Study Island as a Tool for Test Preparation on the Georgia Criterion-Referenced Competency Test

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ABSTRACT

This study investigated the relationship between eighth grade student scores on the Study Island Science: Matter program and the Georgia CRCT Science: Structure of Matter test. In addition, the CRCT Science: Structure of Matter mean scores were compared for students enrolled in the web-based Study Island and those who were not. Comparisons were also made to examine the program effects by gender and ethnicity. Participants were eighth grade students who attended rural middle schools located in a public school district in southeast Georgia.

The study utilized correlational research. The correlation between student scores on the Georgia CRCT Science: Structure of Matter domain and student scores on the web-based Study Island Science: Matter program was $r(233) = .48$, $p < .001$. Results of an independent samples *t* test showed a significant difference between students using the Study Island program and those who did not, $t(367) = 3.36$, $p < .001$. Male and female students using the Study Island program had similar CRCT mean scores; however, minority students still lagged behind nonminority students. Results of the study led to the conclusion that the use of the web-based Study Island Science: Matter program can increase student scores and positively impact student learning of the Structure of Matter.

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Chapter I

INTRODUCTION

Background

With the pressure to increase student achievement across the United States, federal, state and local school administrators and teachers continue the search for tools and ideas they can employ to transform student learning and increase student achievement (Hamilton, 2009). Technology continues to be the focus of this search with its continual advancements and the possibilities of engaging students with content in the learning environment (Grinager, 2006). Tyack and Cuban (2000) believed the computer to be the focal point for changing education because of its support and criticism, as well as the amount of money, research, and time devoted to its use. New advances in technology have given teachers a new cache of tools to engage their students in a variety of ways with different content (Wilson, 2008). Martineau (2008) believed the use of technology gave educators the tools needed to create an engaging learning environment focused on new pathways of teaching and learning. According to the Executive Office of the President Council of Economic Advisers (2011), the potential to use technology to positively affect student achievement is much greater in today's educational environment.

Using technology to explore learning pathways comes at a time when the need to increase student achievement is at a fervor with the implementation of President Barack Obama's Race to the Top Initiative (RTTT) introduced in 2012 (Wellings & Levine, 2009). According to Brenchley (2011), the total educational budget for the federal government for 2013 was 69.8 billion dollars, up 1.7 billion dollars from 2012. RTTT funds represented 850 million dollars of the total budget and were distributed based on increased student achievement and teacher performance (Pascopella, 2012). In her article, *Stroll to the Top*, Hess (2010) wrote of how RTTT funds were granted to states based on their ability to adopt standards and assessments to measure student achievement, use data to make educational decisions, increase the quality of teachers and administrators through professional development, and reward schools who excel. Wiseman (2012) also believed greater focus should be placed on teachers to increase their students' achievement. With these financial and personnel pressures continuing to build, and in order to increase student achievement, administrators and teachers have centered their resources and energies on using new technologies to help meet the educational needs of their students (Lim, Zhao, Tondeur, Chai, & Tsai, 2013).

The web-based program Study Island offered educators the possibility of assisting students in reviewing state guided curriculum content to increase achievement on standardized tests. Study Island is a comprehensive online instructional tool for grades K-12 in reading, math, language arts, science, and social studies and is used by millions of students in thousands of schools across the United States (Rivero, 2011). Additionally Watts (2008) was contracted by Archipelago Learning, the company that owns Study Island and later renamed Edmentum, to complete an independent evaluation of the Study Island program and its effect on student achievement in relation to state standardized tests. The study included eleven states across the country and incorporated students from grades three through eight. In their final report, the researchers found the data to support Study Island's ability to positively affect student achievement (Watts, 2008). Watts found that student achievement increased in all subject areas and grades that used the software, but mainly saw increases in math. However, because the research was so broad other researchers recommended additional studies to examine specific subjects and examine possible variables in order to discover more direct effects of the Study Island program on student achievement (Styers & Broussard, 2011).

The purpose of this study was to address the recommendations by Styers and Broussard (2011) by specifically examining whether or not a relationship existed between student scores on standardized tests and student scores on the Study Island program. They study eighth grade students' mean scores on the science portion of the Georgia Criterion-Referenced Competency Test (CRCT) in the Structure of Matter domain and students' mean scores in the Matter section of the Study Island Georgia physical science subsection. Participants for this study were all eighth grade students attending two separate middle schools in rural southeast Georgia. This study added to the existing literature concerning computer-assisted instruction, the understanding of computers in science education, and the use of Study Island in the science classroom for test preparation.

Statement of the Problem

With the continual pressure to increase student achievement, those within public education have been, and will continue to be, affected by the use of standardized tests to measure student achievement. According to Marsh, Pane, and Hamilton (2006), educators will need to make data-driven decisions that enable them to use their time and resources effectively to increase student achievement. With variables such as budget cuts, teacher accountability, and more testing, teachers need to make informed data-driven decisions (Marsh, Pane, & Hamilton, 2006). With many schools throughout the country using Study Island, understanding the possible impact, whether positive or negative, is vital in order to enable educators to make data-driven decisions in selecting the tools they use within their schools and classrooms.

Purpose of the Study

The purpose of this quantitative study was to determine whether a difference existed between scores on the Georgia CRCT Science: Structure of Matter section for students who used the web-based Study Island Science: Matter program and those who did not. They also sought to determine if a relationship existed between students' scores on the Georgia CRCT Science: Structure of Matter section and their scores on the Study Island Science: Matter section. Lastly, they determined if there was a difference between student mean scores on the Georgia CRCT Science: Structure of Matter section and their mean scores on the Study Island Science: Matter section in regards to gender and ethnicity.

Significance of the Study

If a difference is found between the student mean scores on the Georgia CRCT Science: Structure of Matter section and their mean scores on the Study Island Science: Matter section, then educators would have applicable information when making decisions about using Study Island for science review, remediation, and test preparation for eighth grade students in Georgia. Teachers would also have data to support a decision to increase or decrease Study Island use within their classrooms.

The need for increased student achievement has been placed primarily on math, reading, and language arts in the past; however, with recent changes in accountability, science and social studies are now being held equally accountable (Georgia Department of Education, 2014). With these new trends, the results of this study would give educators a better understanding about what works in web-based learning and specifically using the Study Island program. For students, results could help them make data-driven decisions on where they spend their time in review and test preparation using Study Island. It could also validate the use of Study Island as a tool used to assist students with remediation in science. Parents would be provided with data to assist them in making decisions about using Study Island when working with their children at home. Administrators could use the results to make more informed decisions about where to allocate financial resources needed for investing in a web-based program that may fit their needs.

Research Questions

1. Is there a significant relationship between eighth grade student scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student test scores on the Science: Structure of Matter domain on the Georgia CRCT?
2. Is there a significant difference between mean test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Matter and those eighth grade students who did not use the program?
3. Is there a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and

eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to gender?

4. Is there a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to ethnicity?

Null Hypotheses

1. There is no relationship between eighth grade student scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student test scores on the Science: Structure of Matter domain on the Georgia CRCT.
2. There is no difference in the mean test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Matter and those eighth grade students who did not use the program.
3. There is no difference between eighth grade student mean scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to gender.
4. There is no difference between eighth grade student mean scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to ethnicity.

Identification of Variables

The independent variables for this study were student use of the web-based Study Island program, scores received on the program to review concepts in Matter, gender, and ethnicity. The dependent variable for this study was the student score on the Physical Science: Structure of Matter domain on the Georgia CRCT.

