As a result of Keene and Davey (1987); Kim, McKenna, and Park (2017); and Srivastava and Gray (2012) students in the modern classroom are in need of explicit reading comprehension strategies in order to make meaning out of the expository text they are expected to read. With the increased usage of computer assisted instruction and the need for schools to help students comprehend expository text, computerized instruction has become an option for many schools. The need to understand what effects these programs have on student achievement, especially students with special learning needs, is of great importance for schools to make informed instructional decisions. The use of technology has become an ever increasing reality in almost all aspects of modern life and a clear understanding of how these programs can help our student master the skills they need to be successful is of utmost importance. The present study aims to build on the existing research of Aydemir and Ozturk, (2012); Cuevas, Russell, and Irving (2012); Jones, Staats, Bowling et al., (2005); and Sorrell, Bell, and McCallum (2007) and investigate the use of Achieve3000 on the reading comprehension of high school students with learning disabilities reading expository text.

Chapter 3

Methodology

Setting

School. The research was conducted in a regional high school in southern New Jersey which services students from three different municipalities. The municipalities range from rural to suburban. The high school houses an academy, which draws students from other districts to focus on a specific subject area. The school is currently on block scheduling, which consists of four 90 minute classes each day.

The high school currently has a total student population of 487 students and is considered to be an at-risk school. The economic status of the communities varies substantially. Approximately 67% of the student population is eligible for the free or reduced lunch program. Of these students, 24% are classified for special education services and currently hold an IEP. According to the New Jersey Performance Report (New Jersey Department of Education. 2016), the student population is approximately 53% male and 47% female. The racial makeup of the school is: 43% African American, 29% Hispanic, 27% White, and 1% other.

Classroom. The classroom where the study was conducted is a standard social studies classroom which is used by only one teacher. There are multiple social studies classes being taught in this classroom which services all four grade levels in the building. The room consists of one teacher's desk and 25 student desks. There is a teacher's computer, which is connected to a projector, five Chromebooks, and five laptops for student use.

The specific class in which the study was conducted is a language and/or language

disabilities, mild to moderate, self contained World History class with 14 students enrolled. The class is held daily for ninety minutes during the second block of the day. There is a paraprofessional in the room every day to assist the students. None of the students require a one-on-one aid.

Participants

All of the participants in the study are high school students enrolled in a ninth grade World History class. There are two females and five males. The students range in age from 14 to 18 and are in ninth through 11th grade. The majority of the students in the class are classified as specific learning disability or other health impaired. All students in the class have an IEP and are receiving special education services. Table 1 presents the general participants information and baseline data.

Table 1

General Information of Participating Students

Student	Age	Grade	Classification	Reading Comprehension as IEP Goal	Task Completion as IEP Goal	CRI grade level Word list scores	LevelSet Initial Lexile Scores
A	14	9	SLD	✓	✓	8	785
B	14	9	OHI	✓	✓	7	755
C	14	9	SLD	✓		9	950
D	18	11	MD	✓	✓	9	815
E	16	9	SLD	✓		7	675
F	14	9	OHI	✓	✓	9	940
G	14	9	OHI	✓		7	570

Participant 1. Student A is a 14-year-old Hispanic female. She is eligible for special education services under the classification of specific learning disability. She is a

very respectful young lady who has difficulties working with her peers. She often prefers to work alone and will protest if asked to work with a partner or in a group. She is inconsistent with her performance due to her struggles to interact with other students. She can become irritated by others in the class and will then refuse to participate in any assignment. When left to work independently, she remains focused on the task assigned and will ask for additional work when she has completed what was asked of her. She has a large vocabulary and has strong reading skills. She does have some troubles with reading comprehension and critical thinking questions. Her strengths are in her reading fluency and her ability to answer text-based questions. She has expressed interest in cosmetology as a postsecondary goal.

Participant 2. Student B is a 14-year-old African American male. He is eligible for special education services under the classification of specific learning disability. He is a very polite and considerate young man who works well with the teacher and his peers. He has difficulty staying on task and subject matter comprehension. He works diligently when he is on task and is able to be redirected when he goes off task. He needs constant reminders to attend to his assignments and often needs breaks in order to refocus. Student B often leaves his seat in order to approach other students, he often does not know why he is off task and quickly moves back to his seat when prompted. His vocabulary is below grade level and he has significant trouble with reading comprehension. He performs better on text-based questions, rather than critical thinking. He has expressed interest in automotive mechanics as a postsecondary goal.

Participant 3. Student C is a 14-year-old African American female. She is eligible for special education services under the classification of other health impaired.

Student C is an inconsistent student, depending on the peers in the room. She remains on task and completes her assignments when she is working independently, but has trouble focusing when her friends are around her. When working independently, she works diligently and completes her assignments with a high degree of accuracy. She has a vocabulary that is about grade level, but struggles with reading comprehension. She has the ability to read the material at grade level, but has difficulty processing the information from expository text. She has expressed a wide range of interests, including: doctor, surgeon, veterinarian, cosmetology, and babysitting.

Participant 4. Student D is an 18-year-old Caucasian male. He is eligible for special education services under the classification of multiply disabled. Student D has difficulty remaining on task and has great difficulty comprehending what he reads. He has had inconsistent attendance this year and in the past and is often disciplined for leaving school. His attendance and inability to complete assignments has caused him to repeat this class for a third time. He is a very kind and respectful young man who wants to do well but makes poor choices outside of school. His choices have hindered his ability to succeed and have carried over into the school, causing added disruption to his academics. Student D needs constant reminders to stay on task and will often only complete an assignment if the teacher or paraprofessional sits with him throughout the class period. Due to his attention and reading disability, Student D becomes quickly frustrated with the majority of assignments and gives up quickly. His vocabulary is below grade level and his comprehension scores are far below grade level. He has expressed interest in vocational or technical school after graduating; he has also expressed interest in opening his own business.

Participant 5. Student E is a 16-year-old African American male. He is eligible for special education services under the classification of specific learning disability. Student E is a respectful young man who has a great amount of difficulty with his comprehension. He is often reluctant to ask for help and will often try and sleep as a means of avoiding his assignments. He is taking world history for a second time. He was not able to pass the class last year due to incomplete assignments. Student E has difficulty with his organization and often loses his work. He also has difficulty processing and understanding directions. He will often sit quietly at his desk or try and sleep when he does not understand what the task requires of him. Once the directions are verbally explained to him, he understands what the task requires but has difficulty comprehending the written material he is presented with. He has expressed that he is interested in attending college and then becoming a NBA player.

Participant 6. Student F is a 14-year-old African American male. He is eligible for special education services under the classification of other health impaired. Student F is a respectful young man who has great difficulty staying on task. He is very interested in the subject matter and has a substantial amount of background knowledge in the subject. He is always willing to participate in class discussions, group assignments, and presentations. He enjoys being social with his peers, but can become quickly distracted from the assigned task. He has a strong vocabulary, but often has trouble understanding what the reading comprehension questions are asking him to do. He has difficulty discriminating the different forms of questions being asked, causing him to reply inappropriately to the question. He has expressed interest in pursuing a career in acting.

Participant 7. Student G is a 14-year-old African American male. He is eligible for special education services under the classification of other health impaired. Student G is easily distracted and often causes disruptions to the class. He has difficulty interacting with his peers in a positive manner. When he is able to focus on his work, he is able to complete assignments and has a high degree of accuracy. His vocabulary is below grade level and he has difficulty with critical thinking questions. He has difficulty analyzing the questions that are being asked of him and often answers the questions using an improper process and has difficulty inferring information. He has expressed interest in pursuing a carrier working with technology in the future.

