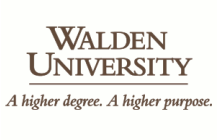

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Impact of the Study Island Program on Students' Reading Comprehension

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COLLEGE OF EDUCATION

This is to certify that the doctoral study by

Rodney Gernert

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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Walden University
2014

Abstract

Impact of the Study Island Program on Students' Reading Comprehension

by

Rodney L. Gernert

MA, Gannon University, 2001

BS, Penn State University, 1993

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

School administrators at the research site, which is a public school district, had been under pressure to improve low reading state scores of Grade 11 students as measured by Pennsylvania System of School Assessment (PSSA) tests. A web-based reading software called Study Island was integrated into the literacy curriculum for students to increase their reading proficiency and pass PSSA state tests. The research problem was that the integration of Study Island had not been evaluated and students were not meeting adequate yearly progress (AYP). The purpose of this study was to provide research-based evidence on whether Study Island helped students to improve their reading proficiency. This nonequivalent, quasi-experimental study was based on Tomlinson's differentiated instruction theory and Marzano's intelligence theory. Archived PSSA scores were collected for 2 cohorts of Grade 11 students (N = 800), before and after the curricular integration of Study Island between the academic years 2009–2011 and 2011–2013. An independent samples t test showed that students' reading proficiency scores were significantly higher after receiving the Study Island software than they were before the software. These findings can be used by school and district administrators regarding the integration of Study Island into other academic subjects. Implications for positive social change may include professional development (PD) for high school teachers to use Study Island in the academic subjects they teach. PD on Study Island for high school teachers may help students pass PSSA testing, meet AYP, and graduate from high school.

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Dedication

This paper is dedicated to my family, for whom I strive to become a better son, brother, uncle, teacher, and member of the community. I cannot communicate how much, and how important, your support has meant to me.

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I wish to thank my parents, Robert and Betty Gernert, for their strong support during the course of my life, including my work in the doctoral program. Without their love and support, this would not have been possible. I also want to acknowledge the love and support of my sister, Rhonda, and her family. They were the source of uplifting moments away from my studies, which Bobbi and Dakota greatly intensified by their love and affection.

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Section 1: Introduction to the Study

Introduction

Literacy teachers assess student proficiency in reading and writing (U.S. Department of Education, 2012). According to Cookson (2009), Garner (2010), and Odden (2009), there is a national literacy crisis in the U.S. The literacy crisis is the result of reading students who are not challenged to use higher order thinking skills (Duke, 2010; Gallagher, 2009; Gewertz, 2010; National Assessment of Educational Progress, 2011). Literacy teachers use reading software to help students to increase their reading proficiency (Chen, Chen, & Sun, 2010). Literacy skills are important for communication purposes (Meyer, Wijekumar, & Lin, 2011). Reading is about thinking and reconstructing meaning (Tovani, 2004) when thinking strategies are used (Schmoker, 2007; Weih, 2013). A more detailed discussion of related literature follows in Section 2.

The research site has been under pressure to improve the reading comprehension of Grade 11 students as measured by Pennsylvania System of School Assessment (PSSA) tests. The school district administrators mandated the integration of web-based curriculum software called Study Island into the high school reading curriculum in order to help students improve proficiency in reading as measured by PSSA scores. Study Island's impact on Grade 11 students' reading proficiency as measured by archived PSSA tests scores had not been examined. For two cohorts, archived state scores from the academic years 2009–2011 and 2011–2013 were collected from before and after the implementation of Study Island. In order to determine if use of Study Island led to a

significant statistical impact, the means of the PSSA test scores of the two cohorts were used in an independent samples *t* test.

Research Problem

School administrators at the research site needed research-based findings on reading comprehension programs that assist students to increase their proficiency in reading on standardized tests. The schools at the research site were not meeting adequate yearly progress (AYP) as mandated by the No Child Left Behind (NCLB) Act of 2002.

At the research site, school administrators mandated the implementation of a web-based reading program named Study Island as an intervention program to assist Grade 11 students pass standardized tests. Study Island helps students in developing higher-level thinking, analytical, and problem-solving skills. School administrators were in need of research-based evidence regarding the impact of the integration of Study Island program into the literacy curriculum. I chose the research site because (a) the required proficiency levels of Grade 11 students were not being met, (b) students were not meeting AYP and their PSSA scores were below state average for over 3 academic years, and (c) no research examined the impact of Study Island program on student proficiency.

Educational researchers suggested to literacy teachers to help students in developing higher order thinking skills (Duke, 2010; Gallagher, 2009; Gewertz, 2010; National Assessment of Educational Progress, 2011) by reading large amounts of reading materials (Molenda, 2008) and integrating reading software into the curriculum (Chen, Chen, & Sun, 2010; Macaruso & Rodman, 2009). Educational leaders mandated literacy teachers at the research site to help reading students by using Study Island (Hannafin &

Foshay, 2008; Macionis, 1989; Meyer, Wijekumar, & Lin, 2011; Starkman, 2007) to help students comprehend text that they have read (Schmoker, 2007; Weih, 2013).

Nature of the Study

The research site is a public high school of approximately 1,600 students located in Pennsylvania. For this nonequivalent, quasi-experimental research design, all participants had participated in PSSA testing. Grade 11 students during the academic years 2009–2011, before the implementation of Study Island, were the first cohort. Grade 11 students during the 2011–2013 academic years who had used Study Island were the second cohort. Following IRB approval from Walden University, the differences in the means between the PSSA testing scores of the first and second cohorts were analyzed using SPSS 20.0. More information about the research design is presented in Section 3.

Research Question and Hypotheses

The following research question was addressed in this study:

What is the impact of the web-based reading Study Island software on the proficiency of Grade 11 students in reading as measured by Pennsylvania State Achievement (PSSA) test scores?

H_{o1}: There is no statistically significant difference in the Grade 11 students' proficiency in reading as measured by PSSA test scores between students who were taught by reading teachers before the implementation of the web-based reading Study Island software and students who were taught by the same reading teachers after the implementation of the web-based reading Study Island software.

H_{a1}: There is a statistically significant difference in the Grade 11 students' proficiency in reading as measured by PSSA test scores between students who were taught by reading teachers before the implementation of the web-based reading Study Island software and students who were taught by the same reading teachers after the implementation of the web-based reading Study Island software.

Purpose Statement

The purpose of this study was to provide research-based evidence to school administrators at the research site. I examined the impact of the integration of the Study Island software into the reading curriculum for Grade 11 students on PSSA scores.

Theoretical Framework

Literacy students need different instructional approaches to address their reading needs (Tomlinson, 2009). Marzano (2002, 2003) theorized the existence of two types of knowledge, crystallized and fluid (cognitive) intelligence. Crystallized intelligence is directly impacted by the amount of fluid intelligence, meaning the more a reader has experienced in life gaining fluid intelligence, the more crystallized intelligence will be generated. Marzano (2006) stated, "Only the confluence of high fluid intelligence and a rich experiential base is conductive to high crystallized intelligence" (p. 133). The more crystallized intelligence the reader possesses, the more successful that reader will be in comprehending what he or she has read, leading to successful reading comprehension. The theoretical framework of this study was based upon Tomlinson's differentiated instruction and Marzano's intelligence theories to examine the impact of the integration of Study Island into the literacy curriculum at the research site.