Assumptions and Limitations

It was assumed that a relationship would be found between student scores on the Study Island Physical Science: Structure of Matter subsection and student scores on the Georgia CRCT Structure of Matter domain because both Study Island and the Georgia CRCT were vertically aligned to the eighth grade physical science Georgia Performance Standards (GPS). The GPS for science were adopted during the summer of 2004 and have since directed science education across the state; including the district and schools from which the data were gathered. It is also assumed that the Georgia CRCT has been tested for reliability and validity by the Georgia Department of Education's Office of Accountability. It is also assumed that Study Island has been tested for validity based on independent research by Styers and Broussard, LLC in 2011. The strength of the relationship between the Study Island Program and the Georgia CRCT scores is uncertain.

The sample for this study consisted of 369 participants from two separate middle schools in a rural public school district in southeast Georgia. Although the sample size was large, it was limited because it does not include representations from various locations throughout the state of Georgia and therefore limits the ability to generalize the findings to the population outside its participants. It is also limited in that it focuses only on the Structure of Matter domain of the GPS and not the entire eighth grade physical science curriculum.

Research Plan

This study was designed to determine if a relationship existed between the CRCT Science: Structure of Matter scores and Study Island Science: Matter scores. Correlational tests were conducted using the Statistical Package for the Social Sciences (SPSS). To verify whether a relationship existed between the scores on the CRCT and Study Island, I employed the Pearson's Correlation Coefficient. The second objective of this study was to determine if a difference existed between students who use the web-based Study Island program to review Matter and students who do not use the program. To determine if a difference existed, an independent *t* test was completed using the statistical computer program SPSS. The final two objectives of the research were to determine if a difference existed between the CRCT Science: Structure of Matter scores and Study Island Science: Matter scores in regards to gender and ethnicity. To determine if these differences existed, a Factorial Analysis of Variance (ANOVA) was conducted using the SPSS program.

Definition of Key Terms

Computer-assisted Instruction (CAI)

Computer-assisted instruction is defined as "the use of a computer to deliver instruction" (Reynolds, 1985, 11). Kara (2007) defined CAI as using computers as both material and method of instruction to assist students in focusing on and understanding content. Also known as computer-based learning (CBL), computer-based instruction (CBI), computer-aided instruction (CAI), and computer-assisted learning (CAL).

Ethnicity

Ethnicity is defined as “the fact or state of belonging to a social group that has a common national or cultural tradition” by Oxford Dictionaries (2015).

Gender

Gender is defined as “the state of being male or female” by Oxford Dictionaries (2015).

Georgia Criterion-Referenced Competency Test (CRCT)

The Georgia CRCT is a yearly administered test “to measure the level of student achievement of the state-mandated content standards, to identify students failing to achieve mastery of content, to provide teachers with diagnostic information, and to assist school systems in identifying strengths and areas of improvement in order to establish priorities in planning educational programs.” (Georgia Student Assessment Program Student Assessment Handbook 2013-2014, 2013, p. 7).

Georgia Performance Standards (GPS)

The Georgia Performance Standards were established in 2004 to “provide clear expectations for instruction, assessment, and student work” as well as “isolate and identify the skills needed to use the knowledge and skills to problem-solve, reason, communicate, and make connections with other information” in the academic areas of science and social studies (Georgia Performance Standards Curriculum Frequently Asked Questions, 2014, p. 1).

Race to the Top (RTT)

Race to the Top is a federally funded grant created to "reward States that have demonstrated success in raising student achievement and have the best plans to accelerate their reforms in the future" (Race to the Top Executive Summary, 2009, p. 2).

Study Island

Study Island is a "Web-based standards-mastery program that combines highly specific and dynamic content with real-time reporting to create a customized assessment, diagnostic, and instructional program based on each state's standards" (Edmentum, 2012, p. 5).

Summary and Overview of Dissertation

With the increased advancements and use of technology within the classroom, teachers, administrators, students, and parents need to choose what works best for their content area. The purpose of this study was to determine if the Study Island Science: Matter program's use made a significant difference in student mean scores on the Georgia CRCT Physical Science: Nature of Matter domain and whether or not a relationship existed between the students' mean scores. The following chapter conveys a review of related literature in the areas of computer-assisted instruction and its research, the Study Island program, cognitive load and computer-assisted instruction methods, and ends with a brief history of computer-assisted instruction.

In Chapter 3, the methodology of the research is described, including the research design, procedures, and data analysis. Chapter 4 details the data analysis and findings for each research question. Chapter 5 presents the findings in conjunction with their limitations, implications, and recommendations.

Chapter II

LITERATURE REVIEW

Introduction

The National Education Association reported in 2008 that there are approximately four students to every computer based on the nation's average (NEA Policy Brief, 2008). This number had decreased from being approximately twelve to one, 10 years earlier (National Center for Education Statistics, 2002). The increase of computers within the classroom, along with technology's role and worth, have remained a point of contention among educational researchers (Valdez, 2000). As a result of these mixed findings, school leaders have continued their search for new strategies to boost standardized test scores (Lunenburg, 2010).

One avenue schools explored was using computer-assisted instruction to help students in their review of academic content through individualizing review and pace within online programs (Grinager, 2006). Study Island was one web-based program designed to address the test preparation needs of individual students in all five academic areas: reading, language arts, math, science, and social studies (Study Island: About Us, 2015). It has grown into a commonly employed educational software throughout the United States due to its alignment with individual state standards and its inclusion of elementary, middle, and several high school courses in mathematics, reading, English/language arts, science, and social studies (Rivero, 2011).

One purpose of this study was to determine if a relationship existed between the student scores on the web-based Study Island Science: Matter program and student scores on the Science: Nature of Matter section of the Georgia Criterion Referenced Competency Test (CRCT). There were many studies supporting the use of computer-assisted instruction to increase student achievement. Bayraktar (2009) found that although small, CAI has a positive effect on student achievement in science. Burns, Klingbeil, and Ysseldyke (2010) discovered computers used for formative assessment resulted in a higher percentage of students scoring in the proficient range in math. Huang, Liu, and Chang (2012), constructed a CAI learning system to aid students in developing problem solving skills in math and found it to improve their problem solving skills. In their study, Kaplan, Ozturk, and Ertor (2013), compared the use of CAI in teaching math to creative drama and conventional education to reveal the CAI delivery to be more successful. Kara (2007) compared traditional instruction with CAI in science and found the CAI to have a significant difference on student post-test scores. In their study of using CAI to increase the reading comprehension of students with special needs, Kim et al. (2006) identified a significant increase in student comprehension. Kingsley and Boone (2006) examined the use of CAI in an American history classroom and discovered it made a significant difference in test scores of those students who participated in the CAI portion of the study. However, a review of the literature revealed a need for studies focusing on computer-assisted instruction and its impact on science instruction. Another intention of this study was to add to the literature of computer-assisted instruction and its impact on science by examining student use of the Study Island program for science and its possible impact on standardized test scores in science.

This chapter will provide a review of the literature in understanding the key elements and variables of the study. First, a review of the literature focusing on computer-assisted instruction (CAI) is presented, followed by CAI research and its impact on student achievement focused on the fields of mathematics and science. Next, a review of CAI instructional methods will be examined, followed by Study Island, cognitive load theory and instruction, and a brief history of computer-assisted instruction and its various forms.