Research Design

This research study utilized a single-subject design with ABAB phases. This study explored the independent variable, Achive3000 reading program, on the dependent variables of student reading comprehension. One of the dependent variables is the students' ability to answer questions that are derived directly from the information provided in the text they are required to read. The second dependent variable is the students' ability to answer questions that require them to critically think and make inferences about the required reading in order to construct an answer. During Phase A, typical teacher-led instruction was used consisting of students being asked to read a short expository passage and then answer ten open ended questions. Students were given directions that they are allowed to look back at the text and how to analyze questions in order to determine what the question is asking them to do. Baseline data was collected using the Critical Reading Inventory (CRI). The reading selections were designed to

assess the students' ability to answer text-based and critical thinking questions. Phase A consisted of six sessions over the course of two weeks.

During Phase B, the online computer program, Achieve3000, replaced teacher-led instruction. Phase B also consisted of six sessions over the course of two weeks. Students were assigned expository reading articles and then presented with multiple choice questions. These questions were designed by the program developers and measure the students' ability to answer text-based and critical thinking questions. Students' scores were recorded as correct or incorrect, and the students had two opportunities to correctly answer each question. The program reported if the student was able to answer the question correctly the first time, the second time, or not at all. Student progress was also reported by the program as a Lexile number.

During the second Phase A, the Achieve3000 intervention was removed and students were returned the baseline condition. This phase again consisted of six sessions over the course of two weeks. During the second Phase B, the Achieve3000 intervention was reintroduced for six sessions over the course of two weeks.

Measurement Materials

Critical Reading Inventory- second edition.

Word lists. The word lists are designed for the teacher to establish what words each student can read at different grade levels as sight words. The word lists are words that are within the reading passages for each grade level. Students are presented with each word and given one second to correctly verbalize the word. If the student mispronounces the word, they are then presented with the word again and given time to try and sound out the word. The use of the word list allows the teacher to begin

administering the passages at a grade level that each student should be able to read fluently. By allowing this differentiation, the measure of student reading comprehension is not skewed by the student's inability to read the words in the passage, but on their ability to comprehend what they just read.

Comprehension check. Students were presented with the grade level reading passages which match the reading level they presented with the word lists. They were then presented with a list of ten open-ended questions. These questions are broken down in order to assess three different aspects of comprehension. The ten questions assessed the student's comprehension of the text based on three dimensions of comprehension: text-based, inference, and critical thinking. Each passage asked four text-based questions where the student needed to recall main ideas directly from the text. Four inference questions were asked in each passage where the students needed to draw logical conclusions from the information they just read. Two critical thinking questions are asked which require the student to analyze, respond, and justify their answer.

Achieve3000 *LevelSet*. The Achieve3000 program began with a reading comprehension pre-assessment for each student. The assessment presented the students with a leveled reading and then asked comprehension questions based upon the passage. As the student proceeded through the assessment, they were presented with reading passages that were on different reading levels. The assessment chooses the next passage based upon if the student answered the previous question correctly. If the student was able to correctly answer the questions they were presented with a reading passage at a higher reading level and a new set of questions. If the student answered the questions incorrectly, they were presented with a less difficult passage and new questions. By

doing this, the program established a basal and a ceiling of the students' reading abilities. The LevelSet assessment assigned each student a lexile score and will base the students intervention assignments at that reading level.

Reading Passages. Students were presented with reading passages that were selected by the teacher. The teacher only had the ability to choose the topic of the passages and had no ability to change the reading level the students were presented with, nor the questions that were asked. The passages were differentiated, by the program, for each student's Lexile level. The students were required to read a two-page expository article and were allowed to note-take in the field provided. Once students completed the readings, they were presented with seven to ten multiple choice questions about what they just read. These questions assessed the students' ability to state the main idea, justify a claim, and make inferences. The students were given two chances to correctly answer the questions. After the students completed multiple passages, their Lexile score were increased, decreased, or remained the same based upon their performance.

Procedures

This study was conducted over an eight-week period. During week 1, baseline data was collected using three CRI readings and questions. Students were first asked to read individual words in isolation in order to determine their starting point of the readings. Students were first asked to read a word on an index card and given one second to properly verbalize the word. If students mispronounced the word, they were presented with the word again and given unlimited time to try and sound out the word. Students were presented with multiple grade level sets of words until they reached 70% accuracy. Students were then presented with the grade level reading that matched their basal visual

word recognition level. Once students completed the reading, the reading was collected and the students were presented with 11 questions about what they read. Once students completed answering the questions, the answer sheets were collected and scored. The results were not reported to the students.

Based upon the students' answers to the initial reading passage, during the second and third sessions they were either presented with a higher level reading or a lower level reading. And the same procedures were followed. During the second week of Phase A, and baseline of reading comprehension was established, the same procedures were followed as week one. The students' reading passages were adjusted according to their comprehension scores on the previous session.

During week three, students were trained on the use of Achieve3000 in session 1, and made familiar with the procedures of the program. All students were able to log into the site, retrieve their assigned reading, and proceed through the three steps of the program. These steps included: answering a pre-reading question in order to activate prior knowledge, read the two-page text, answer the seven to ten multiple choice questions, and answer the same question as the pre-reading question. In sessions two through six, students were asked to log into the Achieve3000 program and access the assigned readings and questions independently.

During weeks five and six, students were returned to Phase A and the use of Achieve3000 ceased. Students were again presented with an expository text to read and then 11 questions about the reading. Students were presented with either a higher level of reading passage, same level, or lower level of reading passage, based upon their previous score. During weeks seven and eight students were returned to Phase B and the

Achieve30000 program was reintroduced. Students were again required to log into the site, answer the pre-reading question, answer seven to ten multiple choice questions, and the post-reading question.

Measurement Procedures

In this study, there were two sets of materials used in order to collect data. In phase A, the Critical Reading Inventory – second edition (CRI-2) was used. This measure used word lists, expository text readings, and question lists. In phase B, the Achieve3000 online reading comprehension program was used to measure student growth.

CRI Questions. During both A Phases, students were required to answer 10 open-ended questions about the reading passage. The students were allowed to refer back to the reading if they needed to look back to answer their questions. The questions were scored based upon the CRI answer key and given a score of one point per question correctly answered. Each reading consisted of 4 text-based questions, 4 inference questions, and two critical thinking questions. All data collected was recorded on the CRI's Recapitulation Record. For purposes of this study, student scores were converted to percents.

Achieve3000. During both of the B Phases of the study, the data was collected automatically through the Achieve3000 program. All data was secured in the password-protected website and accessible by the teacher only. The reports are automatically generated by the program for the class participants and presented in a chart format. The students' ability to answer the multiple choice questions correctly was indicated by a green check mark and incorrect answers are represented by a red X. Student scores may

have been deemed invalid if they proceed through the selected module too quickly or if there was a pattern to the responses. The program monitored the students' time on task and how quickly they answered the questions. If the program determined that the student did not actually read the passage or answered the questions with fidelity, it invalidated their score. Student scores were reported as percents.

Survey. At the conclusion of the study the students were asked to voluntarily fill out a satisfaction survey. The survey consisted of ten items that are rated on a Likert scale. The Likert scale ranges from 5 (strongly agree) to 1 (strongly disagree). The survey was designed to measure the students' satisfaction with the Achieve3000 program. The researcher read the directions and explained the expectations of the survey to the participants. The researcher then read each question to the class and allowed for the students to ask any clarifying questions. The students were then given two minutes to mark their survey sheet. The questions prompted students to consider the ease of access of the Achieve3000 program, their preference between paper and computer reading, the usefulness of the program on curriculum topics, and the level of difficulty they found with the materials presented to them.

Data Analysis

Data was collected for each phase. CRI results were converted into percentage scores for each grade level completed. The data from the variables were displayed in visual line graphs for each participant. The results of the Achieve3000 program were converted to percentage scores for each passage and a Lexile score for each student. As the student proceeded through the program, the program adjusted the students' Lexile scores. As student Lexile scores changed, their score was recorded and converted to a

grade level range. The comprehension percentage scores and the Lexile/grade level scores were presented in a visual line graph. The mean score for each student was compared and contrasted to determine the student's growth in comprehension scores between both datasets and over time.