Definitions of Terms

Adequate yearly progress (AYP): This is a measure determined by individual states to determine the achievement of state academic standards. AYP is the minimum improvement level that schools, school districts, and states must annually achieve (U.S. Department of Education, 2009a, p. 1).

Advanced academic success: This term reflects academic success at a superior level, indicating high level of understanding and impressive display of the skills included, and expected, in the Pennsylvania Academic Content Standards (Alverman & Phelps, 2001).

Basic academic level: This term refers to the marginal performance on the PSSA, indicating some understanding and display of the skills intended to be learning for the PSSA (Alverman & Phelps, 2001).

Comprehension: This term refers to the metacognition awareness of one's own level of understanding and the use of that understanding as a guide (Keene & Zimmerman, 1997).

Inferences: This term refers to the process of combining the current text information with one's own experience in order to create meaning that is not directly stated in the text (Dole, Duffy, Roehler, & Pearson, 1991).

The Pennsylvania System of School Assessment (PSSA): Established in Chapter 4 of Title 22 of the Pennsylvania Code, the PSSA is a standards-based criterion-referenced assessment used to measure student achievement of the state academic standards (U.S. Department of Education, 2009a, p. 1).

Proficient: This term refers to the satisfactory academic performance is indicated at the second level of success, indicating: Observable understanding and acceptable display of the skills addressed in the Pennsylvania Academic Content Standards (U.S. Department of Education, 2009a, p. 1).

Study Island: This term refers to the web-based computer program used as both an instructional and diagnostic tool providing educators with the ability to assist students in mastering state standards and assess their mastery of those standards (U.S. Department of Education, 2009a, p. 1).

Assumptions

I used a nonequivalent, quasi-experimental design and assumed that reading teachers: (a) knew how to use the features of Study Island; (b) used Study Island in their literacy classes; (c) helped students use Study Island in the classroom; (d) integrated Study Island into the reading curriculum on a weekly basis as prescribed by the building administration and were supportive of its inclusion. I also assumed that Grade 11 students were at the same reading level and that PSSA is a reliable assessment tool for reading proficiency.

Limitations

The first limitation was the use of archived data. Additionally, only Grade 11 students from one school were used in the data collection and analysis of data.

Scope and Delimitations

The scope of this study was Grade 11 students who attended school in the academic years 2009–2013. The findings of this study may not be applicable to other

school districts. Class lists were developed by school administrators and random sampling and assignment were not possible for the purpose of this study. This study was delimited by the experiences of the literacy teachers who used Study Island.

Significance of the Study

Middle school level teachers are not often prepared to teach reading (Cooney, 1999). Irvin (1998) stated that educators teaching reading within the content areas, in order to increase understanding, should include reading strategies into their reading lessons. Teachers should include various levels of the same materials for students at different academic levels to read and feel comfortable (Irvin, 1998). The findings of this research study can be used by educators and administrators at the secondary level as well as curriculum developers interested in increasing reading comprehension levels of students.

Social Change Implications

Literacy teachers who use Study Island may help students in passing PSSA. Students who use Study Island may meet AYP. Educators, administrators, and software developers may use the findings of this study to make decisions on the allocation of funds regarding the integration of reading programs into the curriculum.

Transition Statement

Section 2 is a review of the professional literature relevant to this study, outlining the reading guidance the district has used previously, as well as research regarding aspects of this study. Section 3 is about the research design used in the study, and Section 4 relates to the study's findings regarding Study Island's effectiveness in raising the

scores of the participants on the PSSA. A discussion of the study topic, interpretation of the findings, implications for social change, recommendations for action and further study, and a closing statement will be presented in Section 5.

Section 2: Literature Review

Introduction

In this section, I present a review of related literature. I searched the Walden University library, Educational Resource Information Center, ProQuest Dissertations and Theses, SocINDEX with Full Text, and Teacher Reference Center databases using the following words and phrases: *NCLB, computer assisted instruction, scores, reading, technology, reading comprehension, reading strategies, learning from what is read, remediation, reading comprehension, reading habits, reading technology, high school, critical analysis of reading resources, reading and technology, and examples of reading comprehension using technology*. I present literature pertinent to the study in the following topics: (a) NCLB, (b) an historical perspective on reading, (c) reading comprehension, (d) keys to reading comprehension, (e) critical analysis of the two district resources, (f) learning and technology, and (g) development of computer-based instruction.

Theoretical Framework

The theoretical framework of this study was based on differentiation and intelligence theories. Tomlinson (2009) stated that differentiation theory is relevant to education because it is nearly impossible to find two students of the same age who are at the same educational level. As a result, the instructional approach to reading needs must be different for students of the same age (Tomlinson, 2009).

Theorizing the difference between what he termed knowledge (crystallized intelligence) and cognitive intelligence (fluid intelligence), Marzano (2006) defined intelligence as the ability to reason and aspects of memory. Alternatively, crystallized intelligence is the result of an individual's life experiences, and Marzano believed that only a high amount of fluid intelligence could produce a vast amount of crystallized intelligence. The more experiential knowledge people possess, the more likely they will be able to comprehend what they have read.

NCLB: The Federal Mandate for Improved Reading Scores

"Teaching children to read is the most important thing our schools can do," was a mantra of President George W. Bush's administration, and on January 9, 2002, President Bush's No Child Left Behind legislation became law (USDOE, 2001, p. 10). NCLB's purpose was to make certain that students in the United States were to be held to high, rigorous standards of learning (USDOE, 2001). NCLB was based on four principles: accountability for results; local control and flexibility; expanded parental choice; and effective and successful programs (USDOE, 2001). Secretary of Education Rod Paige, speaking at the International Reading Association Conference in 2001, explained that NCLB was to enable students to read by third grade as a "bold goal," thus indicating the importance of literacy to the Bush administration (International Reading Association [IRA], 2001).

Due to the increased accountability levied by NCLB, scientific research became instrumental in making educational decisions (Simpson et al., 2004). The U.S. Department of Education (2009a) noted that the impetus of NCLB was "to ensure that all

children had a fair, equal and significant opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging state academic achievement standards and state academic assessments" (p. 1). Report cards, created by the school districts to be distributed to the states and to parents, detailed the quality of education provided by that particular school district (U.S. Department of Education, 2012). Student achievement data, gathered by the state assessments, included data broken down by AYP subgroups (U.S. Department of Education, 2012).

Nelson, McGhee, Meno, and Slater (2007) noted that the accountability demanded by NCLB stemmed from the Texas Public School Accountability System. The Texas Assessment of Academic Skills (TAAS) test, which was adopted in 1990, assessed schools' accountability. By using student achievement on the TAAS as well as graduation rates, school districts were then given a grade. There were changes to the system, however, in 1999. The revised system increased the emphasis on standardized tests as student measurements of learning since they provided test data for specific subgroups of students. The grades individual school buildings and districts received reflected the annual accountability rating based on the percentage of the students who achieved the level of proficient in Grades 3 through 11, through a range of student groups (European American, Hispanic, African American, and other). Additionally, the overall dropout rate and that of each group was also considered in the rating attributed to each building and the entire district (Texas Education Agency [TEA], 2006). Texas, where President Bush had been governor prior to being elected President of the United States, was believed to possess a strong accountability system (Peterson & West, 2003). PSSA

is the assessment tool developed and used a "standards based criterion-referenced assessment used to measure a student's attainment of the academic standards while also determining the degree to which school programs enable students to attain proficiency of the standards" (Pennsylvania Department of Education, 2011, para 3).