Computer-Assisted Instruction

Prensky (2008) stated the "role of technology in our classrooms is to support the new teaching paradigm" (p. 1). Kulik (1991), in order to understand this role, conducted several meta-analyses involving computer-based learning and concluded computer use in education significantly increased scores and did so in a much smaller time frame than traditional methods. Although his findings were not focused on specific methodologies or instructional components, his research showed computers did work in education. With new technology comes the need for a better understanding of that technology and how to use it effectively.

Prensky (2001) described technology users as digital natives and digital immigrants. Digital natives were those who grew up using technology in their everyday lives, whereas digital immigrants were those who did not grow up using technology but instead have learned to use it in everyday life. Educators today are a mixture of both natives and immigrants who have used the same tools to create engaging learning environments. The relationship between students and their technology within the realm of education continues to grow. According to a study conducted by Laird and Kuh

(2005), college students used technology for personal use and communication with their peers and teachers rather than in their studies. Nevertheless, they were found to be more engaged in the learning process. However, Ferguson (2005) believed computers to have a viable role in education as assistive tools, but warned their use should be monitored so as not to become a distraction to students from their intended purpose. Mendicino, Razzaq, and Heffernan's (2009) concerns have been found in the ease of cheating through sharing answers, which have prohibited teachers from accurately identifying the needs of learners. They also expressed concern over the cost of such programs and the uncertainty of knowing if they have significantly increased student understanding and achievement (Mendicino et al., 2009).

Although there have been concerns when using technology, McClure, Jukes and MacLean (2011), in their book *Getting It Right: Aligning Technology Initiatives for Measureable Student Results*, focused the idea of how it is to be used by stating, "the key to truly integrating technology-and positively influencing teaching and learning with it-is not merely the use of the technology but how the technology is used" (p. 14). They also stressed the importance of the teacher's role in knowing and understanding what learning goals need to be set for their students and how using technology as a tool can enhance the learning experience (McClure, Jukes, & MacLean, 2011).

Technology has been a knowledge-building tool and therefore, must be treated as such, meaning it required an understanding of how it has been used and applied correctly. The understanding and application of technology as both instructional tool and method for instruction has led to students becoming more engaged in the associated content (Kara, 2007). Kara's (2007) belief supports the importance of technology in education and the acquisition of knowledge through its use. Hartley (2007), in reviewing previous studies of infusing instruction with technology, described the importance of using technology adjacent to direct instruction thus signifying the importance of using both methods instead of one versus the other. The idea of using technology alongside direct instruction prompted Prensky (2008) to view the use of technology in schools as a tool that students should be using to teach themselves various concepts, not merely as tools which teachers use to keep students busy.

Implementing technology within direct instruction has affected both the teacher and the learner. Gros (2007) understood the function of the teacher in the modern classroom as one who has assisted students in analyzing and reflecting on what they were working with and learning. Lee and Winzenreid (2009) took the function a step further by deeming teachers as gatekeepers because using technology within the classroom was dependent upon them to use it in such a way that it benefitted their students. They also wrote that teachers must have not only the confidence in the technology they are using, but also an understanding of how it is used, and that it is helping their students (Lee & Winzenreid, 2009). Teachers needed to choose what tool they would use to apply these ideas correctly. Fleischmann (2007) discovered that teachers desired educational technology, specifically software, already aligned to the specific content standards they taught to meet this need. This allowed the teacher to understand the role of the technology in the classroom and in turn become more successful with its implementation (Fleischmann, 2007). Educators have adapted their teaching styles to incorporate these new technologies to engage students deeper into the content (French, Hale, Johnson, & Farr, 1999). Others also placed high priority on the teacher knowing and understanding his students when lessons involving technology have been prepared and also believed it to be a contributing factor in a student's motivation for learning (Ahmed & Elfessi, 2008). As revealed in a study conducted by Miller (2009), CAI has had an impact on student learning in higher education. Participants in the study were undergraduate students enrolled in a teacher education program. Miller created testing modules that provided user feedback to evaluate student understanding of educational assessment strategies using the Hot Potatoes assessment generator software. Data collected from module assessments and questionnaires that evaluated student perceptions of the modules were found to be moderately effective in assisting student learning (Miller, 2009).

In the early years of implementation, Reynolds (1985) indicated learners made significant gains and in half the time as non-users based on 75 previous studies using CAI. Wang, Wang, Wang, and Huang (2006) found computer-assisted instruction could have been statistically significant when the teacher considered the student's learning style. They found student achievement increased with students who primarily used web-based instruction than those who used it infrequently or not at all. Hu (2008) found similar results in that "interactivity, multimedia, easy access of information, and knowledge construction" made web-based learning environments "superior to the conventional text-based learning materials" (p. 98). He concluded the ability for learners to select what they learned individualized the learning process and empowered them to control their learning (Hu, 2008).

Wang and Reeves (2007), in their study of motivation for high school science students, also found that students enjoyed computer-assisted instruction because it allowed them to be more engaged in the learning environment and increased their desire to learn. Wu et al. (2010) reported students to be more engaged with the content, teachers more comfortable with content and using technology, and significantly higher scores than before using a mobile one-on-one learning environment.

Another study conducted by Mouza (2008) examined the implementation of one-to-one laptops in an elementary school setting and its effect on student motivation, attitude, and learning in language arts and mathematics. Students who participated in the study were from the third and fourth grades and were given a laptop connected to the Internet. Data were collected through classroom observations, teacher interviews, student questionnaires, and focus groups. Results showed teachers created meaningful activities and increased student engagement in the content while implementing laptop use with the lessons. Students also saw computers as tools used to both find and create information. Additional findings showed an improvement in student motivation and an increase in academic gains in both language arts and mathematics (Mouza, 2008). However, Donovan, Green, and Hartley (2010) found middle school students with access to one-to-one laptops were less engaged in learning and engaged in more off-task behaviors. Chaudhary (2008) concluded from his research of digital game-based learning that a combination of traditional and digital style instruction has allowed students with different interests to learn through a combination of varying resources.

In order to give learners a chance to use technology as a tool, the technology must first be evaluated to determine whether it can be helpful. To evaluate the technology properly it must first be carefully aligned with the content being taught and reviewed (Means & Haertel, 2004). Miranda and Russell (2011) suggested the strongest predictors of technology use in schools fell to district awareness of various technologies and the administration's desire to implement it. Lee and Winzenreid (2009) found many schools' approach to implementing technology has been simply to buy the newest hardware and software available and then hand it over to teachers, expect them to use it, and then to see improvement in student learning. The United States Federal Government has spent almost six billion dollars per year to provide schools with technology (Ferguson, 2005). With such a large amount of funding designated to schools for technology, proper evaluations of computer-based educational programs should be paramount. Lee and Winzenreid (2009) believed lack of additional funding, time, and resources to be the variables that have prohibited complete evaluations of new technology. Administrators were not patient and did not want to wait on results but rather just began using it in the classrooms. Another report suggested much of the data collected by government agencies was not as accurate as presented due to the high pressures of making the data look better (Lee & Mezenreid, 2009).