Chapter 4

Results

This single subject design study utilized ABAB phases in order to examine the use of computer assisted instruction on text-based and critical thinking questions for students with LD. All 15 students in a self-contained World History class participated in the baseline and intervention instruction. Consent was obtained for seven of the 15 students' data to be utilized to present the results of the intervention.

Text-Based Comprehension Questions

Research question one asked, will the use of Achieve3000 impact responses to text based comprehension questions by high school students with learning disabilities? Text-based comprehension scores were obtained through the use of the Critical Reading Inventory- Second Edition during baseline phases and the Achieve3000 reading comprehension program during intervention phases. Each question was graded correct or incorrect and given one point for a correct response. Scores were then converted to percentages. Means and standard deviations of student percentage scores on text-based reading comprehension questions are shown in Table 2.

Table 2

Mean and Standard Deviation of Text-Based Comprehension Questions

	Baseline 1		Intervention 1		Baseline 2		Intervention 2	
	Mean %	SD %	Mean %	SD %	Mean %	SD %	Mean %	SD %
Student A	62.50	13.69	50.00	31.62	70.83	24.58	47.00	17.54
Student B	50	35.36	34.67	77.43	45.83	18.82	43	24.98
Student C	41.67	12.91	58.33	39.14	54.17	24.58	33.33	27.97
Student D	70.83	10.21	57.17	17.5	75	15.81	73.67	22.6
Student E	58.33	12.91	55.67	32.82	70.83	18.82	54.17	28.9
Student F	62.5	13.69	58.33	37.64	54.17	29.23	47.17	32.38
Student G	62.5	13.69	37.5	32.45	70.83	18.81	52.67	26.88

In the area of text-based comprehension questions, the group mean for baseline 1 was 58.33, and the group mean at intervention 1 was 50.24. The group mean at baseline 2 was 63.1, and the group mean at intervention 2 was 50.14. The group as a whole decreased in their scores during intervention 1 and 2, but scored a higher mean during baseline 2. Student C was the only student to have an increase in individual mean score between baseline one and intervention one. Student C and F showed decreased individual mean scores between intervention one and baseline 2. All students showed a decrease in individual mean scores between baseline 2 and intervention 2.

Critical Thinking Comprehension Questions

Research question two asked, will the use of Achieve3000 impact responses to critical thinking comprehension questions by high school students with learning disabilities? Critical thinking comprehension scores were obtained through the use of the Critical Reading Inventory- Second Edition during baseline phases and the

Achieve3000 reading comprehension program during intervention phases. Each question was graded correct or incorrect, and given one point for a correct response. Scores were then converted to percentages. Means and standard deviations of student percentage scores on critical thinking reading comprehension questions are shown in Table 3.

Table 3

Mean and Standard Deviation of Critical Thinking Comprehension Questions

	Baseline 1		Intervention 1		Baseline 2		Intervention 2	
	Mean %	SD %	Mean %	SD %	Mean %	SD %	Mean %	SD %
Student A	38.83	13.56	51.33	32.70	30.67	16.21	43.33	28.75
Student B	33.33	29.63	57.00	22.45	35.83	6.94	49.50	16.05
Student C	25.00	8.76	37.50	14.70	25.17	13.75	47.67	10.23
Student D	36.50	11.61	34.00	27.17	28.00	20.15	54.17	10.21
Student E	39.83	8.33	60.50	31.07	30.33	16.34	51.67	20.41
Student F	22.33	8.26	38.83	19.87	25.00	31.00	40.50	21.36
Student G	25.50	8.29	59.17	23.75	25.00	17.36	68.33	22.29

In the area of critical thinking comprehension questions, the group mean for baseline 1 was 31.62, and the group mean at intervention 1 was 48.33. The group mean at baseline 2 was 28.57, and the group mean at intervention 2 was 50.74. The group as a whole increased their critical thinking comprehension scores from baseline 1 to intervention 2 by 19.12. The group scored lower during baseline 2 than the other three phases with a 28.57. Student D was the only student to have a decrease in individual mean score between baseline one and intervention one. All students showed an increase in individual mean scores between baseline two and intervention 2.

Individual Results

Student A is a 14-year-old Hispanic female. She is eligible for special education services under the classification of specific learning disability. Figure 1 illustrates the text-based and critical thinking comprehension scores for Student A. During the first baseline phase, Student A's mean text-based comprehension questions score was 62.5%. During intervention phase one, when Achieve3000 was implemented, the mean score decreased to 50%. Student A's mean score for text-based comprehension questions increased to 70.83% during the second baseline and the intervention was removed. During the second intervention phase, Achieve3000 was reintroduced and Student A's mean score decreased to 47%. From the beginning of baseline one to the end of intervention two, Student A's texted-based comprehension score decreased by 18.5%.

During the first baseline phase, Student A's mean critical thinking comprehension questions score was 38.83%. During intervention phase one when Achieve3000 was implemented, the mean score increased to 51.33%. During the second baseline, when the intervention was removed, Student A's mean score for critical thinking comprehension questions decreased to 30.67%. During the second intervention phase, Achieve3000 was reintroduced and Student A's mean score increased to 43.33%. From baseline one through intervention two Student A increased her critical reading comprehension score by 4.5%.

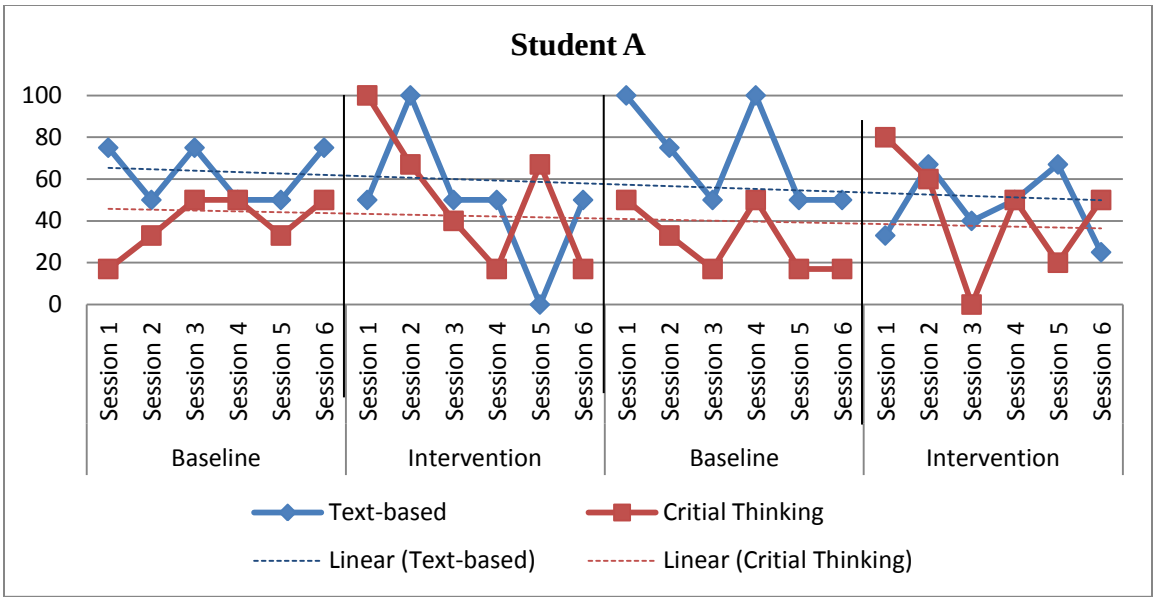

Figure 1. Student A Text-Based and Critical Thinking Comprehension

Student B is a 14-year-old African American male. He is eligible for special education services under the classification of specific learning disability. Figure 2 illustrates the text-based and critical thinking comprehension scores for Student B. During the first baseline phase, Student B's mean text-based comprehension questions score was 50%. During intervention phase one, when Achieve3000 was implemented, the mean score decreased to 4.67%. Student B's mean score for text-based comprehension questions increased to 45.83% during the second baseline and the intervention was removed. During the second intervention phase, Achieve3000 was reintroduced and Student B's mean score decreased to 43%. From the beginning of baseline one to the end of intervention two, Student B's texted-based comprehension score decreased by 7%.

During the first baseline phase, Student B's mean critical thinking comprehension questions score was 33.33%. During intervention phase one when Achieve3000 was

implemented, the mean score increased to 57%. During the second baseline, when the intervention was removed, Student B's mean score for critical thinking comprehension questions decreased to 35.83%. During the second intervention phase, Achieve3000 was reintroduced and Student B's mean score increased to 49.5%. From baseline one through intervention two, Student B increased his critical reading comprehension score by 16.17%.

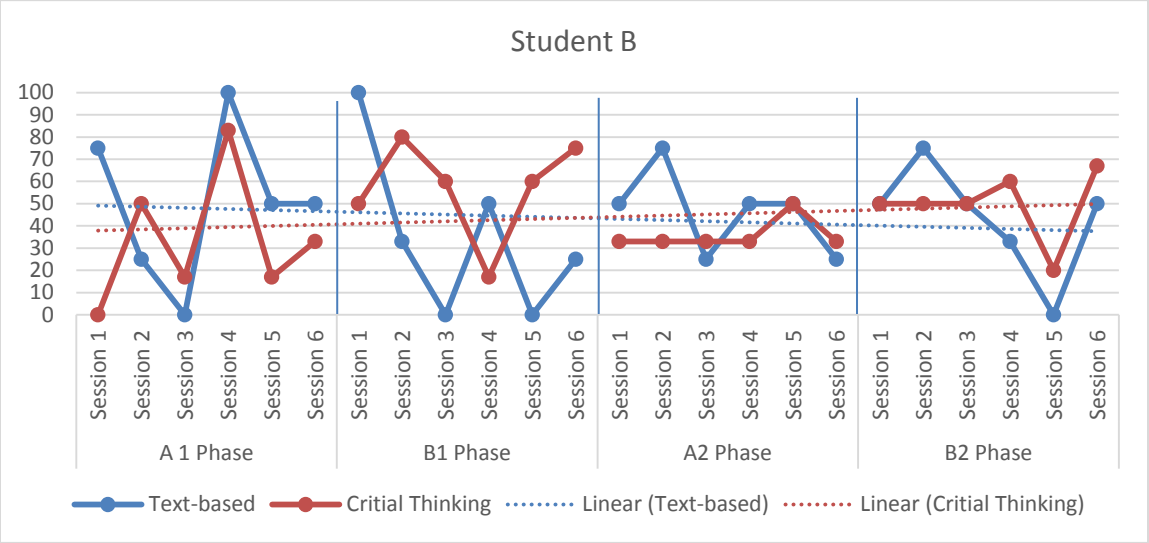

Figure 2. Student B Text-Based and Critical Thinking Comprehension

Student C is a 14-year-old African American female. She is eligible for special education services under the classification of other health impaired. Figure 3 illustrates the text-based and critical thinking comprehension scores for Student C. During the first baseline phase, Student C's mean text-based comprehension questions score was 41.67%. During intervention phase one, when Achieve3000 was implemented, the mean score increased to 58.33%. Student C's mean score for text-based comprehension questions decreased to 54.17% during the second baseline and the intervention was removed.

During the second intervention phase, Achieve3000 was reintroduced and Student C's mean score decreased to 33.33%. From the beginning of baseline one to the end of intervention two, Student C's texted-based comprehension score decreased by 8.34

During the first baseline phase, Student C's mean critical thinking comprehension questions score was 25%. During intervention phase one when Achieve3000 was implemented, the mean score increased to 37.5%. During the second baseline, when the intervention was removed, Student C's mean score for critical thinking comprehension questions decreased to 25.17%. During the second intervention phase, Achieve3000 was reintroduced and Student C's mean score increased to 47.67%. From baseline one through intervention 2 Student C increased her critical reading comprehension score by 22.67%.

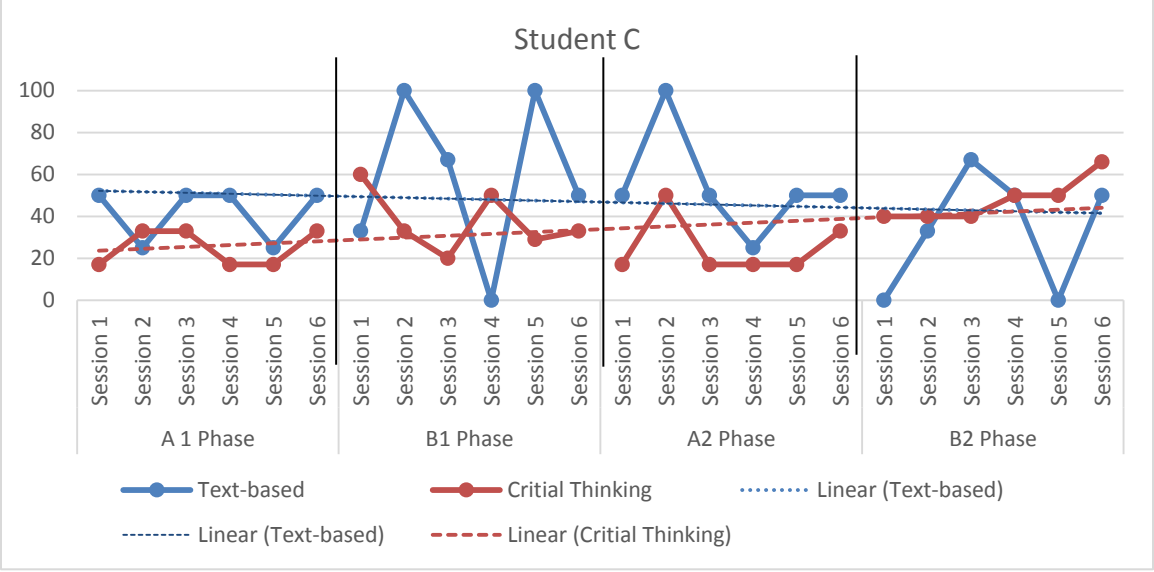

Figure 3. Student C Text-Based and Critical Thinking Comprehension

Student D is an 18-year-old Caucasian male. He is eligible for special education services under the classification of multiply disabled. Figure 4 illustrates the text-based and critical thinking comprehension scores for Student D. During the first baseline phase, Student D's mean text-based comprehension questions score was 70.83%. During intervention phase one, when Achieve3000 was implemented, the mean score decreased to 57.17%. Student D's mean score for text-based comprehension questions increased to 75% during the second baseline and the intervention was removed. During the second intervention phase, Achieve3000 was reintroduced and Student D's mean score decreased to 73.67%. From the beginning of baseline one to the end of intervention two, Student D increased his texted-based comprehension score by 2.84

During the first baseline phase, Student D's mean critical thinking comprehension questions score was 36.5%. During intervention phase one when Achieve3000 was implemented, the mean score decreased to 34%. During the second baseline, when the intervention was removed, Student D's mean score for critical thinking comprehension questions decreased to 28%. During the second intervention phase, Achieve3000 was reintroduced and Student D's mean score increased to 54.17%. From baseline one through intervention two, Student D increased his critical reading comprehension score by 17.67%.