Reading: A Historical Perspective

Reading is a process by which the brain must process a code, or print, as a neural code that can be deciphered (Clements, 2009). Literacy students have not received proper literacy training to progress into higher education (Baleghizadeh & Babanour, 2011). Phonics, skills, vocabulary, and syllabification should be stressed after reading comprehension, which should be the main goal of reading instruction (Zemelman, Daniels, & Hyde, 2005, p. 44). Rupley (2009) stated that readers struggling with comprehension difficulty need effective reading instruction to include fluency, phonics, phonological awareness, and vocabulary awareness.

Kamil (2008) supported Rupley's assertions in stating the need for comprehension and vocabulary instruction to increase adolescent writing ability and reading comprehension. According to Ness (2009), reading comprehension is more important for middle and high school students in content area classes. Bluestein (2010) supported Ness's assertions that specific directions and explicit instruction must occur for students to internalize what has been read. Teachers perceive the teaching of vocabulary as beneficial and utilize this strategy more than other strategies (Nixon et al., 2012).

According to Cookson (2009), Garner (2010), Odden (2009), and Slavin, Chamberlain, and Daniels (2007), the reading scores of secondary students indicate that

many of them are reading at substandard levels, meaning there is a national literacy crisis. Allington (2006) encouraged readers to make connections with the text by sharing what they have read with others, which increases reading comprehension. This process of sharing is referred to as text-to-self connections, text-to-text connections, or text-to-world connections (Jude & Udosen, 2012).

Reading Comprehension: Learning From What is Read

Ness (2008) reported that teachers use demonstrations, lectures, and PowerPoint Presentations as educational resources. Ness (2008) also reported that teachers provide remediation for content teaching materials; however, teachers do not provide remediation to help students improve their reading skills. Students are not challenged to use higher order thinking skills (Duke, 2010; Gallagher, 2009; Gewertz, 2010; Irvin, Meltzer, & Dukes, 2007; National Assessment of Educational Progress, 2011; Silver, Perini, & Dewin, 2012; Tovani, 2004).

Comprehension of what has been read is important in all subject areas (Moje, 2008; Morse, 2009). Ness (2008) agreed that the integration of literacy skills into the literacy curriculum helps students improve both their comprehension. Prado and Plourde (2011) examined the use of reading strategies with a sample of 57 students who took a reading test before and after the implementation of reading strategies and found a significant increase in comprehension.

Allington (2006) reported that students need to understand the text they read. Zwiers (2004) believed that making predictions or inferences create a greater connection between the reader and what has been read. Educators use software, books, television,

and videos to make learning easier for students (Fahser-Herro, 2010) when they develop language skills via reading (Abdullah et al., 2012).

Allington (2006) stated that analysis and synthesis help understand what was read. Zimmerman and Hutchin (2003) noted that synthesizing text is a key to reading comprehension. Abdullah et al. (2012) used two cohorts, and although both groups had the same pretest results, the posttest results were significantly different where the experimental group had been reading for pleasure for 5 weeks.

Keys to Reading Comprehension

Ness (2009) reported that there is a lack of reading comprehension strategies students are taught in literacy classes. Scaffolding is an important reading comprehension strategy where students gain knowledge with the guidance of teachers (Prescott, 2010). According to Dewitz, Jones, and Leahy (2009), reading comprehension programs need to include reading comprehension strategies. According to Zimmerman and Hutchins (2003), reading comprehension can be improved through the utilization of: fix-up strategies, determining importance, synthesizing, questioning, background knowledge, and sensory images.

Background Knowledge for Reading Comprehension

Kuhi and Yavari (2013) reported that background knowledge is beneficial for reading comprehension. Kuhi and Yavari used two cohorts of participants who were tested before and after a reading comprehension intervention and the experimental group improved reading proficiency significantly compared to the control group. Fatemi et al.

(2014) reported similar findings regarding reading comprehension interventions. Reading comprehension strategies help students (Attaprechakul, 2013).

Reading Text to Understand the World

Relating the read text to events occurring in the world increases reading comprehension. Wagaman (2008) encouraged readers to ask the questions of who, what, when, and why for greater reading comprehension. Swanson and O'Connor (2009) agreed that continuous reading increases comprehension of what was read.

Zarei et al. (2012) suggested questioning students for reading comprehension. Casey (2009) also supported the concept of questioning to help students in reading comprehension. For reading comprehension, both reading and writing shall be encouraged (Baleghizadeh & Babanour, 2011).

Reading and Inferences

According to Anderson (2008), software can be used to assist students in processing information they have read. With reading software, readers can experience greater reading comprehension by seeing the inferences and their relationships to develop higher order thinking skills (Zimmerman & Hutchins, 2003). Rosenthal and Ehri (2011) reported that reading software pronounce words for students to improve vocabulary learning. Inferences are occurring when a reader makes connections between prior knowledge and experiences while reading. Zwiers (2004) explained, "Effectively and automatically mix the text and their background knowledge to make good inferences and predictions" (p. 11).

Reading Habits

Manoli and Papadopoulou (2012) reported that reading comprehension strategies help students. Reading software use images that help students increase their comprehension of read text (Zwiers, 2004). Reading comprehension increases as students link read text and images displayed by the reading software (Zwiers, 2004). Linking read text with past events in the reader's life is referred to as text-to-text and text-to-self/world, and assists the reader to make connections with read text (Zwiers, 2004). When a reader considers previously read text and tries to formulate an idea of what is going to occur next in a passage, that reader is utilizing the text-to-text method of reading comprehension. Text-to-self/world is when the reader considers previous lifetime experiences and trying to decipher what is going to occur next in the read passage (Zwiers, 2004). Text questioning should take place at three times in the reading process: before, during, and after reading the text (Zwiers, 2004). Connections are made when good questions are asked and relate parts of the same text, the reader's life experiences, and between the text and situations or world events (Zwiers, 2004). Reading the title, reading subtitles, and looking at any pictures to determine if they have any message to convey are three keys to greater reading comprehension that should take place before a reader begins reading the text of the passage (Zwiers, 2004). During the reading process, the reader should be attempting to develop a formulation of where the text is leading. At the conclusion of reading a passage, the reader should be able to describe what has been learned and ask questions related to the text.

Zwiers (2004) referred to the understanding and remembrance of word meanings as s*coping out the neighborhood.* The use of the deductive method while reading will help a reader determine the meaning lying in the text. The use of words or phrases such as: *is*, *are*, *has*, *means*, and *defined* as signal the meaning of a new word in text of the explanation or definition type (Zwiers, 2004). *Similar* or *likewise* are two words utilized to signal the reader to a synonym or restatement. *Despite*, *although*, *but by contrast*, and *such as*, and on the other hand are employed by authors conveying an antonym, or contrast text, when relating the opposite meaning of a term. When cause and effect are depicted in text, the author could use sentence or phrase with a new phrase or sentence with an unknown word proceeded by sentence or phrase with a known word and convey the effect relationship by using vice-versa as a signal. Signal words may also be utilized promote the understanding of read text. This is due to, such as, therefore, such that, resulting in, and in one case are examples of signal words utilized to assist in the understanding of read text.