Computer-Assisted Instruction Research

Mathematics

Studies conducted investigating computer-assisted instruction have been completed in varying academic areas supporting the use of technology within the classroom and more specifically, when used alongside traditional teaching components (Mendicino, Razzaq, & Heffernan, 2009). A case study conducted by Hannafin and Foshay (2008) evaluated a Massachusetts's school's CAI program's effectiveness on increasing state math scores for students who were considered at-risk of not passing the state exam. State test scores from students enrolled in the CAI program were compared to those who were not enrolled. Although student scores increased from eighth grade to tenth, scores from students using the CAI program were more significant. They also found a positive correlation between state test scores, and student usage of the CAI program (Hannafin & Foshay, 2008). In evaluating ways to improve mathematics achievement, Tienken and Maher (2008) analyzed mathematics scores from the New Jersey Grade Eight Proficiency Assessment to determine if any significant differences in eighth grade students who used drill and practice CAI software for review existed when compared to students who used a traditional paper and pencil method. They concluded there were no significant differences in student achievement scores and the use of the CAI drill and practice could have had a negative effect on student achievement. They recommended any CAI program introduced into the learning environment should be evaluated first and demonstrate its success before being implemented in the classroom (Tienken & Maher, 2008). Tienken and Wilson (2007) provided one group of seventh grade math students with web-based drill and practice software to improve basic mathematic skills while the control group was not exposed to any CAI. Although small, a positive effect on student achievement in seventh grade mathematic skills was found when basic skills were taught using a component of CAI through drill and practice (Tienken & Wilson, 2007).

Mendicino, Razzaq, and Heffernan (2009) compared traditional homework to online supported homework for fifth grade math students by comparing pretest and posttest scores. Posttest scores reflected a significant difference in the gains of students using the web-based support program. Students who used the online homework assistance had a mean score double that of those who used traditional homework. CAI programs were determined to be beneficial to students and teachers because they provided help and instruction at a low cost, gave students immediate feedback, and allowed teachers to assess student learning easily (Mendicino, Razzaq, & Heffernan, 2009).

Ysseldyke and Bolt (2007) performed another web-based study that involved the use of CAI alongside traditional instruction in teaching math skills. They implemented the web-based program, Accelerated Math (AM), into a sample of both elementary and middle schools. Data collected and analyzed for a complete school year indicated positive and consistent gains in classrooms with high-implementation of the web-based program. These results led researchers to draw attention to the integrity of the AM program's implementation as a limitation to the study (Ysseldyke & Bolt, 2007).

At the college level, Buzzetto-More and Ukoha (2009) used a web-based instructional program to assist struggling college students in Mathematics 101. The historically high minority college sought to increase pass rates by implementing a web-based tutoring program called Math XL. The Math XL program became part of the class and paired traditional instructional methods with CAI methods. Most students found the program to be an important instructional tool that enhanced their educational experience and provided a better understanding of mathematical concepts. Data also showed a decrease in class withdrawal rates as well as an increase in the number of students who passed the class (Buzzetto-More & Ukoha, 2009). However, a study from the Institute of Education Sciences conducted by Campuzano, Dynarski, Agodini, Rall, and Pendleton (2009), examined four CAI reading programs and two CAI math programs to determine if there had been an increase in student achievement since implementation. After the first year of implementation no statistical differences were found in using the math or reading software for any of the participating four levels (first, fourth, sixth and Algebra I). However, the second year of implementation yielded mixed results showing no significant differences in reading for all grades, while math scores were significantly lower for sixth graders and Algebra I students showed significantly higher scores (2009).

Science

In her research of the effect of computer-assisted instruction in science education, Kara (2007) found using computers to apply math and science concepts made learning more interesting and encouraged students to be engaged. She also found a significant positive difference for those students who received instruction through computer assistance compared to those under traditional learning strategies. Furthermore, those students who received computer-based instruction were found to have retained more after a 5-month period than those receiving traditional instruction (Kara, 2007). Kay (2011) examined web-based learning tools at the middle and secondary levels in science. Five specific categories were evaluated to determine the effectiveness of web-based learning tools: remembering, understanding, application, analysis, and evaluation. A meaningful increase of 21% to 57% was recorded across various grade levels, and Kay concluded web-based learning tools should be specific for the content being taught and be implemented alongside traditional teaching methods to accelerate them and not replace them. Another study using game-based CAI to help eighth grade students master microbiology objectives revealed significant learning gains in the post-test (Spires, Rowe, Mott, & Lester, 2011).

Liao and She (2009) looked at achievement scores of middle school students who were given web-based instruction in addition to traditional instruction. Those receiving the web-based instruction performed better than those only receiving traditional instruction on understanding atoms. The results of the study showed a significant increase in student achievement scores for both the post and retention tests. They also implied that web-based learning can increase student achievement if the content is specific to what was being taught not only in the short-term but also long-term (Liao & She, 2009).

In their research on computer use in science, Guzeller and Dogru (2011) used an experimental design and found computer-assisted learning increased student achievement of fifth graders on the topics of heat and temperature. However, when Yu, She, and Lee (2010) conducted research examining the effects of web-based and non web-based problem solving instruction for middle school students in biology, their findings suggested there were no significant differences in the web/non-web-based delivery. Even though the web-based delivery results were not significantly better than traditional instruction, it improved their capability to recognize key pieces of information that enabled them to make important connections to their previous knowledge (Yu, She, & Lee, 2010).

Study Island

Study Island is a "Web-based standards-mastery program that combines highly specific and dynamic content with real-time reporting to create a customized assessment, diagnostic, and instructional program based on each state's standards" (Edmentum, 2012, p. 5). It was founded in 2000 by Cameron Chalmers and David Muzzo who wanted to develop an engaging online program to help students master content and become independent learners (Rivero, 2011). Study Island was launched in Ohio and saw success with students being engaged, having fun, and improving in academic areas. Now Study Island has served over 13 million students in thousands of schools throughout the United States, Canada, and the United Kingdom (Rivero, 2011).

According to the Study Island website, the program was based on state specific content standards as well as the Common Core standards. The authors who developed questions for the various content areas analyzed each state's learning objectives to create state-specific versions of the program that covered all content areas for grades K through twelfth (Styers & Broussard, 2011). This alignment has allowed teachers and administrators to monitor student progress and make adjustments to individualize student learning. Student progress has been provided through reports of assessments, including formative and summative, which have been made available instantly through the web-based program (Styers & Broussard, 2011). Within these reports, teachers have discovered individual student strengths and weaknesses that have been used to differentiate their instruction.

Another aspect of the Study Island program has been its feedback ability. Kulik and Kulik (1988) found that when feedback was given directly after a question had been answered, it has had a positive effect on student learning. In another study, Marzano, Pickering, and Pollock (2001) found feedback to be more effective when the correct answer was provided along with an explanation of the corrected answer. The Study Island program has included this by giving students the ability to review the questions they missed, as well as providing an explanation as to why an answer was correct. It was designed to reinforce skills and learning through distributed practice. Both studies from Cepeda et al. (2006) and Donovan and Radosevich (1999) presented findings that showed distributed practice with much higher retention rates than compared with mass practice. The distributed practice throughout the year, along with reliable teaching methods and strategies, has the ability to create an engaging and motivated learning environment in which students can both reinforce skills, as well as understand and develop new skills (Styers & Broussard, 2011).

Cognitive Load Theory and Instruction

Cognitive load theory has presented one way students learn by examining what happens to new information and its movement into memory. According to Sweller (2005), memory was divided into two parts: working memory and long-term memory. Placing information into long-term memory is the basic goal of education. The information needs to be placed where it can be easily retrieved the next time it is needed. Sweller distinguishes between long-term memory and rote memory by writing, "Rote learning occurs when some connections between elements occur, but other essential connections, are omitted" (p. 20). It has been these essential connections that educators have striven to make with their content. The connections that Sweller spoke of have been called schema, or cognitive constructs that have enabled learners to group various pieces of information as a single piece of information. Only the acquisition and use of these numerous schemas in long-term memory allow learning to occur (Sweller, 2005). van Marriënboer and Ayers (2005) believed these schemata would become automatic with repetition and practice.

Working memory is the gateway to placing information into schemas within our long-term memory (Paas, Renkl, & Sweller, 2003). In 1956, Miller proposed that working memory could only hold seven pieces of information at any given time, which limits the ability to move it into long-term memory. Because of this limited ability to process information, Sweller (2005), concluded the amount of new information should not overload the working memory to allow it to create the appropriate schema and move it into long-term memory. Extraneous cognitive load refers to placing more information into the working memory than it can handle and thereby weakening its ability to move new information into long-term memory. Sweller (2005) concluded, "Instructional design that proceeds without reference to human cognition is likely to be random in its effectiveness" (p. 28).

Tsai (2009), while trying to understand and evaluate student e-learning, found student scores for both males and females on internet literacy were very high. This meant students were proficient in navigating the internet; however, concentration scores were lower and reflected a possible cognitive overload. In order to improve learning by alleviating the cognitive load, instructional styles needed to be manipulated in such a way that learners were motivated to learn (van Marriënboer & Ayres, 2005). Fong and Aldalalah (2010) found that students presented with the same information visually, audibly, or both, had better post-test scores when the information was presented by either one or the other. Information presented in both forms at the same time caused cognitive overload and diminished their learning.

Computer-Assisted Instruction Methods

In the book, *Introduction to Computer-Based Education*, Digital Equipment Corporation (1984) identified seven teaching strategies commonly used in computer-assisted instruction. Those seven strategies included: drill and practice, dialogues, testing, games, simulations, problem solving, and discovery learning. Each of these strategies plays a particular role in how computers have needed to be productively used within the educational environment. Each has different components geared to address the various styles of learning for which they have been specifically designed. Understanding these various methods was pertinent to them being used correctly. Computer-assisted instruction has allowed learners to select their own pathways through learning; however, they must be guided in order to choose the correct tools needed on their journey of learning (Ford, 2008). Gros (2007) warned that "only a deep knowledge of the tool, of the programs, of how it is used, may enable us to select the most suitable methods and mediums according to our needs and education objectives" (p. 36). This knowledge along with its correct implementation can positively enhance the learning process. Lee and Winzenried (2009) stated:

> The digital can enrich the teaching, make the learning more relevant, engage all manner of students, individualize much of the teaching, enhance the efficiency of the teaching, open new unexplored worlds, reduce teachers' workload, and when successfully used across the schools of the nation can assist to enhance national productivity in knowledge-based economies. (p. 5)

Kim et al. (2006) believed computer-assisted instruction (CAI) could be a tool teachers use in their classrooms to create lessons that are more engaging and an elevated learning environment. Wang and Reeves (2007) further stated "what educators do to help students actively engage in learning may be more important to academic success than how much information is presented to them through instructional materials or other forms of instruction" (p. 170). When using CAI, teachers began to look at their understanding of learning and the acquisition of knowledge differently due to their gathering and analyzing of data they collected either formally or informally while CAI was implemented in their traditional forms of teaching (Godfrey & Sterling, 1982).

Drill and practice was the term used to identify the teaching strategy in which a skill or information was learned through repetitive practice (Digital Equipment Organization, 1984). Digital Equipment Organization (1984) identified purposes for using drill and practice and why it has been commonly used within education. The main purpose has been reinforcing content or material previously learned and essential to student success has been cited when implementing a drill and practice program. This purpose focused on meeting the needs of the individual learner. Additionally, meeting the needs of the educator has focused on the ease of creating drill and practice programs and materials that can be easily quantified and analyzed to guide further instructional needs.

The strategy of computer-assisted instruction has tried to replicate dialogue that would have existed between the teacher and the student (Sozcu, Ipek, & Taskin, 2013). These dialogues are separated into two types: tutorials or inquires (Digital Equipment Corporation, 1984). The tutorial dialogue has used the computer to control the information and guide the instruction presented in various ways. One design was the linear page-turning model, which presented the information much like a book. The learner simply read material presented on the screen and then turned the page to read the next set of prepared material. A second design was linear with branching. This design was similar to the linear page turning model with the inclusion of more graphics and giving the learner the ability to interact by choosing which path or branch to take. The menus, modules, and sequences design enabled the learner to explore various topics by placing similar pieces of information within menus allowing the learner to create a concept map of what he was learning. The largest obstacle when using tutorial programs was its difficulty in understanding the learner's input and then assessing the response. If the computer makes an incorrect judgment, then the program could send the learner to the next screen, pathway, or module, thereby fracturing the learning process. Whereas tutorial dialogue was computer-controlled, inquiry dialogue was leaner-controlled. The computer retained all the necessary information for the learner to reach a preset objective or the leaner could have explored what was offered by the computer to gain understanding of various concepts not assigned.

According to Digital Equipment Organization (1984), computers have also been used in the preparation and the analysis of tests. The computer has allowed the user to scramble questions/answers, determine test layout, and add/delete questions as needed, constructing the test so it can be given on the computer, graded, and analyzed once it is completed. Another important part has been the ability to analyze items to determine which items are better than others and whether or not those items should be used again (Sozcu, Ipek, & Taskin, 2013). Once the items have been analyzed and questions have been determined to be valid and reliable, they can be stored in a test bank within the computer to be pulled for later use. Forster and Souvignier (2011) also supported the use of computers in test analysis in their study of using CAI to monitor student progress in reading. Lee et al. (2011) conducted a review of journal articles on internet-based science learning and discovered increases in student understanding when there was online homework, formative assessments, and resources for students to use in order to answer their questions.

Computers have also involved the use of games for instruction. Digital Equipment Corporation (1984) defines a game as being "a goal oriented activity which can successfully be completed by the skillful application of a set of rules…and the player is motivated to engage in this struggle by his anticipation of eventual reward: winning" (p. 32). Educational games can be classified as either recreational or instructional (Sozcu, Ipek, & Taskin, 2013). Recreational games have been considered to be played for enjoyment, while instructional games have had a specific purpose and goal in order to teach selected skills or content. Games used for instructional purposes should have clear objectives, maintain engagement, and offer rewards based on learning objectives (Sozcu, Ipek, & Taskin, 2013). Gunter, Kenny, and Vick (2008) completed a study in which they examined how academic content was being placed inside gaming content to further engage students. They found that content could be learned through the use of computer-based learning in the form of games, but that additional resources were needed to support the learning and time at the computer by itself is not enough (Gunter, Kenny, & Vick, 2008).

Simulations have been considered a representation of a real-world environment used to provide instructional experiences that was either not desirable or are unavailable (Digital Equipment Organization, 1984). Simulations have been divided into three categories: task performance, where the learner was required to complete a specific task, systems modeling, which allowed the learner to manipulate different variables and simulate the results, and lastly experience/encounter simulations have been used to provide learners with the opportunities to experience activities and situations that would otherwise be unavailable (Digital Equipment Corporation, 1984). The purpose of simulations has been to motivate learner actions and give more real-world experiences in the process (Sozcu, Ipek, & Taskin, 2013).

The computer have also served as a tool to assist in problem solving (Digital Equipment Corporation, 1984). The learner has used the computer to gather data, create concept maps, analyze data, draw conclusions, and present findings. Discovery learning with computers involved placing the learner within an environment complete with the tools they needed to explore, analyze, and understand the various concepts and skills being used. Implementing the discovery learning method of CAI required students to use their existing understanding of concepts and skills to build bridges of understanding to new ones (Levin & Schrum, 2012).

A Brief History of Computer-assisted Instruction

The earliest implementation of computer-assisted instruction originated in the 1920s with the work of Pressy, who developed a machine which presented the user with multiple choice questions and recorded whether the answers were correct or incorrect (Benjamin, 1988). The concept of using machines to learn, coupled with the beliefs of B.F. Skinner, led to the development of programmed instruction in education beginning in the 1950s (Digital Equipment Corporation, 1984).

The use of computers in teaching was first introduced in 1959 by the University of Illinois with the introduction of PLATO (Physics in the 1960s, 2014). This government funded project provided professors at the university with the ability to design instruction for their classrooms as well as connect with other educational facilities in the area through networking, allowing them to share resources and ideas (Sozcu, Ipek, & Taskin, 2013). Several years later, in 1963, Suppes and Atkinson from Stanford developed a program for reading and math focusing on individualizing instruction for students through drill and practice, allowing instructors to analyze student responses and understand which areas needed remediation (Digital Equipment Corporation, 1984).

By 1975, with the release of the microcomputer, over half of public schools had access to computers and about a fourth of those were using them for instruction (Molnar, 1997). To bolster the already increasing trend of computers in the classroom, Apple Computers Inc. released the Apple II microcomputer in 1978 (Alessi & Trollip, 2001). Minnesota became one of the first to employ this technology in education by creating the Minnesota Educational Computing Consortium (MECC) which was established to provide funds for all state-wide universities and schools to design and share instructional materials for education (Digital Equipment Corporation, 1984). The collaboration to use computers for instruction in the classroom and increase student learning had begun.

In the early 1990s, came the public access to the World Wide Web and along with it a change in how computers were used in education. The ability to obtain information instantly was only a click away whether at school, work, or home (Alessi and Trollip, 2001). In a report from the National Center for Educational Sciences (2009), 97% of teachers in public schools had at least one computer in their classroom with a student to computer ratio of approximately five to one (NCES, 2009). However, an important question remained: Do computers help increase student learning and achievement?

Chapter III

RESEARCH DESIGN AND METHODOLOGY

Introduction

The purpose of this quantitative study was to determine if a significant relationship existed between eighth grade student scores in the Science: Matter subsection of the web-based Study Island program and student test scores on the Science: Structure of Matter subsection on the Georgia CRCT. It also sought to determine if there was a significant difference between mean test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Matter and those eighth grade students who did not use the program. It also sought to determine if there was a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to gender and ethnicity. This research design including participants, instrumentation, data collection, and data analysis are presented in this chapter.

Research Design

This study followed a correlational research design to determine the relationship between test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Science: Matter subsection and those who did not use the program. Any student answering at least one question within the Science: Matter section of the Study Island program were counted a user of the program. Students who did not answer any questions within the Science: Matter section of the Study Island program were counted nonusers.

The purpose of correlational research is to identify relationships that may exist between the predictor variable, or independent variable, and the criterion variable, also known as the dependent variable. The predictor variable for this research is the student's score taken from the Study Island Science: Matter section. The criterion variable is the student score from the Georgia CRCT Science: Structure of Matter subsection.

The first research question addressed the relationship between eighth grade student test scores on the Science: Structure of Matter subsection of the Georgia CRCT and their scores on the Science: Matter subsection of the web-based study Island program. A correlation coefficient is the measure that signifies both the strength and direction of the relationship between the two variables. In this study, the Pearson's product-moment coefficient of correlation (Pearson *r*) was calculated. The value of the Pearson's *r* ranged from +1 to -1. The closer the absolute value was to 1 indicated a stronger relationship while the positive or negative sign indicated the direction of the relationship (Holcomb, 2004). Although a relationship, either weak or strong, may exist between variables, it is important to understand a correlation does not mean causation. It cannot be said that one variable causes the other, but rather there is a relationship between the two (Fraenkel & Wallen, 2003). The second research question of this study sought to determine if a statistical difference exists between students who used the Science: Matter subsection of the web-based Study Island program to prepare for the Science: Structure of Matter subsection of the Georgia CRCT and those students who did not. To establish whether or not a difference exists, *t* test for independent samples was used. The third and fourth research questions examined the difference of student mean scores based on their gender and ethnicity. A factorial ANOVA was used to determine the interaction between student use of the web-based Study Island Science: Matter program in regards to gender/ethnicity and student scores on the Georgia CRCT Science: Structure of Matter scores. The factorial ANOVA provided the researcher an opportunity to investigate additional independent variables as well as possible interactions between those variables (Fraenkel & Wallen, 2003). The *Institutional Review Board Oversight Screening Form for Graduate Student Research* was filed with the Graduate School to assure appropriate ethical guidelines were followed (see Appendix B).

Research Questions

1. Is there a significant relationship between eighth grade student scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student test scores on the Science: Structure of Matter domain on the Georgia CRCT?
2. Is there a significant difference between mean test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Matter and those eighth grade students who did not use the program?
3. Is there a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to gender?

4. Is there a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to ethnicity?

Null Hypotheses

1. There is no relationship between eighth grade student scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student test scores on the Science: Structure of Matter domain on the Georgia CRCT.
2. There is no difference in the mean test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Matter and those eighth grade students who did not use the program.
3. There is no difference between eighth grade student mean scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to gender.
4. There is no difference between eighth grade student mean scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to ethnicity.

Participants

Participants were eighth grade middle school students located in a rural southeast Georgia public school system during the 2012-2013 academic school year. Only students who had a valid Study Island user account and a valid score for the Science: Structure of Matter subsection of the Georgia CRCT were eligible to be included in the study. There were 369 students included in the study. The ethnicity of the school was comprised mainly of 241 Non-Minority students representing 65.3% along with 128 Minority students representing the remaining 34.7%. Non-Minority students for this study were classified as White according to their Georgia CRCT profile. Minority students for this study were classified as Black, Multiracial, Hispanic, or Asian/Pacific Islander according to their Georgia CRCT profile. The population encompassed 237 females (64.2%) followed by 132 males (35.8%) as shown in Table 1.

Table 1

Participant Gender, Ethnicity, and Study Island Use

Gender		Ethnicity	
Males	35.8%	Minorities	34.7%
Females	64.2%	Non-minorities	65.3%

Setting

This study included a review of student Study Island Science: Matter data and the students' associated score on the Georgia CRCT Science: Nature of Matter section. The school district is located in the southeast portion of the state and is classified as a rural area with agriculture being its major enterprise. The 2010 US Census Bureau reported a total county population of 109,233 with a median income of $38,348. The Georgia

School Council Institute (GSCI) reported the school system enrolled 9,970 students during the 2011 school year. The ethnicity, also reported by the GSCI, 67% were White, 22% were Black, 7% were Hispanic, and 4% as Asian/Pacific Islander or other. The system consists of seven elementary schools, three middle schools, an alternative program, and one high school.

Instrumentation

I used data collected from the Georgia CRCT and the Study Island web-based program. The appropriate data were collected to determine various differences and correlations between eighth grade student mean scores on the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter subsection on the Georgia CRCT.

The independent variable in this study, students' test scores on the Study Island Science: Matter subsection, was gathered using the Study Island web-based program. The Study Island program is a web-based instructional program aligned with the GPS as well as the College and Career Readiness Performance Index (CCRPI). Study Island is "a web-based standards-mastery program that combines highly specific and dynamic content with real-time reporting to create customized assessment, diagnostic, and instructional program based on each state's standards" (Edmentum, 2012, p. 5). In 2013, 44 states across the nation used at least one of the Study Island programs (Edmentum, 2014). As one of those states, 1,300 Georgia schools utilized the Study Island program in at least one of the following academic areas: math, reading, language arts, science, and social studies. Over one thousand of those schools used both math and reading during the 2013 academic year (Edmentum, 2014).

To address validity, Study Island conducted a complete analysis of the GPS and the CCRPI standards to align its program and build content reflecting those standards. Study Island ensures each standard is covered by building its content using Georgia's specific standards. Creswell (2009) defines validity as "whether one can draw meaningful and useful inferences from scores on particular instruments" (p. 235). This precise alignment to the Georgia GPS and the CCRPI attests to the reliability of the Study Island program. Examples of the GPS for eighth grade science standard one: The Structure of Matter domain and questions taken from the Study Island eighth grade physical science: Matter section have been placed in Appendix A. Reliability, or whether scores on the instrument are internally consistent over time, and if it is consistent in its administration and scoring, are established in that all content questions in Study Island for each specific domain are selected from a common test bank and are scored the same for each user (Creswell, 2009).

In 2002, the Georgia CRCT began its yearly administration to grades one through eight as a means to measure student achievement on state curriculum. However, in the 2010-2011 academic year, testing was suspended for grades one and two due to budget constraints (Georgia Department of Education, 2011). The purpose of the Georgia CRCT is "to provide a diagnosis of individual student and program strengths and areas of improvement…and a measure of the quality of education in the state" (Georgia Department of Education, 2011, p. 51). The administration of the Georgia CRCT is held during the spring of each academic year for the eighth grade and is administered for reading, language arts, math, science, and social studies. Only one academic area test is administered each day, and it is separated into two sections. The science sections each contain 35 questions reflecting the GPS. Unless indicated in a student's individual educational plan or other official documentation, students are given seventy minutes to complete each section of the test. The eighth grade science portion of the CRCT contains questions from the GPS domains: Structure of Matter, Force and Motion, and Energy and Its Transformation. Once testing is complete, tests are scored and students receive an individual score report indicating their performance for each academic area. Teachers and administrators are also provided with class and summary school reports reflecting overall student performance on each test.

Georgia has taken many steps to ensure both the validity and reliability of the CRCT. According to both the 2011 and 2012 Georgia Department of Education Assessment and Accountability Brief, Georgia identifies the purpose of the CRCT to be a "measure of how well students have mastered the state's curriculum" (p. 1). Validity of an instrument hinges on whether the instrument measures what it is designed to measure. The Georgia Department of Education takes several steps to ensure the test's validity. The process begins with the state standards as the foundation and includes the use of Georgia educators from around the state to develop test item specifications that include item format, content scope, and sequence and cognitive complexity (Georgia Department of Education, 2011). Actual test items are then written by "qualified, professional assessment specialists specifically for Georgia tests" (Georgia Department of Education, 2011, p. 2) and then reviewed by Georgia educators who have the authority to accept or reject the items. Accepted questions are field tested within an operational test and then reviewed along with the data collected to determine their future use within operational tests. Once Georgia educators and other specialists accept an item, it is moved into the testing bank and is available for selection on an operational test (Georgia Department of Education, 2011). This process is vital to the validity of the Georgia CRCT.

With validity established it is also important to know the test is reliable. Creswell (2009) defines reliability as "to whether scores to items on an instrument are internally consistent, stable over time, and whether there was consistency in test administration and scoring" (p. 233). The Georgia CRCT reports reliability using two indices: Cronbach's alpha reliability coefficient and the standard error of measurement (SEM). The Cronbach's alpha reliability coefficient requires only one administration and measures the "internal consistency over the responses to a set of items measuring an underlying unidimensional trait" (Georgia Department of Education, 2011, p. 4). The SEM is an "index that shows the extent to which a measurement would vary under changed circumstances" (Fraenkel & Wallen, 2003, p. 168). According to briefs released by the Georgia Department of Education in both 2011 and 2012, the Cronbach's alpha reliability coefficient for the eighth grade science portion in 2011 was .92 and .91 in 2012. A reliability coefficient of .70 or higher is considered acceptable. The reported SEM for eighth grade science was 3.31 in 2011 and 3.29 in 2012. The SEM score implies that the student score was within 3.31 points of the highest and lowest hypothetical score in 2011 (Georgia Department of Education, 2011) and within 3.29 points of the highest and lowest hypothetical score in 2012 (Georgia Department of Education, 2012) as shown in Table 2.

Table 2

Reliability Coefficients (Cronbach's alpha) and Standard Error of Measurement (SEM) for Eighth Grade Science CRCT

CRCT Administration Year	Physical Science	
	Cronbach's alpha	SEM
2011	.92	3.31
2012	.91	3.29

Procedures

Permission to conduct this study was granted by the dissertation committee and the Institutional Review Board of Valdosta State University. Permission was granted by the participating school district to use both the Study Island data and Georgia CRCT scores for the purpose of this study. The permission was granted with the understanding that all results would be shared with the school district upon completion. Student test scores were obtained by permission through the Director of Curriculum and Instruction and then entered into a digital spreadsheet for organization and descriptive statistical examination. Initially, student names and GTID numbers were used to identify all participants until all CRCT scores and Study Island scores could be combined into a single document. Once the data were combined, all student names and GTID numbers were erased and a number was generated and assigned to identify each participant's data. This was done to ensure confidentiality of the participants' scores and general demographic information.

Both Study Island and Georgia CRCT scores were kept electronically in a spreadsheet format, which enabled the data collection and organization to be made with ease. Participants for this study must have had an active Study Island account and attempted the Structure of Matter domain of the Georgia CRCT. Student names were the common factor in merging the data and to ensure confidentiality, student identification numbers and names were removed. As an employee of the participating school district, I had access to all data collected for the completion of this research. There were no breaches in confidentiality because the test scores and Study Island data were kept on a secured computer. Permission from parents was not required because the data collected did not include personal data or identifiers. The data collected from the Study Island reflected the number of questions students attempted in the Matter subsection of the Georgia eighth grade physical science section. The scores represented the percentage of questions students answered correctly on the Structure of Matter domain on the eighth grade physical science portion of the Georgia CRCT.

Data Analysis

Data were collected and entered using Microsoft Excel. Once all data had been collected and entered into Microsoft Excel, it was imported into SPSS, an analytic statistics software to be analyzed. Descriptive statistics were computed and reported. To address Research Question 1, Pearson's *r* coefficient was calculated to determine both the strength and direction of the relationship between eighth grade science CRCT scores and scores on the Study Island Science: Matter. For Research Question 2 concerning the difference between CRCT mean scores for students who did use Study Island and those who did not, a *t* test for independent samples was used. For research questions three and four, a factorial ANOVA was conducted to determine if gender and ethnicity effects were present. All statistical procedures were assessed at $\alpha = .05$ for statistical significance.

Results of the study may be valuable to students, teachers, parents, and administration. With the use of Study Island in this district as well as many others around the country, it would be very beneficial to know how students should or should not be preparing for standardized tests. Teachers could make a better choice on how to use Study Island within their classes. Parents and students would be able to make a data-driven decision about what they can do on their own to prepare for the CRCT. Administrators would be better equipped to make decisions in allocating resources to help teachers and students prepare for the CRCT. With the goal of increasing student achievement, understanding whether or not the tools being used are working is crucial.

Summary and Overview

This chapter has established the research methods, designs, and procedures used in carrying out this study. Through this study I attempted to determine whether or not there is a difference between the CRCT score means of students who did use Study Island and those who did not. Furthermore, it seeks to determine whether or not a relationship exists between the number of questions students attempted on Study Island and their scores on the eighth grade science CRCT. The findings of this study are reported in the following chapter.

Chapter IV

RESULTS

Introduction

This study sought to determine if a relationship exists between student scores on the Georgia CRCT Science: Structure of Matter subsection and student scores on the Study Island Science: Matter subsection. I also intended to determine through this study whether or not a difference exists between eighth grade student test scores on the Georgia CRCT for students who used the web-based Study Island program for Science: Matter and students who did not use the program including a focus on gender and ethnicity.

The eighth grade Georgia CRCT scores used for this research were taken from the 2012-2013 academic year. The eighth grade Study Island scores were also taken from the 2012-2013 academic year. Only those students who took the Georgia CRCT and had a registered Study Island account for the 2012-2013 academic year were included in this study.

This study was guided by the four following research questions:

1. Is there a significant relationship between eighth grade student scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student test scores on the Science: Structure of Matter domain on the Georgia CRCT?
2. Is there a significant difference between mean test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who

used the web-based Study Island program to review Matter and those eighth grade students who did not use the program?

3. Is there a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to gender?
4. Is there a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to ethnicity?

The null hypotheses for these research questions were:

1. There is no relationship between eighth grade student scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student test scores on the Science: Structure of Matter domain on the Georgia CRCT.
2. There is no difference in the mean test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Matter and those eighth grade students who did not use the program.
3. There is no difference between eighth grade student mean scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to gender.

4. There is no difference between eighth grade student mean scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to ethnicity.

Data Analysis

All data for this research were first placed into a Microsoft Excel spreadsheet, and then imported into SPSS. A Shapiro-Wilk's test ($p > .05$) and an examination of the histograms, normal Q-Q plots showed that Georgia CRCT Science: Structure of Matter scores were approximately normally distributed for the participants. A Levene's test verified the equality of variances in the samples ($p = .61$).

Descriptive statistics and frequencies were compiled for student demographics and test results to show representations within the sample. Students who took the CRCT Science: Structure of Matter domain (N = 369) had a mean score of 75.64 (*SD* = 18.19). Students who used the web-based Study Island Science: Matter program (N = 235) had a mean score of 70.02 (*SD* = 15.26). The sample included 132 (35.8%) males and 237 (64.2%) females. Student ethnicity frequencies were reported as 128 Minorities at 34.7% and 241 Non-minorities at 65.3%. Minorities in this study were defined as ethnicities other than White. A user in this study was defined as a student who attempted any questions on the Study Island Science: Matter section.

Table 3

Participant Gender, Ethnicity, and Study Island Use

Gender		Ethnicity		Study Island	
Males	35.8%	Minorities	34.7%	Users	63.5%
Females	64.2%	Non-minorities	65.3%	Non-users	36.2%

Research Question 1

Is there a significant difference between mean test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Matter and those eighth grade students who did not use the program?

To evaluate Research Question 1, a Pearson's correlation coefficient was computed to determine if a relationship exists between eighth grade student scores on the Science: Matter subsection of the web-based Study Island program and eighth grade student scores on the Science: Structure of Matter domain on the Georgia CRCT. Student scores on the web-based Study Island Science: Matter program (*M* = 70.02, *SD* = 15.26) and student scores on the Georgia CRCT Science: Structure of Matter domain (*M* = 75.64, *SD* = 18.19) were moderately positively correlated, $r(233) = .48$, $p < .001$.

Research Question 2

Is there a significant difference between eighth grade student scores on the Science: Structure of Matter domain on the Georgia CRCT between students who used Study Island and those who did not?

To evaluate Research Question 2, a *t* test of independent means was computed to determine if a difference exists between mean test scores on the Science: Structure of

Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Matter and those eighth grade students who did not use the program. Results of the t test indicated that students who did not use the web-based Study Island Science program to review Matter (n = 134, M = 71.47, SD = 19.98) scored lower than students who used the web-based Study Island Science program to review Matter (n = 235, M = 78.01, SD = 16.67). The difference in mean scores was statistically significant, but the effect size was small, $t(367) = 3.36$, $p = .001$, 95% CI [2.71, 10.35], d = 0.24.

Research Question 3

Is there a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to gender?

Research Question 4

Is there a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to ethnicity?

To evaluate Research Questions 3 and 4, a factorial ANOVA was performed to determine the difference between eighth grade student mean scores in the Science: Matter subsection of the web-based Study Island program in regards to gender and ethnicity. Levene's test for homogeneity of variances, $F(3,231) = 2.27$, $p = .08$, indicated the assumption of equal variances was met. A 2 (Male, Female) x 2 (ethnicity) ANOVA was conducted on student scores on the Science: Structure of Matter domain on the Georgia CRCT. No gender by ethnicity interaction effect was detected, $F(1, 231) = 1.69$, $p = .19$. No difference in mean scores was found between males and females, $F(1, 231) = .18$, $p = .67$, partial $\eta^2 = .001$. However, nonminorities scored statistically significantly higher, on average, than minorities, $F(1, 231) = 6.53$, $p = .01$. The mean and standard deviation for the participants and based on gender and ethnicity are shown in Table 4.

Table 4

Study Island Users Mean Scores on the Georgia CRCT Science: Nature of Matter Domain

		Mean	Standard Deviation
Gender	Male	77.91	16.63
	Female	78.13	16.80
Ethnicity	Minority	74.72	18.03
	Non-Minority	80.45	15.20

Summary and Overview

In this chapter, the data analysis for each research question was reported. The data analysis revealed significant differences in the mean scores of students who used the Study Island Science: Matter program than those who did not use the program. It also reported a moderately positive relationship between the mean scores of the Georgia CRCT Science: Nature of Matter section and those on the Study Island Science: Matter section. The remaining chapter, Chapter 5, discusses the limitations, implications, and recommendations based on these findings.

Chapter V

SUMMARY AND DISCUSSION

Introduction

The purpose of this study sought to gather information about the use of the web-based Study Island program in preparing students for the Georgia CRCT and to assist in the decision-making process about its use in the classroom specifically in the area of science. As a middle grades science teacher, my desire is to provide my students the opportunities and resources they need to understand and apply the concepts and skills provided by the state curriculum. A portion of this process includes the need to provide students with resources that can help them review, remediate, and further develop their understanding through practice. However, finding resources that allow students to practice specific scientific content, while keeping them engaged, has been troublesome.

Several resources that have been available or provided to my students in the past have not been correlated to the standards, lacked a meaningful level of rigor, or have not been engaging. From a teacher's perspective, the Study Island program seemed to be a viable solution to these issues. Conducting this study has given me the opportunity to better assess whether the program is truly helping students and assisting them with understanding the content.

The questions I sought to answer through this study were:

1. Is there a significant relationship between eighth grade student scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student test scores on the Science: Structure of Matter domain on the Georgia CRCT?
2. Is there a significant difference between mean test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Matter and those eighth grade students who did not use the program?
3. Is there a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to gender?
4. