

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

The iPad

A READING COMPREHENSION INTERVENTION VEHICLE

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Mild/Moderate Disabilities

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DEDICATION

I dedicate this thesis to my father, Jeff Levine, for his patience, encouragement and great skills as an editor. I also dedicate this thesis to my mother, Allyn Levine, for her optimism, determination, and phenomenal organization skills. The love and support from both of my parents throughout my education has been invaluable to my success.

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ABSTRACT

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Mild/Moderate Disabilities

The purpose of this action research study was to determine the effects, if any, of the use of the iPad as an instructional tool to facilitate reading comprehension. Specifically, the intent was to see if students with learning disabilities in the 8th grade could gain a gestalt understanding of a paragraph written at the 8th grade level when supported with the use of the iPad. In addition, an effort was made to determine if the use of an explicit, systematic reading comprehension strategy in conjunction with the touch features of the iPad could support student comprehension when reading at grade level rather than the student's instructional level. In other words, could the iPad be used both as an intervention tool and as a compensatory strategy? A total of ten middle school students participated in the study. Using two treatment designs and a control design, the instructor read a paragraph to students while they followed along. Students were asked to

select one of the four possible main idea answer choices provided by the teacher after each treatment or control intervention was used. The results of the data collection illustrated that the use of the iPad in conjunction with systematic and explicit reading comprehension instruction supported stronger gestalt than either of the other two conditions.

Introduction

Technology has emerged as an important educational tool. When used in the classroom, technology both engages students and prepares them for the world outside of the classroom. Still, are classroom engagement and real-world exposure the only benefits to technology in the classroom, or can technology support desired pedagogical outcomes for students?

One of the most pressing needs of today's students is support in reading comprehension (Hutchison, Beschoner, & Schmidt-Crawford, 2012). This need is even more essential for students with learning disabilities (LD) in secondary education. These students struggle to acquire reading skills in elementary school necessary to support learning in later years (Kennedy & Deshler, 2010). Finding a tool that can be both remedial and compensatory is vital for the success of these students. The purpose of this study is to discover if the iPad can help students with LD bypass the need for decoding in order to access their comprehension while also supporting their comprehension in order to ensure their success in the general education setting.

Literature Review

Kennedy and Deshler (2010) describe students with LD as having a wide gap between ability and performance across a range of school curricula. This gap increases as the demands of the curriculum grow because reading becomes a tool for learning rather than a subject to be learned. As concepts presented in the curriculum become more advanced, so do language and comprehension demands placed upon students. In fact, 90% of students with LD in later grades struggle to read independently. Difficulty in reading, especially in the area of reading comprehension, is the main cause for students to be referred for special education services (Stetter & Hughs, 2011). This deficit demonstrated by students with LD makes the need for successful reading comprehension intervention for older, struggling readers critical in the middle and high school years (Gardill & Jitendra, 1999).

The ability for older students to develop compensatory methods is just as important as developing decoding skills. A compensatory method is a way for students who struggle in any academic area to bypass their difficulty when placed in a high-demand setting, such as a classroom that includes grade-level rather than instructional-level curriculum (Ruban, et Al., 2003). As Ruban and colleagues describe, all students struggle academically in some way and therefore develop compensatory methods. However, students with LD do not naturally develop these compensatory strategies and therefore it is necessary to explicitly teach these strategies. Because reading comprehension is one of the most common academic areas in which older students with LD struggle, it follows that compensatory methods for reading comprehension are

especially important in providing a means for these students to succeed (Gardill & Jitendra, 1999).

Reading comprehension, as defined by Bell (2007), is the ability to understand a cohesive, whole understanding of written language. For struggling readers, connecting the details of a passage and creating a gestalt understanding is difficult. Instead, these students may focus on parts or less unimportant details of a passage (Bell, 2007). The ability to select the main idea of a passage is a critical component for understanding text. Richard Boning's *Getting the Main Idea Series* (1997) aids students in assessing and building their ability to identify the main idea of grade-level passages and was used in this study in conjunction with the iPad.

In the field of special education, educators are constantly experimenting with innovations for better ways to improve reading comprehension for students with LD. Although research has contributed to what we know to be effective interventions, little is known about how new innovations, such as the iPad, can enhance what is known about successful compensatory strategies to facilitate reading comprehension instruction for students with LD (Hutchison, Beschorner, & Schmidt-Crawford, 2012).

The particular challenge of researching the benefits of new technology with students with LD is that both technology and best-practice pedagogy in the field of special education are rapidly growing and changing. It is essential that research design accounts for both the latest technologies and evidence-based pedagogy for effective reading comprehension instruction for students with LD before beginning a study of technology in the special education classroom. Kennedy and Deshler (2010) suggest that an effective construct would ensure that the technology be taught explicitly and relate

directly to best practice pedagogy already being used in the classroom. The technology tools should limit the need for learning superfluous procedures, for example teaching students to scroll with three fingers instead of two in order to enable features specific to only that device, while continuing to have to manage and build upon essential processing skills. The multimedia should adhere to Response to Intervention principles and valid theories of learning. Digital processing skills that can be generalized to other devices, such as how to use one's finger to highlight on a touch screen, are beneficial to students and instruction in these skills should be implemented (Kennedy & Deshler 2010).

This study will review (i) the types of instruction that have been the most successful in improving the reading comprehension of students with LD, (ii) typical kinesthetic approaches that have been successful in reading instruction, and (iii) the use of the iPad as an intervention tool and compensatory method for students with LD to determine whether the use of the iPad is efficacious (Hutchison et al., 2012).

Successful Instruction

Evidence suggests that reading comprehension intervention for struggling readers is most effective when explicit and systematic (Manset-Williamson & Nelson, 2005). Explicit instruction is defined as clearly explained, modeled, and guided by the teacher. Systematic instruction in comprehension includes transferring the control of instructional strategies from teacher to student using teacher guidance and scaffolding until the student's use of the strategy becomes independent. In a study conducted by Manset-Williams and Nelson (2005), two reading programs were compared. The two programs were similar except that one was an explicit and systematic reading comprehension program and the other was not. In both groups, the students made improvements in the

areas of decoding and fluency. However, the students gained significant progress in reading comprehension only in the treatment group in which instruction was explicit and systematic.

Student improvement in the area of reading comprehension also depends on the environment in which instruction occurs. In general education classroom settings, reading comprehension instruction tends to be implicit and is typically insufficient to support the progress of students with LD. Implicit instruction occurs when teachers model a particular strategy and students are expected to organically internalize this model, or “pick it up” by example. Conversely, when students are pulled out of general education classrooms and provided with explicit reading comprehension instruction, they have a difficult time generalizing their reading comprehension skills back to their general education classroom. Therefore, an environment in which students with disabilities receive the preponderance of their reading comprehension instruction (assuming it is also explicit and systematic) in a general education classroom is the most effective environment to ensure they are able to generalize the skills to novel situations (Vaughn, Moody, & Schumm, 1998).

One type of reading comprehension instruction that is explicit, systematic, and is appropriate for a general education classroom setting is Story Map Instruction. Story Map Instruction provides students with an understanding of common narrative structures such as the presentation of a problem, a character’s attempts at solving the problem, and an eventual resolution (Gardill & Jitendra, 1999). In a study by Gardill and Jitendra (1999), six middle school students with LD who struggled with reading and who were given explicit instruction in this method improved their reading comprehension skills and were

able to transfer these skills to other classrooms and subjects. These students received instruction in making inferences based on story titles, headings, and other story details. Students in this study made significant progress in the area of reading on retell assessments.

Story Map Instruction has also been demonstrated to improve the reading comprehension skills of students with LD when it was presented with computer-assisted technology. In a study by Stetter and Hughs (2011), nine students with LD, ages 14-15, who received special education services in reading instruction, were explicitly taught Story Map Instruction and were then directed to use this strategy when reading narrative texts on a computer. The computer provided easily accessible menus with 20 items that related to Story Mapping themes such as character descriptions and resolutions. The class, on average, improved significantly on retell and informal comprehension assessments. Student perception surveys also indicated that the majority of students enjoyed using the computer as a means of implementing this strategy and preferred it to teacher prompted practices of the Story Mapping strategy. This suggests that computer assisted instruction can be motivating for students with LD and increase success in improving their reading comprehension skills (Stetter & Hughs, 2011).

Similar to Story Map instruction, the Lindamood-Bell Visualizing/Verbalizing method (Bell, 2007) provides explicit instruction that supports reading comprehension (Sadoski & Wilson, 2006). This method promotes the ability to visualize concepts presented in written material as well as the ability to convey what was visualized. Both abilities - visualizing concepts and verbalizing conveyance - strongly support the reading comprehension skills of struggling students. This method is explicit and systematic

because it depends on “reciprocal teaching” wherein students actively explain visualizations to their teachers and other students in order to demonstrate understanding (Sadoski & Willson, 2006). In addition to being explicit, a best-practice with struggling readers, this method also utilizes Dual Coding Theory, or the theory that reading involves both a verbal and nonverbal code (Sadoski & Willson, 2006). The Visualizing Verbalizing program combines language, mental images, and haptic (kinesthetic) approaches in order to successfully support the reading comprehension skills of struggling readers (Sadoski & Willson, 2006).

Kinesthetic Approach

While the studies discussed above illustrate that explicit, systematic reading comprehension instruction can lead to improved reading comprehension skills for students with LD, it is also important to note that reading instruction should be balanced to meet all a student’s reading needs. Reading comprehension instruction by itself may not be enough to support improvement in reading for students with LD. All components of reading instruction may need to be addressed (Foorman & Tureen, 2001). While many instructional approaches utilize visual and auditory modalities, the use of kinesthetic approaches for reading instruction is less common but also important to promote the skills of students with LD and can help in improving all areas of reading (Hutchinson, et al., 2012).

Manset-Williamson and Nelson (2005) note that when teaching decoding and introducing new phonograms (written characters), a kinesthetic approach is beneficial to students with LD. Kinesthetic approaches might also benefit students with LD when learning Alphabetic Phonics, a strategy that emphasizes characters in the English

alphabet when teaching phonics skills. A Kinesthetic approach is one that allows students to learn by touch. For example, a teacher might use manipulative letters or syllables when teaching students to decode complex phonics patterns. Kinesthetic approaches would also be beneficial when using strategies such as the Dyslexia Training Program (DTP) that implements multiple types of sensory instruction, including kinesthetic. The DTP is instruction that begins at basic levels of reading instruction, such as letter recognition, and builds up to more advanced instruction in syllable division and comprehension (Oakland, Black, Standford, Nussbaum, & Balise, 1998). Oakland and colleagues (1998) found that when using DTP, middle school students with dyslexia improved significantly in fluency and decoding over the control group taught using instruction that did not include a kinesthetic approach.

The Lindamood-Bell Visualizing/Verbalizing Program directly utilizes a kinesthetic approach to reading comprehension (Bell, 2007). When creating mental images for a paragraph, the student places a colored felt square on her desk to represent each sentence in that paragraph. When reviewing the entire paragraph, the student then puts her finger on the colored felt square in order to recall the image associated with that square. The student is better able to recall the sequence of each part of the image and is able to piece together the whole image of the paragraph by placing her finger on the felt squares (Bell, 2007).

With the use of the iPad, reading instruction that utilizes kinesthetic approaches can be expanded. Two features that have been most beneficial to students are being able to highlight text and to define words by touching the screen. This allows students to

manipulate the text according to their own preferences, which provides for an individualized and engaging experience (Hutchison, et al., 2012).

Kinesthetic approaches, such as using an iPad, also allow students to become more engaged with the text. Engagement in reading comprehension occurs when students are both motivated and apply cognitive strategies to reading (Wigfield et al., 2008).

According to Wigfield, students will not apply a strategy taught to them unless they are motivated to do so. Therefore, engagement occurs when motivation and strategy occur simultaneously (Wigfield et al., 2008).

Interactive Media

A study by Beeland found that the use of interactive technology, such as a SMART Board, is able to increase student engagement (2002). According to a student survey taken during this study, students preferred to use the interactive board during instruction and enjoyed the experience. Thus, when used in conjunction with the iPad, kinesthetic approaches serve not only to support student learning modalities but can also motivate students to apply strategies, causing students to become engaged.

The iPad, by nature a kinesthetic tool, has been beneficial for students with LD in many subjects. McClanahan, Williams, and Tate (2012) conducted a case study to investigate how using the iPad helped Josh, a 5th grade student with Attention Deficit Disorder, when he was working with a tutor. The tutor observed that when working without the iPad, Josh was much less attentive to his work. When he used the iPad, Josh was much more engaged with the lesson.

The iPhone and iPod Touch, with similar interactive features, have also been successful intervention tools for students with LD. Schneps, O'Keeffe, Heffner-Wong,

and Sonnert (2010) found that implementation of the technique Span-Limiting Tactile Reinforcement, an application of technology that reformats text to display only a few words at once on an iPhone/iPod Touch, is efficacious when students with dyslexia attempt science, technology, engineering and mathematics (STEM) tasks. The results indicated that, even with limited training, students with dyslexia made better progress in STEM while reading on the iPhone/iPod Touch in comparison with reading a paper copy.

iPad Intervention

As noted above, interactive technology can increase motivation and engagement in students with LD. Accordingly, the use of the iPad might be beneficial for students with LD in building their comprehension skills. Students with LD often gravitate toward kinesthetic approaches, and the kinesthetic experience offered by the iPhone/iPad can support students' engagement with the subject matter (McClanahan, et al., 2012). The iPad allows for kinesthetic reinforcement of skills that can be generalized to many different subjects (Schleps et al., 2010). Therefore, when combined with explicit, systematic reading comprehension instruction as part of a comprehensive reading program, the iPad might prove to be a valuable intervention when supporting the reading comprehension of students with LD.

Purpose

It is hypothesized that if students can learn a strategy for supporting reading comprehension skills on the iPad, they might be able to use this strategy to compensate for decoding deficits while at the same time increasing performance on reading comprehension tasks (Ruban, et al., 2003). This study is designed to investigate how the use of the iPad as a possible compensatory method and as a tool for increasing

performance on reading comprehension tasks might increase learning outcomes for students with LD. Data collection will be guided by the following research question: Could the interactive features of the iPad be a successful tool for accessing texts and improving reading comprehension outcomes for students with LD?

Methods

This study was conducted at a private school in the suburbs of a large urban city in the southwestern United States, dedicated to providing instruction to students diagnosed with LD. The school includes students in the 3rd through 12th grades. The instructional program, used with all children, is based upon Dr. Mel Levine's methodologies as discussed in *A Mind at a Time* (2002) and strategies in the Lindamood-Bell Reading program (Bell, 2007). *Getting the Main Idea* (Boning, 1997) is a comprehension assessment tool widely used on the campus.

The methodologies adapted from *A Mind at a Time* (Levine, 2002) at this school include modifying course curricula for students according to their individual strengths and challenges exhibited in various neurodevelopmental constructs. These neurodevelopmental constructs are: Attention, Memory, Spatial Ordering, Language, Neuromotor Functions, Social Cognition, and Higher Order Cognition (Levine, 2002). All students who attend this school are guided to understand their own learning profiles according to the areas of learning prescribed in Levine's *A Mind at a Time* (2002).

The Lindamood-Bell Reading Programs used at the school include Symbol Imagery and Visualizing/Verbalizing. The Symbol Imagery Program develops the fluency and decoding skills of students through the visualization of the sounds and letters of words (Bell, 2007). The Visualizing/Verbalizing Program develops comprehension skills of students through the visualization of concepts described in reading passages (Bell, 2007). Both programs progress through a carefully scaffolded series of steps, and the vocabulary and strategies used in these programs are utilized across curricula.

Getting the Main Idea (Boning, 1997) is a workbook series with paragraphs grouped according to grade level. Each paragraph is accompanied by four possible main idea answer choices. *Getting the Main Idea Book H* (Boning, 1997), an 8th grade level workbook, was used as an assessment for the purposes of this study.

Participants

Ten students in the 8th grade, between thirteen and fifteen years of age, were included in this study. All students were in an English class taught by the researcher. This sample included seven boys and three girls. All students were previously diagnosed with a language processing disorder. These students were in a high socioeconomic group. Ten students were white and two were African American. All students in this study struggled with reading comprehension to various degrees. All students tested at below grade level on the NWEA (Northwest Evaluation Association) performance in the area of reading.

Pre-intervention Conditions

The pre-treatment comprehension level of each student was measured by a Lindamood-Bell style assessment. The assessment described the instructional grade level at which each student was reading and the amount of text a student could visualize independently. Visualization is the ability to create a mental picture of the information given in a written passage. According to Lindamood-Bell, visualization is critical for developing reading comprehension skills (Bell, 2007). The students were designated a grade level at which they were able to visualize independently. For example, a student who was able to visualize one paragraph of text at the 6th grade level independently, was described as being able to imagine what a whole paragraph was about (picture, characters, setting, etc.) at the 6th grade level. The specific language processing disorders

and Lindamood-Bell imagery level of the ten students who participated in this study are described in Table 1.

Table 1: Student Profiles

Student	Age	Gender	Diagnoses	Concept Imagery level
Student A	14	M	Visual Processing disorder/ Attention Deficit Disorder	Images paragraph by paragraph at a 6 th grade level
Student B	14	F	Auditory Processing Disorder	Images two sentences at a time at a 6 th grade level
Student C	14	M	Dyslexia, Attention Deficit/ Hyper Action	Images whole paragraphs at a 7 th grade level
Student D	14	M	Visual Processing Disorder	Images paragraph by paragraph at an 8 th grade level
Student E	14	F	Dyslexia, Attention Deficit Disorder	Images sentence by sentence at a 4 th grade level
Student F	14	M	Dyslexia, Attention Deficit Disorder	Images whole paragraphs at a 6 th grade level
Student G	15	M	Visual Processing Disorder, Attention Deficit Disorder	Images paragraph by paragraph at an 8 th grade level
Student H	14	F	Visual Processing Disorder, Attention Deficit/ Hyper Action	Images whole paragraphs at an 8 th grade level
Student I	13	M	Visual Processing Disorder, Auditory Processing Disorder	Images whole paragraphs at a 7 th grade level
Student J	13	M	Dyslexia, Attention Deficit Disorder	Images paragraph by paragraph at a 7 th grade level

The students were in small-group Lindamood-Bell style reading classes and had received prior instruction with the Lindamood-Bell Visualizing/Verbalizing strategies. In

all classrooms, the students were prompted to “picture” concepts discussed in class using a Lindamood-Bell exercise (Bell, 2007)

All students in this study had used the iPad in their classrooms for at least five months. Some students had been using iPads in their classrooms for over a year. The iPads were issued by the school, and instruction in using the iPads was embedded into daily classroom instruction across curricula. All students were familiar with both the methodology and the media utilized by this study.

Intervention Programs

This study was conducted during the 2012/2013 school year. The materials used included the *Getting the Main Idea Book H* (Boning, 1997) and the Lindamood-Bell Visualizing/Verbalizing strategy (Bell, 2007).

The *Getting the Main Idea Book H* is a workbook that provides 8th grade-level paragraphs that are accompanied with multiple main idea answer choices in order to assess gestalt reading comprehension (Bell, 2007). *Getting the Main Idea Book H* was used in two different formats: printed text and electronic text. The printed text was given to students with a yellow highlighter. The electronic text was used on the *iPad* with the application *KNO.com*, an on-line tool that makes educational text available in digital format. In order to create the electronic version of *Getting the Main Idea- Book H*, selections of the book were scanned into PDF documents and viewed on a desktop computer. The PDF documents were emailed to the students in this study. The students were then directed to open their email on their iPads and download the PDF documents. Each iPad provided the students with the option of either viewing the PDF in an email or in the *KNO.com* application so they could highlight the PDF on their iPads.

In the Lindamood-Bell Visualizing/Verbalizing strategy (Bell, 2007), students read a passage of text and are asked to describe their visualization concepts presented in the passage. The instructor, through a series of questions, helps students to become aware of their imagery, discover any errors, and correct these errors through their own reasoning. The Lindamood-Bell Visualizing/Verbalizing Strategy was utilized in this study through the use of specific prompts such as prompting students to *picture* or *visualize* each paragraph from *Getting the Main Idea Book H* as it was read to them. Students were also prompted to picture or visualize the main idea of the paragraph as it was read. The teacher's directions in this study were sufficient to evoke the strategy because students had received direct instruction in using the Visualizing/Verbalizing strategies in supplemental reading classes.

Procedures

This study was conducted one-on-one, using a three-group format. All ten students participated in each group. In the first group (the Control Design), a paragraph from *Getting the Main Idea Book H* (Boning, 1997) was read to each student individually while the student followed along with a paper copy. In the second group (Design 2), the paragraph was read to each student individually while the student followed along with a paper copy while also being prompted by the instructor to “picture” the main idea of the paragraph and to highlight words that would help her remember her “picture” with a yellow highlighter. In the third group (Design 3), the paragraph was also read to the student individually while the student followed along. However, in this group, the student followed along with an electronic copy of the paragraph on an iPad, and was asked to highlight words that would help her remember her “picture” using her finger. The same

paragraphs were used for every student and were chosen sequentially as they appeared in *Getting the Main Idea Book H* (Boning, 1997).

After the paragraph was read to the student, and the student highlighted (or did not highlight) as was directed by the teacher, the student was prompted to select the main idea of the paragraph from the menu of four provided main idea statements that were read aloud to the student by the instructor. While the instructor worked individually with each student, the other students worked on independent assignments at their desks.

For the Control Group, students were asked to identify the main idea after being read to without being prompted to use a strategy or a highlighter. No other cueing was provided for students in the control group.

For the second group (Design 2), students were prompted to follow along on a paper copy, and picture the entire paragraph as it was read. After the paragraph was read, the students were prompted to picture the main idea of the paragraph and then to highlight words on the paper copy that would remind the students of their main idea picture.

The second treatment group (Design 3) included the same procedures as Design 2 but using the iPad to read and highlight. In Design 3, students followed along with an electronic copy of the paragraph on the iPad. The students were prompted to underline words that made them think of the main idea picture using the touch feature on the iPad.

Data Collection and Analysis.

For each group, the instructor asked the student if she wanted the paragraph or the main idea statement menu to be read a second time. The instructor recorded the main idea statement chosen by each student as it was selected from the menu of main idea

statements provided with each paragraph. The instructor then noted if the selected statement was correct or incorrect according to the answer key provided by *Getting the Main Idea Book H* (Boning, 1997). The instructor also noted when a student asked for the paragraph or main idea statement menu to be read again.

The students participated in each group five times during the first treatment. They then participated in each group an additional five times during the second treatment. The instructor kept a real-time record of correct and incorrect answers as well as a note as to whether or not the student asked for the paragraph or main idea statement menu to be read again over the course of two weeks.

Results

Table 2: Treatment Effects

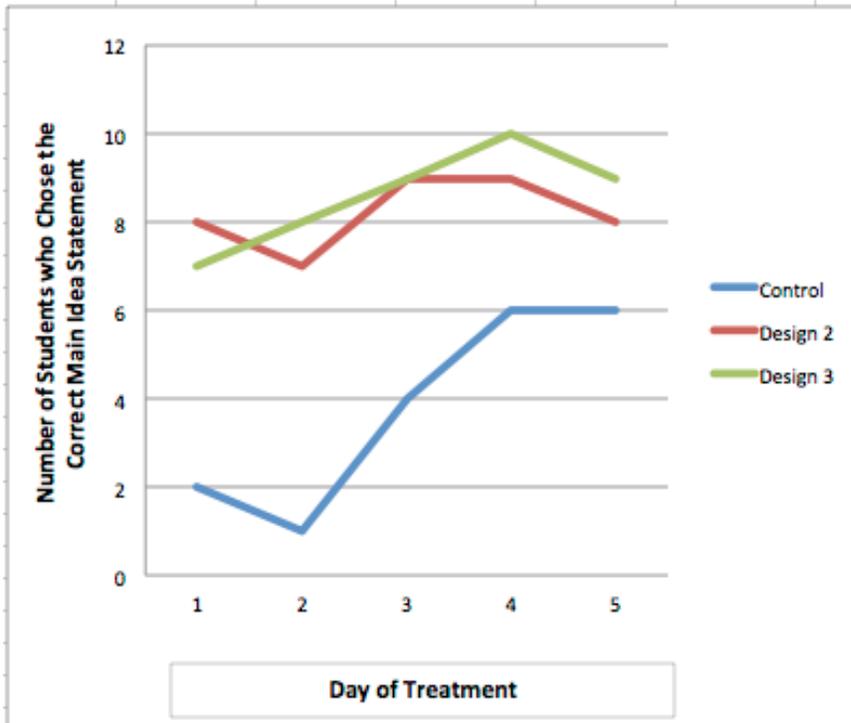
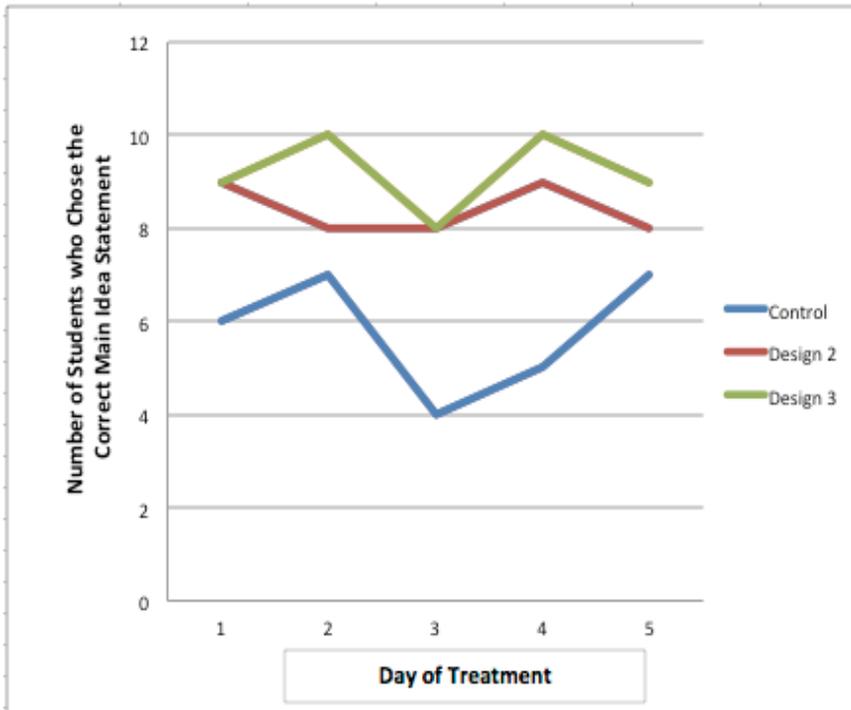


Table 3: Replication of Treatment Effects



The results demonstrated in Table 2 display the scores on average of all student participants (n=10). Each model demonstrates the progress made by student groups over the course of five days. Table 2 shows that students chose the correct main idea answer choice more often when using a highlighter or iPad (Design 2 and Design 3) than when they did not use a highlighter or iPad (Control). Table 2 also demonstrates that students chose the main idea answer choice more often when using the iPad (Design 3) than when using a highlighter on a paper copy (Design 2). On all three designs, students made fewer gains on the second day than on other days. On day five of the Control Design, students performed as well as they had the day before while the students made fewer gains on day five than they had on day four in Designs 2 and 3. Still, the number of answers chosen correctly in the Control Design were at 48%, in Design 2 were at 83% and Design 3 were at 89%.

The results on Table 3 demonstrate similar results to Table 2. During the second set of data collection, students (n=10) chose the correct main idea answer choice more often when using a highlighter or the iPad (Design 2 and Design 3) than when they did not use a highlighter or the iPad (Control Design). Table 3 also demonstrates that students chose the correct answer choice more often in all three designs during the second set of data collection, which suggests that students may perform better regardless of design as they become more exposed to the treatment. Yet, despite improvement in all designs, students still chose the highest number of correct main idea answer choices when using the iPad (Design 3).

All student participants were given the option to have the main idea menu of choices and the paragraph re-read to them on request. During the first data collection set,

no students asked for the paragraph to be re-read during the Control Design, three students asked for the paragraph to be re-read during Design 2, and two students asked for the paragraph to be re-read during Design 3. During the first data collection set, four students asked for the answer choices to be re-read during the Control Design, ten students asked for the answer choices to be re-read during Design 2, and seven students asked for the answer choices to be re-read during Design 3.

During the second data collection set, one student asked for the paragraph to be re-read during the Control Design, three students asked for the paragraph to be re-read during Design 2, and four students asked for the paragraph to be re-read during Design 3. During the second data collection set, three students asked for the answer choices to be re-read during the Control Design, seven students asked for the answer choices to be re-read during Design 2, and ten students asked for the answer choices to be re-read during Design 3.

Discussion

The students who chose the main idea correctly when highlighting using a highlighter marker or the iPad were successful regardless of the sections of text they chose to highlight. Students chose different combinations of text and were still able to select the correct answer from the answer choices. This could suggest that highlighting alone can help students solidify their understanding of the text, even if the words highlighted are not specific to the main idea of the paragraph. So it appears that while the choice of words is not the determining factor in making the correct answer choice, either or both the kinesthetic modality or the increased engagement resulting from highlighting are likely causes of the increased gestalt comprehension indicated.

Students who performed better on assessment by highlighting on the iPad instead of with a highlighter explained that they were better able to recall what they had pictured as the main idea because they did not have to think about picking up a highlighter and finding their place on the page again. The simplified motor demands of using the iPad versus manually holding the highlighter might have resulted in students being better able to attend to the academic component of the task. With the iPad, they could picture the main idea and highlight it immediately on the iPad without looking away from the screen. As predicted by Kennedy & Deshler (2010), it seems that the months of instruction and practice these students had using the iPad may have had a positive impact on their use of the iPad to support comprehension instruction.

All students in the Control Design (without a highlighting step) performed worse on assessment. There might be many factors that affected student performance on this assessment. One of these may be student engagement. An indicator of student

engagement in this study is the number of times students asked for paragraphs or answer choices to be re-read. The lack of the kinesthetic element in this design demonstrates the importance of using this modality to support engagement (Hutchinson, et al., 2012). In the Control Design, very few students requested that the paragraphs or the answer choices be re-read, demonstrating that students were not as engaged. Many students stated that they could not understand or were not interested in the paragraphs read in this assessment during the Control Design. Some students stated that they had difficulty paying attention to the paragraph in this assessment and they guessed at an answer in order to get through the process quickly during the Control Design. In contrast, students in Design 3 were more engaged and were better able to verbalize their picture. This correlates with Beeland's (2002) findings that technology increases student engagement while also increasing their ability apply strategies.

Limitations

The results of this study are not broadly generalizable because they are not randomized. The results of this study can provide advisable practices to educators but cannot be generalized to all class settings or schools.

The same paragraph can engage students differently therefore they were not controlled. Some paragraph subject matter may have been more interesting or familiar to some students than others which may have affected results.

Another limitation of this study was the small sample size.

Implications for Teachers

This study suggests that when explicit and systematic instruction, such as the Lindamood-Bell Visualizing/Verbalizing Strategy, is paired with the use of the iPad, the reading comprehension of struggling readers might be better supported than without the iPad. The use of the iPad might therefore be an effective component of intervention because it places fewer motor demands on students, which can get in the way of their processing. Additionally, iPads are, by their very nature, inherently engaging to most students, and their use can help them become more engaged in almost any text. Moreover, the mobility of the iPad allows for the use of the iPad in a general education setting. This would enable the device to be used as an accommodation for students who could use it as a compensatory strategy in general education settings.

Implications for Further Study

Further study on the impact of the use of the iPad with students with Attention Deficit Disorder could prove beneficial. Participants' comments relating to the simplified motor demands of the iPad correlate with the researcher's experience with the learning obstacles of such students. This study would require a randomized sample of students in order to generalize results.

Conclusion

It is essential for students with LD to develop compensatory methods in order to be successful in secondary education in which the setting is inclusive. It is also essential that any individualized intervention be designed to permit the student to apply skills learned in the intervention in the general education setting. This study demonstrates that the iPad is an effective intervention vehicle. Moreover, the iPad is suited to “anytime, anywhere learning” because it is a mobile device (Hutchison, et al., 2012, p. 1). In addition, this study shows that the iPad is supportive of interventions through the kinesthetic modality and the engagement it embodies. Thus, while the introduction of technology to the classroom generally adds the benefits of engagement and real-world exposure to all students, the use of the iPad in particular can be an essential tool for successful reading remediation and compensatory strategies for students with LD.

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