Semantic context is a term used to describe the practice of readers gaining meaning from text by either looking ahead or looking back in the text to gain a better understanding of the text being read. Pictoral context is the use of pictures, charts, and graphs in the attempt to gain a better understanding of the text being read. Learning the meaning of a new term or concept by looking at the text and determining its grammar role is terms syntactic context. Zwiers (2004) stressed that teachers need to allow for enough time to read while also planning and utilizing mini lessons to teach vocabulary,

connecting newly learned words to the background knowledge of students, and how to understand word meanings by teachers.

According to Massengill (2004), improvement in reading comprehension has been noted when emphasis is placed on guided reading activities for the purpose of word recognition. Burns et al. (2012) found that the use of keyword strategy improves reading comprehension. Akinbobola and Afolabi (2009) reported that there is an increase in students' interest when they interact with the reading software.

Mendelman (2008) reported that teachers cannot assume students can think critically; however, teachers must engage students in lessons for the purpose of increasing critical thinking. Zwiers (2004) supported the use of metacognition or the practice of readers monitoring their own reading comprehension. Reading habits are similar to the director working behind the scenes to manage the actors in the production of a play (text meaning). Rereading the text, sounding out words, adjusting the rate or reading, reading further to see if understanding of read text will occur, looking at pictures, looking at text structure and instructions, or asking for additional help are reading strategies (Zwiers, 2004).

Norman (2012) used a sample of 30 Grade 2 students and found that retelling a story was beneficial toward reading comprehension. Readers should reread the text for reading comprehension (Hedin & Conderman, 2010). McNeil (2011) used self-questioning methods for reading comprehension and found that background knowledge is predictor of reading comprehension.

Critical Analysis of the Two District Resources

Reading is a higher-order thinking activity that takes place before, during, and after the reading activity occurs. According to Allington (2006), reading comprehension increases with phonological awareness. Pang (2013) acknowledged that the lack of knowledge slows reading comprehension.

Allington (2006) encouraged reading strategies of sharing for improved reading comprehension. A connection with background knowledge is stressed as being a means to greater reading comprehension (Zimmerman & Hutchins, 2003). Zwiers (2004) stated that inferences and predictions are more suitable links between the reader and the text being read. Wagaman (2008) suggested the use of examples of inferential questions for readers to reading comprehension.

Maine (2013) stated that dialogue increases reading comprehension. Maine used case studies to determine the impact of the practice of children discussing text and engaging in inter- and intra-mental processes of reading referring to the contrasting of the reader and themselves and the reader and the text. Maine determined that this practice generated more exciting and meaningful responses to what was read because of the encouragement of teachers and the students reading together.

The process of making connections with read text and then drawing connections between the self, text, or the world, also known as analysis, is noted as a means of achieving a greater understanding of text. The combination of multiple information sources in a meaningful fashion or synthesis, is compared to analysis (Allington, 2006).

Zimmerman and Hutchins (2003) suggested to readers to weave known information with the newly learned information.

Students discuss read text inside and outside of school as well as events and the effects of those events on their lives (Allingont, 2006). Murphy and Fink (2012) stated that teachers could stimulate students to read. Successful readers evaluate, connect, predict, visualize, and question while reading (Zemelman, Daniels, & Hyde, 2005). The strategy for improved reading comprehension is explained to the reader before actually engaging in the reading of text (Zemelman et al., 2005).

Learning and Technology: A Developing Partnership

According to Molenda (2008), allowing students to work through large amounts of material while being checked frequently for understanding was first becoming possible in the 1960s. Behaviorist B.F. Skinner invented a teaching machine to allow learners to progress through guided study individually, progressing through an ordered series of questions, and immediately be assessed on their learning of the material (Skinner, 1954). Skinner reported that a significant effect on lab animals was present when stimuli, responses, and consequences were carefully manipulated. This new method of learning became known as programmed instruction (PI), and inspired Crowder (1962) to give the learner more control over their learning. The machine developed by Crowder allowed student success on activities to skip subsequent lessons or content. Branched programming developed by Crowder, as it would become termed, would be compared with linear programming developed by Skinner. The following decade saw many linear and branched programming products and devices being introduced into education for

educators to assist teachers and assist in student success. This revolution in instruction allowed students to progress through learning curriculum and be checked by teaching professionals for learning mastery in a timely and efficient way. PI reached its peak in the 1960s, when computer-based instruction (CBI) was first becoming accepted in schools (Sugar & Brown, 2008). The computer-based instruction of today has roots in the teaching machines utilized in education in the 1950s and 1960s. The success of CBI and the development of personal computers has been the catalyst for the education software available to schools districts, educators, and students today.

Research proved the relationship between technology and improved student achievement (Chambers et al., 2008; Kiriakidis, 2011). Technology helps schools and school systems in achieving student success (Molenda, 2008). The increased use of computers in the classrooms changed from desktop computers to laptop computers, from chalkboards to Smart boards, and new hand-held devices to help students in learning. Van Melle and Tomalty (2000) reported that the resulting change in education has led to students having greater learning and understanding of the content that educators are striving to teach. Technology outcomes that benefit students include: (a) enhanced student engagement in learning, (b) greater ability of students to learn through teaming, (c) more frequent interaction between teachers and students, (d) transporting real-world applications into the classroom, (e) making studies relevant to today's student, (f) increasing technological literacy for all learners thereby narrowing the achievement gap between various student groups, (g) providing opportunities to work daily on building skills necessary in the modern 21st century world of business, (h) encouraging creativity

and imagination, (i) fostering an awareness and curiosity about the global nature of our existence in today's world, and (j) strengthening the usage of problem solving strategies (Metiri Group, 2006, p. 2). Research showed that CBI has benefits: (a) individualization, (b) student tracking and branching, and (c) immediate feedback.

Individualization

Allowing students to have more control of their learning can increase their achievement (Corbalan, Kester, & van Merrienboer, 2006). An important attribute of CBI is the interaction with the student (Meyer et al., 2011; Starkman, 2007). The opportunity for students to progress through the learning activities at their own pace is another benefit of CBI (Hannafin & Foshay, 2008). According to Meyer et al. (2011), although the individualization of instruction through CBI is beneficial for students at all levels of the ability spectrum, providing for remediation and enrichment for struggling through higher achieving students. Fry and Gosky (2008) found that the computer-based intervention of pop-up dictionary to be statistically effective in increasing the reading comprehension rate of social studies students and their test scores.

Student Tracking

Individualization of instruction is important, which is another important benefit of CBI. For instance, the collection and analysis of student progress data is allowing a teacher to make an immediate, informed decision regarding the learning of a student. CBI allows teachers to monitor a student and what is being read, how the student is progressing, and also branch students to the next learning level based on performance (Chen, Chen, & Sun, 2010; Macaruso, Hook, & McCabe, 2006). Some CBI systems

allow teachers or the software to determine the next branch a learner will take. CBI programs are designed to help students master the learning materials before they progresses to the next lesson or level of instruction (Hannafin & Foshay, 2008). Depending upon the software system, students may have extra practice or review or access to more advanced lessons (Macaruso & Rodman, 2009).

Immediate feedback

Molenda (2008) stated that students need immediate feedback. Mckie et al. (2012) supported Molenda's findings as the result of their evaluation research study of a Pre-Kindergarten Incentive Program in Washington, DC. Mckie et al. asserted that students need immediate feedback generated from observations and constructive feedback. Wolff et al. (2013) reported that student comprehension had been impacted by a web-based program, which incorporated teacher feedback.

Immediate and non-judgmental feedback for students is an important attribute of CBI (Hannafin & Foshay, 2008). A strength of CBI is timely feedback regarding the learning of the learner for each activity completed (Meyer et al., 2011). Marshall (2002) reported that reading comprehension has been found to be increased with the use of technology. With the use of the computer, students are able to visualize the concepts and theories while reading passages and stories (National Institute of Child Health and Human Development, 2000).

Development of Computer-Based Instruction

In order to help educators narrow the achievement gap in learning, computer-assisted instruction (CAI) was developed. CAI merges instruction and remediation

(Magnolia Consulting, 2008). The use of computers is the result of a significant research that computers are educational tools used in the classroom demonstrating an increase in student knowledge (Pearson et al., 2005). CAI includes practice worksheets (Wild, 2009). Kulik (1994) found that students achieved greater understanding of language arts, explored higher level questions, and developed deeper understanding of concepts through the use of computers. The use of computers has resulted in greater student achievement in all grade levels and courses (Bayraktar, 2001). Reading comprehension, as well as reading motivation, was found to be increased when readers use instructional technology as opposed to readers using textbooks or text-specific assignments (Cuevas et al., 2012). Chen (2009) stated that learners instructed with the use of technology make gains in their reading comprehension levels.

Marzano (2006) explained (a) students should gain a clear picture of their progress on learning goals and understand how to improve when provided feedback on classroom assessments, (b) feedback on classroom assessments should encourage students to improve, (c) classroom assessment should be formative in nature, and (d) formative classroom assessment should be frequent. Magliano et al. (2011) used reading strategy assessment tool (RSAT) and assessed both comprehension and comprehension strategies. An automated computer-based reading program was used and RSAT to calculate the results from questions posed to the reader after each sentence and Magliano et al. (2011) reported that the levels of comprehension were comparable to results from standardized tests.

CBI Methodologies

CBI addresses : (a) simulation, (b) tutorials, (c) games, and (d) hypermedia (Sugar & Brown, 2008). McCullough (2011) supported this claim that instruction that includes cooperative learning groups and multiple-strategies helps students with comprehension. Although some of the CBI available area based on one of the types of instruction, the majority of the software available is based on two or more of the instruction types identified. Park (2013) found that Web 2.0, a CBI tool, could be used to increase student engagement to promote reading engagement.

Simulation

A class of CAI is simulation, which attempts to create real-life situations. Problem-solving skills are developed together with higher-order thinking skills (Dowd & Bower, n.d.) with the use of simulations. CAI simulation has been possible with the development of modern computer graphics (McNamara, O'Reilly, Best, & Ozuru, 2006; Meyer et al., 2011).

Tutorial

This most common type of educational software (Handal & Herrington, 2004) is also known as computer-assisted instruction (CAI). Built on the traditional drill and practice utilized in the classroom, this type of CBI provides automatic feedback to the student through repetition. Meyer et al. (2010) stated that students who received elaborate feedback performed better on standardized tests than those who received simple feedback through the web-based instruction study performed. Providing students with the ability to

learn new material using technology is the tutorial class. This class provides one-on-one tutoring allowing the student to receive immediate feedback, but does not remove the teacher completely (Brown, 1997). Although the tutorials offer the student practice in learning correct and incorrect responses to questions, the software does not analyze where the deficiency can occur in the learner through use of the technology (Kiriakidis, 2011). This type is essentially modern computer-based versions of the machines made popular by B. F. Skinner in the 1950s. Yu-Fen et al. (2008) reported that the reading comprehension rates of subjects utilizing computer-assisted instruction increased, and they even relied less on the system's feedback as they progressed through the program.

Games

The class most likely to create student motivation is the game class. Developed from the scaffold of the personal computer and computer games designed for recreational use, games entered school instruction in the 1980s (Sugar & Brown, 2008). Teaching "children about the realities of 19th-century pioneer life on the trail" (Sugar & Brown, 2008, p. 81), the Minnesota Educational Computing Consortium (MECC) developed The Oregon Trail in the 1970s. This type of CBI can be viewed as drill and practice, but they can also reinforce material previously learned in class (Dowd & Bower, n.d.).

Hypermedia

A term used for the first time in 1965, was inspired by Vannevar Bush, chief scientific advisor to President Franklin Roosevelt, who proposed the creation of a machine that "would allow its users access to diverse materials including text, still images, film and sound clips in a way that made the most sense to the individual" (Sugar

& Brown, 2008, para 3). The World Wide Web (WWW), developed 30 years later by Tim Berners-Lee and Robert Cailliau working at the European Organization for Nuclear Research (CERN) in Geneva, Switzerland (Berners-Lee, 1999), is the best known form of hypermedia. Web Quests, where students would read, analyze, and synthesize information, was a concept created by Dodge and March making the WWW an educational tool for the first time (Dodge, 2007). The utilization of digital media encourages student learning by satisfying the intrinsic need of students to learn while increasing the students' ability and familiarity with technology (Weigle, James, & Gardner, 2009). Srivastava and Gray (2012) contrasted the learning of students exposed to computer-based and paper-based formats and reported no significant growth in comprehension of what was read by students with or without language-learning disabilities.

Souleyman (2009) found that the implementation of hyperlinked text improved learning of the subjects in the study, lengthening the gain and retention of what was read from electronic text supported by highlighted text with auditory and graphic enhancements. Conversely, Stetter, and Hughes (2010) researched the comparison of printed versus computerized text, the use of computers to compensate for deficiencies in reading ability, and the use of hypertext for students to increase their understanding of what has been read. Stetter and Hughes recommended additional research.

Conclusion

Weih (2013) concluded that a combination of literacy strategies including repeated readings, phonemic awareness, character perspective chart, personal vocabulary

journal, reader response journal, and self-questioning in a one-to-one environment enhanced the reading enjoyment, comprehension. The Nation Assessment of Adult Literacy (NAAL) explained that, in the United State, an estimated 30 million adults have no more than the simplest concrete literacy skills (NCES, 2009).

On January 9, 2002, when President Bush's No Child Left Behind legislation became law, reading policy and reading instruction became strongly entwined and have become even more so with the passage of state laws, mandates, and educational research. Approximately 10.9 million children in the United States, in 2008, did not speak English their homes (U.S. Department of Education's National Center for Education Statistics, 2010). Students in Grades 4 and 5 are still being found to have poorly developed literacy skills, proven by students not being able to be successful when evaluated by increased academic demands. With the increased demands put on states, school districts, teachers, and students, teachers are in need of meaningful and research-based materials and techniques for addressing the needs of the students in their care. The reading texts provided to the teachers in this district, and the reading software Study Island, were designed to change reading instructional practices resulting in increased proficiency on the PSSA. Section 3 is about the research design used in the study.

Section 3: Research Methodology

Introduction

Study Island's impact on Grade 11 students' reading proficiency had not been examined. In this section, I present a description of the research design and approach, the context of the study, selection and ethical protection of the participants, and data collection and analysis procedures. I collected archived Grade 11 literacy state scores from one high school.

Research Design and Approach

The research design was quantitative to determine the impact of Study Island on PSSA state scores. A *t* test was used to compare the PSSA state mean scores of the two cohorts of Grade 11 students before and after the integration of Study Island into the literacy curriculum.

Other quantitative research methods were considered but not selected because I was interested in archived PSSA state scores that are numeric scores. I did not select a qualitative study because I was not interested in answering *why* questions and was not primary instrument in data collection (Creswell, 2012).

Research Question and Hypotheses

The following research question was addressed in this study:

What is the effect of the web-based reading Study Island software on the proficiency of Grade 11 students in reading as measured by Pennsylvania State Achievement (PSSA) test scores?

H_{01}: There is no statistically significant difference in the Grade 11 students' proficiency in reading as measured by PSSA test scores between students who were taught by reading teachers before the implementation of the web-based reading Study Island software and students who were taught by the same reading teachers after the implementation of the web-based reading Study Island software.

Ha1: There is a statistically significant difference in the Grade 11 students' proficiency in reading as measured by PSSA test scores between students who were taught by reading teachers before the implementation of the web-based reading Study Island software and students who were taught by the same reading teachers after the implementation of the web-based reading Study Island software.

Setting, Population, and Sample

Approximately 1,600 students, per academic year, attended school between the academic years 2009-2010 and 2012-2013. The population for this timeframe was approximately 6,400 high school students.

The sample was 1,600 Grade 11 state scores. A sample size of 560 was appropriate to reflect the population with 95% accuracy along with a confidence interval of 0.5. Archived reading scores were collected following IRB approval. The first cohort comprised of 800 non Study Island state scores, while the second cohort comprised of 800 state scores after Study Island was integrated into the literacy curriculum.

The selection criteria included Grade 11 students who had low state scores in literacy and did not meet adequate yearly progress. The administrators responsible for research at the research site used these selection criteria to provide me with state scores.

The characteristics of the selected sample included: (a) the ratio of 15 students to one teacher, (b) 101 fulltime high school teachers, (c) students who were 81% Caucasian American, 12% Hispanics, and 7% African American, and (d) 25% of students received free-and-reduced lunches.

Instrumentation and Materials

The instrumentation was PSSA, a standards-based criterion-referenced assessment. *A Technical Report for the 2011 Pennsylvania System of School Assessment* provided by the Data Recognition Corporation relates that the PSSA was developed in 1992 as a school evaluation tool for the school level only. When Pennsylvania adopted the State Board of Education's Pennsylvania Academic Standards for Reading, Writing, Speaking, and Listening, and Mathematics in January 1999, the test content of the PSSA changed greatly in structure. The *Chapter 3 Regulations on Academic Standards and Assessment* detailed the knowledge and skills students should possess at particular grade levels. As a result, the levels of performance were developed and defined to include *advanced*, *proficient*, *basic*, and *below basic* assessment criteria.

For the reading assessment, content changes were developed in 2003 and field tested in the spring of 2004, and then put into implementation in 2005 for Grades 5, 8, and 11.

There are two testing methods employed by the Reading PSSA, and they are multiple-choice and open-ended, and are designed to determine the comprehension of the content read in the reading passages by the students. The multiple-choice questions measure the understanding of the overall meaning of a reading passage or in making

inferences about the reading passage. Each question has only one correct answer of the four choices offered on the assessment. Incorrect choices "typically represent some kind of misinterpretation, predisposition, unsound reasoning, or casual reading" ("Technical Report," 2011). The PSSA is also used to determine students' comprehension of reading passages that cannot be determined by multiple-choice questions. About 10 minutes per short written response is permitted to write a summary including details or examples from the text. Using a 0-3 point scale, the essays are scored utilizing an item-specific scoring guideline. The scale used for the PSSA is similar to the scale the nation Assessment of Educational Progress (NAEP) utilizes. The *General Scoring Guidelines for Open-ended Reading Items* has been used as the guide for item-specific scoring. Four score levels are described and represent a hierarchy, which is evaluated in the open-ended category.

The Process for Reliability and Validity of PSSA Assessment

The data from the PSSA are interpreted within-year and across-year. The within-year data for reading has a validity of 71% to 93%, while the across-year data range between the high .60s to low .80s (PSSA, 2011). Both results are similar to the results from prior years of PSSA administration.

The validity of the PSSA assessment is evidenced through the internal and external strand score relationships between the components of the test and within subject-area strands (e.g., reading) more than with other subject-area strands (e.g., mathematics) (PSSA, 2011). Further, there is great consistency of reliabilities of the test scores, measuring in the low 0.90s. The Pennsylvania State Board of Education (PDE) has

attempted to lessen the threat of validity issues that achievement tests can come under. The construct-irrelevant variance has been addressed through ethnic and gender differential item functioning. In the past, the PDE commissioned a study of the validity of past PSSA assessments, including an evaluation of the test items and the statistical relationships, to include validity (PSSA, 2011).

The Pennsylvania Department of Education outlined the processes needed to complete the instrument by participants of the PSSA. Students, when taking the assessment, were provided with two booklets. One test booklet was for multiple-choice test assessment questions, and the other was used for open-ended assessment questions. There were three sections to the Reading PSSA, comprised of 58 multiple-choice questions and five open-ended questions, with students permitted 220-265 minutes to complete the assessment without noting that additional time was needed. The time estimated to complete the multiple-choice questions was 1-3 minutes, and 5-10 minutes for the open-ended questions. Students were not to feel rushed in the administration of the assessment, but the students were not to be permitted to waste time. Students who finished early were to close their booklets and sit quietly, while students who needed more time were to be escorted to another room where they could finish the assessment. If additional time was necessary, that fact has to be noted on the test booklet.

At the research site, raw data are kept and are available because PSSA test scores of the Reading component for Grade 11 students have been collected and kept on file by the high school administration. The collected data have been stored in a secure location and confidentiality has been, and will be, maintained. In order to protect the data that

could compromise the study, a human operator would adjust or clean the scanner when the images did not meet the DRC's image quality standards by viewing randomly selected and displayed images (p. 75).

Data Collection

Upon IRB approval, I collected archived Grade 11 PSSA state scores from the administrators responsible for research at the research site where state scores of the reading component for Grade 11 students are kept on file by the high school administration. PSSA scores were provided to me in electronic format. The scores were numeric values. I printed a hard copy of the scores for my records. The electronic copy of PSSA scores were stored on my personal computer, which was password protected. The hard copies of scores were stored in a file cabinet accessed with lock and key. I will keep all data for at least 5 years.

I entered the PSSA scores into SPSS 20 for data analysis and all scores were checked for accuracy. The first cohort of Grade 11 students received reading instruction before Study Island was integrated into the literacy curriculum. The second cohort of Grade 11 students received reading instruction after the implementation of Study Island.

Data Analysis

PSSA state scores represented the proficiency in reading of students of similar age, ability, and grade. PSSA scores were ratio-based with a numerical scale. In order to determine if a statistical significant difference existed, an independent samples *t* test was used to compares the means of two cohorts of Grade 11 students' reading state scores. To test for significance at a confidence level at or above 95% ($a = .05$), the *t* test was used. A

t distribution table was used to determine if *t* statistic was within or outside the critical region. A two-sample *t* test was used to compare the means of Grade 11 students' PSSA reading state scores before and after Study Island was used in class. Cohen's measure of effect size was used to determine the size of any significant difference in the means of reading test score (i.e., if Study Island had a small, medium, or large effect on literacy scores).

Ethical Protection of Participants

The school administrator responsible for research was contacted about this study. Following the school administrator's agreement for me to conduct the study, I collected only PSSA state scores for Grade 11 reading.

No description of the school or names of Grade 11 reading students are included in the findings. I did not identify either the research site or its teachers, students, administrators. By keeping the participants' identities confidential, I protected the confidentiality of teachers, students, administrators at the research site.

Role of Researcher

I have been a high school teacher for over 18 years. I am interested in how reading programs such as Study Island assist students in improving proficiency in reading. I attended numerous conferences pertaining to reading software designed to help students in passing reading state assessments. I conducted this study as a novice researcher.

Conclusion

In concluding the third section of this study, the purpose, research questions and hypothesis, the population and sample were summarized. The collection and analysis of data was explained together with my role as a researcher. In Section 4, the findings of this study are presented.

Section 4: Findings

Introduction

Because Grade 11 students, at the research site, were not achieving adequate yearly progress (AYP), Study Island was integrated into the literacy curriculum. For this nonequivalent quasi experimental research design, state scores in literacy of two cohorts of Grade 11 students were examined. In this section, the findings are presented.

Research Question and Hypotheses

The following research question was addressed in this study:

What is the effect of the web-based reading Study Island software on the proficiency of Grade 11 students in reading as measured by Pennsylvania State Achievement (PSSA) test scores?

Ho_1: There is no statistical significant difference in the Grade 11 students' proficiency in reading as measured by PSSA test scores between students who were taught by reading teachers before the implementation of the web-based reading Study Island software and students who were taught by the same reading teachers after the implementation of the web-based reading Study Island software.

Ha_1: There is a statistical significant difference in the Grade 11 students' proficiency in reading as measured by PSSA test scores between students who were taught by reading teachers before the implementation of the web-based reading Study Island software and students who were taught by the same reading teachers after the implementation of the web-based reading Study Island software.

Data Collection and Instrumentation

Upon IRB approval (# 06-12-14-0034321), archived state scores in literacy for Grade 11 students were collected from the administrators responsible for research at the research site. State scores were provided in electronic format. Each score contained three digits such as 567 with no decimal places. No description of the school or names of Grade 11 reading students were included during the data collection process implying that the participants' identities were kept confidential protecting the confidentiality of teachers, students, and administrators at the research site.

I entered the state scores into SPSS 20.0 where 800 numeric state scores represented the control group and another 800 state scores that represented the experimental group. The two sets of data represented separate Grade 11 students who were taught by the same literacy teachers. I checked all scores for accuracy before I entered then into SPSS 20.0 for data analysis.

Data Analysis

An independent samples *t* test was used to determine if there was a significant statistical difference between the means of the Grade 11 reading scores of the two cohorts. To test for significance, a *t* test was used, at a confidence level at or above 95% ($a = .05$). The *t* distribution table was used to determine if *t* statistic was within or outside the critical region.

Cohen's measure of effect size was used to determine the size of any significant difference in the means of the reading scores (i.e., if the effect of Study Island was small, medium, or large). Parametric tests were used. The variables for this study were the state

scores. No covariates and confounding variables were included because the focus of this study was on Study Island state scores. The sample was n = 1,600 participants (Table 1).

Table 1

Descriptive Statistics of State Scores

Academic Year	Cohort 1	Cohort 2
2009-2010	400	
2010-2011	400	
2011-2012		400
2012-2013		400
Total	800	800

The mean score of the control group (i.e., first cohort) was M = 577.6 with a standard deviation of SD = 117.5. The mean score of the experimental group (i.e., second cohort) was M = 602.9 with a standard deviation of SD = 106.14.

The mean score of the experimental group was different from the mean score of the control group by 25.3 points on the state tests in reading suggesting that the Study Island software had an effect on the Grade 11 students' state scores in the experimental group (Table 2).

Table 2

Descriptive Statistics of Means of State Scores

Academic Year	Cohort 1	Cohort 2
	M(SD)	*M(SD)*
2009-2010	577.1(117.07)	
2010-2011	577.9(108.09)	
2011-2012		602.2(106.9)
2012-2013		603.9(105.8)

The obtained *t* statistic exceeded the critical region indicating that this result was considered significant, $t\ (1,600) = -2.26$, $p < 0.05$. The one-tailed probability was $p = 0.0122$. The two-tailed probability was $p = 0.0244$. Cohen's *d* was 0.266. The mean difference was greater than would be expected by chance (e.g., the standard error). The mean of the experimental group was different from the mean of the control group by 25.3 points on the reading scores. The null hypothesis was rejected, which stated that there was no statistical significant difference in the Grade 11 students' proficiency in reading as measured by reading scores. The alternative hypothesis was accepted, which stated that there was a statistical significant difference in the Grade 11 students' proficiency in reading.

Based on the findings, the Study Island software helped students improve their proficiency in reading as measured by state tests. The findings are in line with the

theoretical framework of this non equivalent quasi-experimental study, which was based on the intelligence and differentiation theories.

Summary

A nonequivalent quasi-experimental research design was used. Archived data were collected and an independent samples *t* test was used for data analysis to measure the variances in state scores between the two cohorts. A statistical evidence of differences between the mean scores was found suggesting that Study Island had an effect on the reading test scores of the participants in the experimental group. Discussed in Section 5 are conclusions and implications related to the findings.

Section 5: Summary, Conclusion, and Recommendations

Introduction

The findings of this study are discussed in this section together with conclusions and recommendations. The findings provided empirical evidence that state scores improved after Study Island was integrated into the literacy curriculum.

Summary of Findings

In order to determine if there was a significant statistical difference between the means of two cohorts of Grade 11 students' reading state scores at a confidence level at or above 95% ($a = .05$), an independent samples t test was used. The mean score of the control group for the academic year 2009-2010 was $M = 577.1$ with a standard deviation of $SD = 117.07$ (Table 2). The mean score of the control group for the academic year 2010-2011 was $M = 577.9$ with a standard deviation of $SD = 108.09$ (Table 2). Based on the state scores, Grade 11 students' proficiency during the academic years 2009-2010 and 2010-2011 were close to the state average in reading.

The mean score of the experimental group for the academic year 2011-2012 was $M = 602.2$ with a standard deviation of $SD = 106.9$ (Table 2). The mean score of the control group for the academic year 2012-2013 was $M = 603.2$ with a standard deviation of $SD = 105.08$ (Table 2). Based on the state scores, Grade 11 students' proficiency during the academic years 2011-2012 and 2012-2013 were above the state average in reading.

The mean score of the control group for the academic years 2009-2010 and 2010-2011 was $M = 577.6$ with a standard deviation of $SD = 117.5$. The mean score of the

experimental group for the academic years 2011-2012 and 2012-2013 was $M = 602.9$ with a standard deviation of $SD = 106.14$. The mean score of the experimental group (i.e., academic years 2011-2012 and 2012-2013) was different than the mean score of the control group (i.e., academic years 2009-2010 and 2010-2011) by 25.3 points on the state tests in reading suggesting that the Study Island software had an effect on the Grade 11 students' state scores in the experimental group.

The result, based on the t distribution table, was considered statistically significant, t (1,600) = -2.26, $p < 0.05$ (one-tailed $p = 0.0122$ and two-tailed $p = 0.0244$). The null hypothesis was rejected. The alternative hypothesis was accepted. There was a significant statistical difference in the mean scores of the reading scores for the two cohorts. Study Island software assisted students toward the achievement of greater academic proficiency in reading because the experimental group scored higher than the control group from the time district administrators decided to integrate Study Island software into the literacy curriculum.

Summary of Findings Related to Literature on Study Island Software

The findings are in line with the findings of (a) Clements (2009) who agreed that greater success could be achieved with early intervention to reading, (b) Daisey (2009) who recommended reading materials for better comprehension, (c) Kashef et al. (2014) who reported that reading can be changed with learning-centered instruction, and (d) Nosratinia and Shakeri (2013) who asserted that reading strategies have a significant benefit on reading comprehension. Rupley (2009) agreed with Nosratinia and Shakeri

(2013) that readers need effective reading instruction and with Ness (2009) that reading comprehension is important for high school students in content area classes.

The findings of the control group (Table 2) are in line with the findings of Cookson (2009), Garner (2010), Odden (2009), Slavin, Chamberlain, and Daniels (2007) that reading scores of secondary students are below state levels. The findings of the experimental group (Table 2) are in line with the findings of Allington (2006) who encouraged the use of software (e.g., Study Island), being similar to reading text and sharing the understanding of that text. Study Island software focuses on reading, about thinking, and reconstructing meaning (Tovani, 2000).

Study Island software was used to increase the students' proficiency in reading comprehension because students were challenged to use higher order thinking skills (Duke, 2010; Gallagher, 2009; Gewertz, 2010; Irvin, Meltzer, & Dukes, 2007; National Assessment of Educational Progress, 2011). Students learn easier by relating one's environment and psychological processes (Fahser-Herro, 2010) to build knowledge and interpret the read text (Kamil et al., 2008). Greater understanding of read text can be generated by understanding what has been read (Abdullah et al., 2012). O'Connor (2009) stated that continuous reading could increase comprehension.

Study Island uses visual representations. According to Anderson (2008), visual representations can be used to assist students in processing information they have read. According to Rosenthal and Ehri (2011), visual representations and new words could improve learning. Massengill (2004) asserted that improvement in reading comprehension has been noted when emphasis is placed on guided reading activities.

Students who use Study Island have the option of re-reading a passage allowing students to retell the story to check for understanding. Pang (2013) found that the lack of knowledge slows reading rate and delays the comprehension of what has been read. Wagaman (2008) found that stating how, what, and why are examples of the inferential questions a reader should ask to attain greater reading comprehension.

The findings are in line with the findings of Corbalan, Kester, and van Merrienboer (2006) that allowing students to have more control of their learning has benefits, the greatest being the increase of reading comprehension. Students should have the opportunity to tailor reading content (Meyer et al., 2011) and to progress through the learning activities (Starkman, 2007) at their own pace (Hannafin & Foshay, 2008).

Study Island should be integrated into high school subjects such as social studies. Fry and Gosky (2008) found that the computer-based intervention of pop-up dictionary to be statistically effective in increasing the reading comprehension rate of social studies students and their test scores. Intervention software provides teachers with opportunities to monitor a student and what is being read, how the student is progressing, and also branch students to the next learning level based on performance (Chen, Chen, & Sun, 2010; Macaruso, Hook, & McCabe, 2006). Students should master the material before they progresses to the next lesson (Hannafin & Foshay, 2008) and have extra practice (Macaruso & Rodman, 2009). Meyer et al. (2011) found that software can provide timely feedback regarding the learning of the learner for each activity completed.

Applications of the Findings

Empirical evidence was provided by the findings of this study showing that the reading scores of Grade 11 students increased after the integration of Study Island into the curriculum. High school teachers may need professional development on how to use software to help students (Kiriakidis & Jenkins-Williams, 2014). Training teachers on how to use Study Island could improve their confidence using technology in the classroom. School and district administrators could use these findings for the allocation of educational software funding. These practical applications of the findings of this study may be of interest to researchers, policymakers, parents, and the community (Kiriakidis, 2013).

Implications for Social Change

The findings provided valuable insight about the successful integration of software into the literacy curriculum. High school teachers can use software to help students in meeting AYP and passing state exams. School administrators should offer professional development for teachers in improving their pedagogies and the use of software. Professional development providers may benefit from having an awareness of the benefits of the integration of Study Island software into the high school curriculum. District and school administrators should identify strategies for the successful integration of Study Island software into the curriculum.

The awareness of these benefits has implications for positive social change because improving teachers' pedagogies via the use of software could result in increasing state scores to create change at the research site. By integrating standards-based software

into the high school curriculum, students could more likely become productive members of society.

Recommendations for Action

Literacy teachers who integrate Study Island could provide valuable feedback to school administrators regarding the strategies used to integrate technology into the curriculum. Stakeholders such as administrators, teachers, parents or guardians, and professional development providers could benefit from having an awareness of strategies for students to pass state exams.

Based on the findings of this study, a recommendation to administrators would be to offer professional development for high school teachers to integrate educational technologies into the curriculum. Study Island should be used in all content areas at the research site.

Recommendations for Further Study

A qualitative case study should be conducted at the research site to examine the experiences of literacy teachers regarding the integration of Study Island software into the curriculum. A mixed-methods research design could be conducted in order to examine the impact of Study Island software on state scores and to interview teachers and/or students. Recommendations for further research include studying a larger sample of Grade 11 state scores in reading from multiple schools or school districts. A larger sample could include administrators, teachers, parents or guardians, and students for greater consistency and additional findings. Researchers should collect archived reading PSSA scores matched to individual reading teachers.

Reflections

My experience in conducting this study, as a high school teacher, was positive because I learned how to collect, organize, and analyze data and to use statistics to answer the research question. By conducting this study, I interacted with my committee chair and learned a plethora of strategies for conducting quality research. I feel a great sense of accomplishment because I conducted this study as a novice researcher.

Summary

In this section, I discussed and interpreted the findings of this study and provided conclusions and recommendations. The findings are in line with the findings of (a) Clements (2009) regarding early intervention to reading performance, (b) Daisey (2009) who recommended that students should read certain materials for comprehension, (c) Kashef et al. (2014) who reported that attitude about reading can be changed through the utilization of learning-centered instruction, (d) Nosratinia and Shakeri (2013) who asserted that reading strategies have a significant benefit on reading comprehension, (e) Rupley (2009) who agreed with Nosratinia and Shakeri (2013) that readers need effective reading instruction and with Ness (2009) that reading comprehension is important for high school students in content area classes, and (f) software had a positive effect on student achievement (Desimone, 2009). Study Island software increased the students' proficiency in reading comprehension because students were challenged to use higher order thinking skills (Duke, 2010; Gallagher, 2009; Gewertz, 2010; Irvin, Meltzer, & Dukes, 2007; National Assessment of Educational Progress, 2011). According to (a) Anderson (2008), visual representations can be used to assist students in processing

information they have read, (b) Rosenthal and Ehri (2011), visual representations and new words could improve vocabulary learning, (c) Massengill (2004), improvement in reading comprehension has been noted when emphasis is placed on guided reading activities for the purpose of word recognition, and (d) Burns et al. (2012) that the utilization of the keyword strategy could improve reading comprehension.

At the research site, the integration of Study Island into the curriculum by teachers helped Grade 11 students increase their proficiency in literacy. When students pass state tests and graduate from high school, society benefits. Based on the findings of this study, a recommendation to administrators would be to offer professional development for high school teachers to integrate educational technologies into the curriculum. Another recommendation for action would be for teachers to work with technology experts to integrate educational technologies into the curriculum. Study Island software should be used in all content areas at the research site.

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Traveling, boating, hiking, and biking,

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