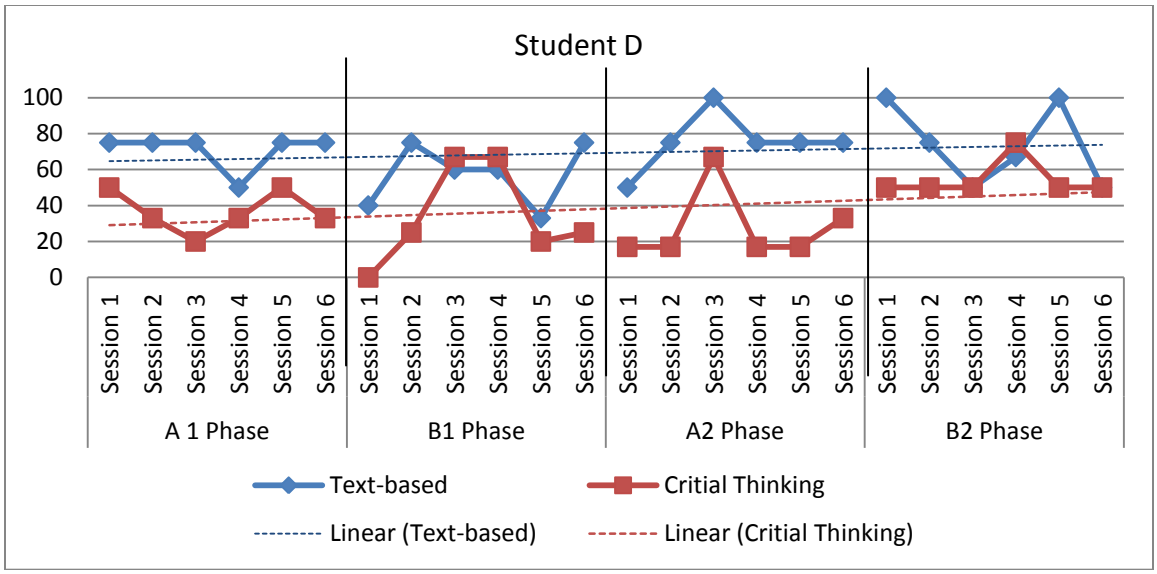

Figure 4. Student D Text-Based and Critical Thinking Comprehension

Student E is a 16-year-old African American male. He is eligible for special education services under the classification of specific learning disability. Figure 5 illustrates the text-based and critical thinking comprehension scores for Student E. During the first baseline phase, Student E's mean text-based comprehension questions score was 58.33%. During intervention phase one, when Achieve3000 was implemented, the mean score increased to 60.5%. Student E's mean score for text-based comprehension questions decreased to 55.67% during the second baseline and the intervention was removed. During the second intervention phase, Achieve3000 was reintroduced and Student E's mean score increased to 70.83%. From the beginning of baseline one to the end of intervention two, Student E increased his texted-based comprehension score by 12.5%.

During the first baseline phase, Student E's mean critical thinking comprehension questions score was 39.83%. During intervention phase one, when Achieve3000 was

implemented, the mean score increased to 60.5%. During the second baseline, when the intervention was removed, Student E's mean score for critical thinking comprehension questions decreased to 30.33%. During the second intervention phase, Achieve3000 was reintroduced and Student E's mean score increased to 51.67%. From baseline one through intervention two, Student E increased his critical reading comprehension score by 11.84%.

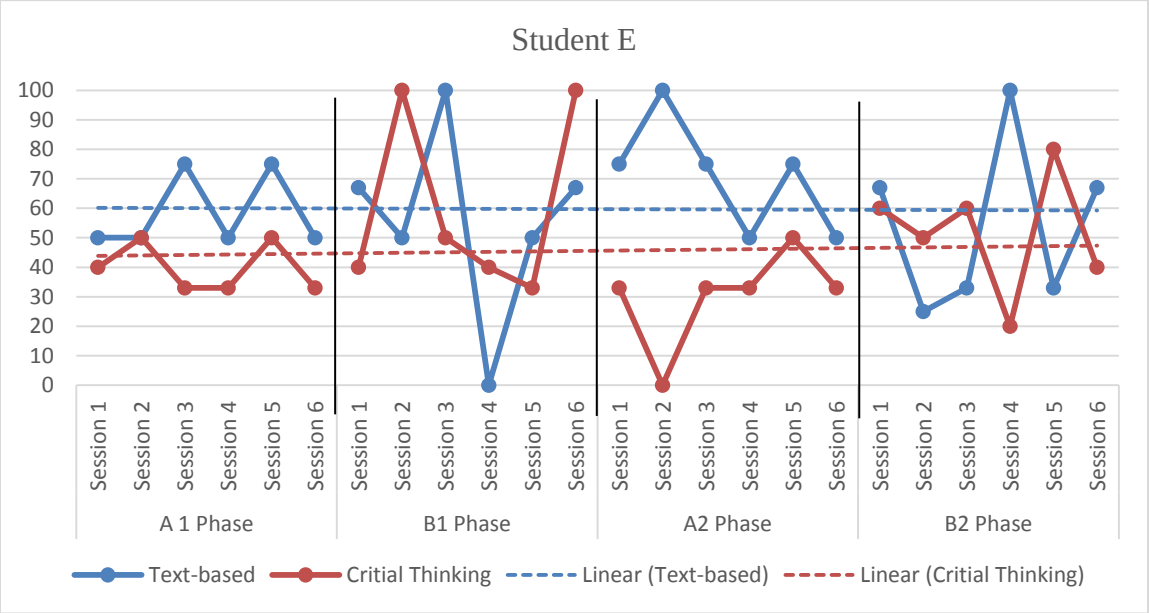

Figure 5. Student E Text-Based and Critical Thinking Comprehension

Student F is a 14-year-old African American male. He is eligible for special education services under the classification of other health impaired. Figure 6 illustrates the text-based and critical thinking comprehension scores for Student F. During the first baseline phase, Student F's mean text-based comprehension questions score was 62.5%. During intervention phase one, when Achieve3000 was implemented, the mean score decreased to 58.33%. Student F's mean score for text-based comprehension questions

decreased to 54.17% during the second baseline and the intervention was removed. During the second intervention phase, Achieve3000 was reintroduced and Student F's mean score increased to 47.17%. From the beginning of baseline one to the end of intervention two, Student F's texted-based comprehension score decreased by 15.33%.

During the first baseline phase, Student F's mean critical thinking comprehension questions score was 22.33%. During intervention phase one when Achieve3000 was implemented, the mean score increased to 38.83%. During the second baseline, when the intervention was removed, Student F's mean score for critical thinking comprehension questions decreased to 25%. During the second intervention phase, Achieve3000 was reintroduced and Student F's mean score increased to 40.5%. From baseline one through intervention two, Student F increased his critical reading comprehension score by 18.17%.

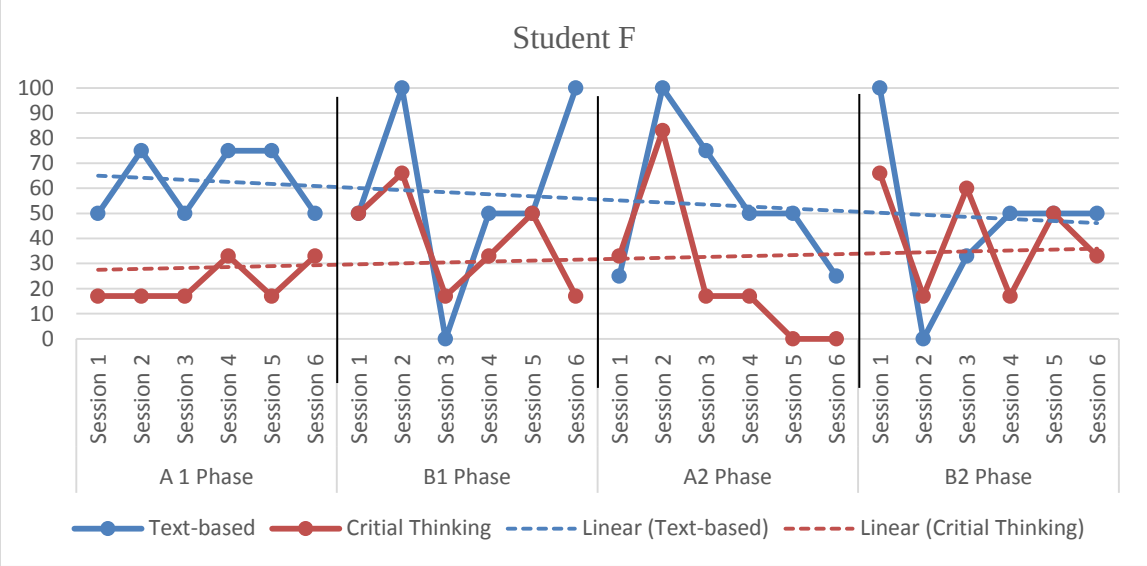

Figure 6. Student F Text-Based and Critical Thinking Comprehension

Student G is a 14-year-old African American male. He is eligible for special education services under the classification of other health impaired. Figure 7 illustrates the text-based and critical thinking comprehension scores for Student G. During the first baseline phase, Student G's mean text-based comprehension questions score was 62.5%. During intervention phase one, when Achieve3000 was implemented, the mean score decreased to 37.5%. Student G's mean score for text-based comprehension questions increased to 70.83% during the second baseline and the intervention was removed. During the second intervention phase, Achieve3000 was reintroduced and Student G's mean score decreased to 52.67%. From the beginning of baseline one to the end of intervention two, Student G's texted-based comprehension score decreased by 9.83%.

During the first baseline phase, Student G's mean critical thinking comprehension questions score was 25.5%. During intervention phase one when Achieve3000 was implemented, the mean score increased to 59.17%. During the second baseline, when the intervention was removed, Student G's mean score for critical thinking comprehension questions decreased to 25%. During the second intervention phase, Achieve3000 was reintroduced and Student G's mean score increased to 68.33%. From baseline one through intervention two, Student G increased his critical reading comprehension score by 42.83%.

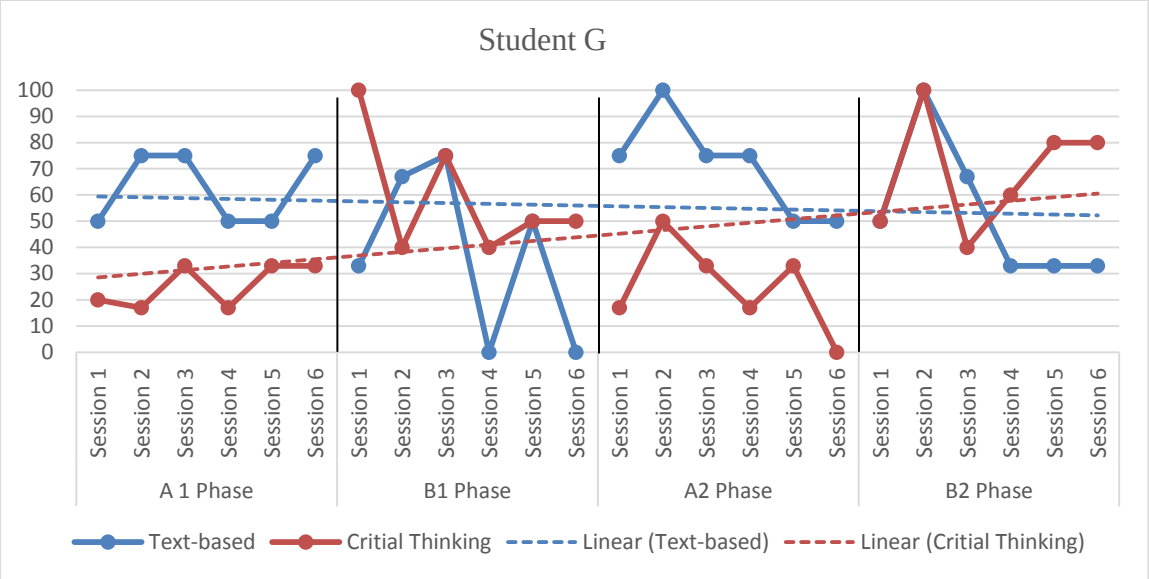

Figure 7. Student G Text-Based and Critical Thinking Comprehension

Survey Results

All students were asked to fill out a Likert scale survey of their satisfaction of the use of the Achieve3000 reading comprehension program. The students' responses were tallied and converted into percentages. The student response percentage totals for each of the 10 categories is presented in Table 4.

Table 4

Student Satisfaction Survey Percentage Results

Statements	**Strongly Agree (%) 5**	**Agree (%) 4**	**Undecided (%) 3**	**Disagree (%) 2**	**Strongly Disagree (%) 1**
1. I found Achieve3000 easy to navigate.	42	14	29	14	0
2. I enjoyed reading the articles on the computer	14	14	57	0	14
3. I would prefer to read from printed paper	14	29	14	14	29
4. I would prefer to read from the textbook	0	19	29	14	42
5. From using Achieve3000, I felt as though I learned more about the topics we were discussing in class.	29	0	29	29	14
6. I felt as though the questions were too hard to answer.	0	0	29	29	42
7. I enjoyed using the program in class.	29	14	29	0	29
8. I felt as though the program was too easy for me.	42	0	29	29	0
9. I hope we use this program more in the future and other classes.	42	14	14	14	14
10. I think I will do better on test, that are conducted on line, in the future because of my experience with Achieve3000	29	14	42	0	14

As seen in Table 4, a score of 4 or 5 indicated that the student agreed with the statement. Due to the limited number of responses, the percentage scores were rounded to the nearest whole number, causing some categories to not total to 100%. A score of 3 indicated that the students was neutral about the statement, and a score of 2 or 1 indicated that the students disagreed with the statement. Table 4 shows that 56% of the students agreed with statement one, "I found Achieve3000 easy to navigate," 29% of the students were neutral on the statement and 14% disagreed. Statements 7, "I enjoyed using the program in class" and 8, "I felt as though the program was too easy for me," received almost identical scores with 43% and 42% of students agreeing with the statements, 29% neutral, and 29% disagreeing. The majority of students (56%) agreed with statement 9, "I hope we use this program more in the future and other classes." Statement 10, "I think I will do better on test, that are conducted on line, in the future because of my experience with Achieve3000," scored a 43% agreement, one percentage point higher than the neutral score.

The only statement that received a majority of responses in the neutral column, with 57%, was statement 2, "I enjoyed reading the articles on the computer." The majority of students disagreed with statements 4 through 6. Statement 4, "I would prefer to read from the textbook," had 56% of students in disagreement. For statement 5, "From using Achieve3000, I felt as though I learned more about the topics we were discussing in class," 43% of students disagreed. Statement 6, "I felt as though the questions were too hard to answer," found that 71% of students disagreed. Statement 3, "I would prefer to read from printed paper," was the only statement which received a split amongst the students with 43% of students disagreeing, 43% agreeing, and 14% responding neutral.

Chapter 5

Discussion

The purpose of this study was to investigate the effectiveness of the use of Computer Assisted Instruction (CAI) in increasing the reading comprehension scores of students in a World History class with LD. The students were measured on their ability to read an expository article and answer critical thinking and text-based questions. At the end of the study, participants were then asked to take a survey about their satisfaction with the program.

Findings

The research on the use of Computer Assisted Instruction (CAI) has shown mixed results when focusing on student reading comprehension (Cuevas et al., 2012; Srivastava & Gray, 2012). The results have appeared to be consistent when using computers as a motivational tool to engage students in the reading process. The results of the current study have mirrored these findings. Further, the skill of look back at the text to find answers has been proven to be a beneficial skill for students to correctly answering comprehension questions (Garner et al., 1984; Keen and Davey, 1987; Swanson and De La Paz,1998). The majority of the participants appear to corroborate these findings, in a comparison of the baseline and intervention phases.

Previous research has also shown that the use of CAI is not an immediate fix for the current problem of students' inability to read on grade level, nor to comprehend what they read. The research has shown that there is some growth when CAI is used, but fails to generalize to standardized testing. As Hill, Lenard, and Page (2016) have suggested, the use of CAI, as a long term intervention, may show improvements in student scores on

standardized tests. As many of the previous research experiments were not implemented over the course of multiple years, there is little evidence that the prolonged use of CAI will produce statistically significant gains, but the possibility is promising.

The results of the current study corroborate these findings. While there was growth noted in the students' group critical reading scores, there was a negative trend in their text-based scores. The results of this study suggest that the use of the CAI system, Achieve3000, may help students' critical reading comprehension, but there may be a disconnect between what the students have read and transfer of the knowledge to the assessment. The students in this study are all students with learning disabilities and may struggle with this form of questioning. They may also have responded to this form of intervention for improving their critical thinking skills, but may need a different intervention to support their text-based question skills.

The research of Cuevas et al. (2012), Keene and Davey (1986), and Sorrell, Bell, and McCallum (2007), suggests that the use of CAI shows little improvement on student reading comprehension. These results were confirmed in the current study where the participants' text-based reading comprehension scores decreased from the start of the study to the conclusion by 8.19%. Student D was the only student to show growth from baseline one to the conclusion of intervention 2, 2.84%. The results are mixed when the paper based assessment is compared to the computer based assessments. The median group score between baseline 1 and baseline 2 increased by 4.76%. In contrast, the median score between intervention 1 and intervention 2 decreased by 0.1%. Participants D and G were the only two to score consistently higher from baseline 1 to baseline 2 and between intervention 1 and intervention 2. While student D did show a decreasing

trendline in his texted-based scores, he did higher in the second intervention phase than he did across all other phases. Student C increased her texted-based score in the intervention phases of the study, while showing a slight decrease in the baseline phases.

As stated in the research of Garner et al. (1984), Keen and Davey (1987), and Swanson & De La Paz (1998), the need for students to look back at the text is important for the students to correctly answer assessment questions of what they have just read. In the area of texted-based questions, the students in this study showed a trend of scoring higher on baseline 1 and then decreasing trendlines on baseline 2. Student A showed a constant decrease in scores across all phases and did not appear to be interested in the paper or computer assessments. After baseline 1, she did not look back at the text when taking the assessment, nor did she appear to thoroughly read the text. Student B showed a dramatic decrease in the texted-based scores in all phases but baseline 1. The dramatic decreasing trendline was created by two high scores in baseline 1; if these scores were removed a positive trendline is created. This may be due to the lower level of readings Student B received at the start of baseline data collection and the subsequently more difficult reading assignments he received due to these high scores.

The decreasing trendline for all students across the intervention phase may be explained by the inability of the students to readily look back at the text on a computer screen. As the Achieve3000 program allowed students to read the text on one screen, click a "next" button and then answer the questions without the text present on the screen, the questions are not presented on the same screen as the text. While students were able to click back to the text, few knew they were able to do so, and even when instructed that it is a possibility, very few actually went back to the text once it was removed. These

findings corroborate the findings of the study conducted by Srivastava and Gray (2012) where they stated that students with LD rarely clicked away from the assignment on the screen or used the supplemental links to increase understanding.

Research has suggested that CAI may help to improve student reading comprehension on critical thinking assessments. The results of six out of the seven participants in the present study corroborate the findings of Jones, Staats, and Bowling (2005), National Lexile Study (2014), and Magnolia Consulting, LLC (2015). As a group, the participants increased their critical thinking scores by 19.12%, from baseline 1 to intervention 2. After the initial baseline phase, Student B showed a steady increase in critical thinking scores across the remaining phases of the study. From baseline 1 to intervention 2, Student B was able to increase his mean critical thinking score by 16.17%. Student C increased her mean critical thinking score by 22.67% over the course of the study. Student G made the most significant gains with an increase of mean score of 42.83% over the duration of the study. As shown by the results, most of the participants scored higher on critical thinking questions when the CAI program was used. Only student D showed a decreased score, by 1.5%, from baseline 1 to intervention 1, but showed a much larger gain between baseline 2 and intervention 2, 26.17%. Further, all students increased their critical thinking comprehension scores from baseline 2 to intervention 2.

This study also corroborated the research of Cuevas et al. (2012), Guthri et al. (2006) and Margolis & McCabe (2004). The use of the computers has helped in the increased interest students have in participating in reading instruction. As the data collected from the student survey suggests, the participants preferred reading from the

computer, rather than the text book. When asked if they felt if the Achieve3000 program was easy to navigate, 42% strongly agreed. When asked if they enjoyed reading from a computer 28% agreed, 57% were undecided, and only 14% disagreed. While this response was not a high endorsement for reading on a computer, it is considerably much higher than the 56% of students who disagreed with the statement that they would prefer to read from the textbook. Interestingly, when participants were asked if they preferred to read from printed paper, not the text book, the results were split. 43% of participants agreed with the statement, 14% were undecided, and 43% disagreed.

While it is apparent that students do not enjoy reading from the social studies text book, they do not appear to be more likely to choose a computer screen over a copied version of the reading. However, the majority of the participants, 43%, agreed when asked if they enjoyed using the Achieve3000 program. While 29% remained undecided, and the remaining 29% strongly disagreed with that statement, the larger percentage of the participants did enjoy using the computer program for reading instruction. Despite the participants' feelings of burnout and some negative responses to the use of the program, 42% strongly agreed with the statement asking if they would like to use the program more in the future. While there are some mixed results as to whether the participants preferred the computer program over paper based readings, it is clear that they enjoyed the program and it may have increased their motivation to participate in the instruction.

Limitations

This study has several limitations. The first limitation is the limited sample size. Due to the smaller size of a self contained classroom, there were few students available as

possible participants in the study. While all of the students were interested in participating in the new, computer based, intervention, few were willing to have their data shared in a publicly accessible research study. While all assurances were given that there would be no identifiable markers in the research report, many were still reluctant to have their personal successes or failures published. Due to the limited sample size, data may not be generalized beyond the participants of this study.

Another limitation of the study would be the timeframe of the research interventions. The research interventions took place in the latter half of the fall semester. Due to the fact that the school, where the research was conducted, operates on a block schedule, PARCC was being conducted concurrently with baseline 2 and intervention 2. While not all of the participants were testing on the same days that data was collected for the research, many of the participants were reluctant to participate in online reading comprehension assessments after spending three hours attempting state standardized testing. After one week of paper based assessments, then one week of computer based assessments, many of the students were complaining of burnout. Due to continued assessment of reading comprehension and the administration of PARCC, many of the participants did not appear to be taking the assignments seriously. This burnout may account for the decreasing trendlines.

As suggested by Saenz and Fuchs (2002), students with learning disabilities tend to have lower scores when being assessed using expository text. Due to the complex structure and how dense the text is with information, students with LD tend to have difficulty comprehending expository text in comparison to narrative text. Due to the fact that this study only focused on expository text, the students were not able to demonstrate

their reading comprehension skills using narrative text. As stated by National Governors Association Center for Best Practices & Council of Chief State School Officers (2010), students are expected to read more expository text as they increase in grade level. As these students were in the first semester of their secondary education, they may not have been exposed to much expository text, nor have had much direct instruction in reading strategies for this type of text.

The increase in critical thinking scores and a decrease in text-based scores appear to be contradictory. As stated above, these students were newly enrolled in secondary education and were now being expected to read a great amount of expository text. Due to this increase, the teacher conducting the study did spend a great deal of time directly instructing students on critical thinking strategies. The results of this study may be representative of this shift in reading comprehension instruction. The participants were no longer receiving instruction using narrative text, but were receiving daily instruction using expository.

Implications and Recommendations

This study added to the research of the effectiveness of the use of computer assisted instruction. This study added to the knowledge of the use of this form of individualized instruction when text-based and critical thinking questions are being investigated with students with learning disabilities. The implications of this study may lead educators to develop differentiated instructional plans to help created targeted assistance plans for students with disabilities. As stated in the research of Campbell & Kmiecik (2004), Park & Osborne (2006) and Roehling, Hebert, Nelson, & Bohaty (2017), many teachers feel unprepared to directly instruct students on reading

comprehension skills. This form of instruction may prove to be useful in helping underprepared teachers support their struggling students.

With the limitations of this study in mind, this study does suggest that the use of the Achieve3000 reading comprehension program can help to improve students' critical thinking scores in reading assessments. The prior research of Jones, Staats, and Bowling (2005), National Lexile Study (2014), and Magnolia Consulting, LLC (2015) does suggest that the use of CAI can help to increase students' critical thinking assessment scores. This study suggests that these tools can be used to help improve students' reading comprehension skills and can add to a teacher's strategies they may utilize to help their students who struggle with reading. With the increased emphasis on reading comprehension, higher order thinking, computerized assessments, and differentiated instruction; a teacher needs to have as many tools to choose from as possible.

As stated earlier, the majority of the research on the use of CAI has been conducted at the elementary and middle school levels. With the need for secondary students to read increasingly more difficult text and the high stakes of assessment at this level, this study adds to the knowledge of how instruction can be conducted at the different grade levels. This study also only focused on the use of expository text, which secondary students are expected to read, and has suggested that this form of intervention may help to increase the critical thinking skills of our most struggling students.

Another implication of this study may be that teachers see the need to directly instruct students on higher order comprehension skills in the secondary grades, but to also reinforce the text-based skills the students have built in the lower grades. As this research has suggested, the students increased their critical thinking scores, but showed a

decreasing trendline for texted-based questions. With the increasing focus on critical thinking skills, students with learning disabilities may begin to lose some of the skills they acquired in the lower grades without adequate reinforcement in secondary schools.

In this study, the majority of students increased their critical thinking scores through the use of the CAI. Further research should be conducted within the secondary schools to assess the use of this form of instruction across all ability levels. By increasing the sample size and including all demographics of the student population, there could be a more clear representation to the implications of the Acieve3000 program. Further, the use of multiple CAI programs should be studied in order to inform the school districts of the strengths of each program. Doing so would allow the districts to allocate their funds to target their individual goals and needs.

References

Achieve3000. (2014) National Lexile Study 2013-2014. Retrieved from http://edcenter.org/resources/intervention/2013-14_NationalLexile.pdf

Achieve3000. (2016) National Lexile Study 2015-2016. Retrieved from https://www.achieve3000.com/download-national-lexile-study/

Andreassen, R., & Braten, I. (2010). Examining the Prediction of Reading Comprehension on Different Multiple-Choice Tests. *Journal Of Research In Reading*, *33*(3), 263-283.

Aydemir Z, Ozturk E. The Effects of Reading from the Screen on the Reading Motivation Levels of Elementary 5th Graders. *Turkish Online Journal Of Educational Technology - TOJET* [serial online]. July 1, 2012;11(3):357-365.

Bouck, E. C., Meyer, N. K., Satsangi, R., Savage, M. N., & Hunley, M. (2015). Free Computer-Based Assistive Technology to Support Students With High-Incidence Disabilities in the Writing Process. *Preventing School Failure*, *59*(2), 90-97. doi:10.1080/1045988X.2013.841116

Compton, D. L., Miller, A. C., Elleman, A. M., & Steacy, L. M. (2014). Have We Forsaken Reading Theory in the Name of "Quick Fix" Interventions for Children With Reading Disability?. *Scientific Studies Of Reading*, *18*(1), 55-73. doi:10.1080/10888438.2013.836200

Cuevas, J. j., Russell, R. r., & Irving, M. i. (2012). An examination of the effect of customized reading modules on diverse secondary students' reading comprehension and motivation. *Educational Technology Research & Development*, *60*(3), 445-467.

Garner, R., Hare, V. C, Alexander, P., Haynes, J., & Winograd, P. (1984). Inducing use of a text lookback strategy among unsuccessful readers. *American Educational Research Journal, 21*, 789-79

Guthrie, J. T., Wigfield, A., & Humenick, N. M. (2006). Influences of Stimulating Tasks on Reading Motivation and Comprehension. *Journal Of Educational Research*, *99*(4), 232-245.

Jenks, M. S. & Springer, J. M. (2002). A view of the research on the efficacy of CAI. Electronic Journal for the Integration of Technology in Education. 1(2). 43-58.

Jitendra, A. K., Hoppes, M. K., & Yan, P. X. (2000). Enhancing main idea comprehension for students with learning problems: the role of a summarization strategy and self-monitoring instruction. *Journal Of Special Education*, *34*(3), 127-139.

Jones, J. D., Staats, W. D., & Bowling, N. (2004). An Evaluation of the Merit Reading Software Program in the Calhoun County (WV) Middle/High School. *Journal Of Research On Technology In Education*, *37*(2), 177-195.

Keene, S., & Davey, B. (1987). Effects of computer-presented text on LD adolescents' reading behaviors. *Learning Disability Quarterly*, *10*283-290.

Kim, M. K., McKenna, J. W., & Park, Y. y. (2017). The Use of Computer-Assisted Instruction to Improve the Reading Comprehension of Students With Learning Disabilities: An Evaluation of the Evidence Base According to the What Works Clearinghouse Standards. *Remedial & Special Education*, *38*(4), 233-245.

McFarland, J., Hussar, B., de Brey, C., Snyder, T., Wang, X., Wilkinson-Flicker, S., … Hinz, S. (2017). The Condition of Education 2017 (NCES 2017- 144). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved [09/13/2017] from https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2017144.

Margolis, H., & McCabe, P. P. (2004). Self-Efficacy: A Key to Improving the Motivation of Struggling Learners. *Clearing House*, *77*(6), 241.

Mwoma, T. m. (2017). Children's reading ability in early primary schooling: Challenges for a Kenyan rural community. *Issues In Educational Research*, *27*(2), 347-364.

Oakhill J., & Patel, S. (1991). Can imagery training help children who have comprehension problems? *Journal of Research in Reading, 14*, 106-115

Rinehart, S. D., Stahl, S. A., & Erickson, L. G. (1986). Some effects of summarization training on reading and studying. *Reading Research Quarterly, 21*, 422-38.

Roehling, J. j., Hebert, M. m., Nelson, J. n., & Bohaty, J. j. (2017). Text Structure Strategies for Improving Expository Reading Comprehension. *Reading Teacher*, *71*(1), 71-82.

Sáenz, L. M., & Fuchs, L. S. (2002). Examining the reading difficulty of secondary students with learning disabilities: expository versus narrative text. *Remedial & Special Education*, *23*(1), 31-41.

Snyder, T.D., de Brey, C., and Dillow, S.A. (2016). *Digest of Education Statistics 2015* (NCES 2016-014). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Sorrell, C. A., Bell, S. M., & McCallum, R. S. (2007). Reading Rate and Comprehension as a Function of Computerized Versus Traditional Presentation Mode: A Preliminary Study. *Journal Of Special Education Technology*, *22*(1), 1-12.

Srivastava, P. p., Gray, S., Nippold, M., & Schneider, P. (2012). Computer-Based and Paper-Based Reading Comprehension in Adolescents With Typical Language Development and Language-Learning Disabilities. *Language, Speech & Hearing Services In Schools*, *43*(4), 424-437.

Stetter, M. E., & Hughes, M. T. (2011). Computer assisted instruction to promote comprehension in students with learning disabilities. *International Journal Of Special Education*, *26*(1), 88-100.

Swanson, P. N., & De La Paz, S. (1998). Teaching effective comprehension strategies to students with learning and reading disabilities. *Intervention In School And Clinic*, *33*(4), 209-18.

Unrau, N., & Schlackman, J. (2006). Motivation and its relationship with reading achievement in an urban middle school. *Journal Of Educational Research*, *100*(2), 81-10.

Wolters, C. w., Barnes, M. A., Kulesz, P. A., York, M., & Francis, D. J. (2017). Examining a motivational treatment and its impact on adolescents' reading comprehension and fluency. *Journal Of Educational Research*, *110*(1), 98-109.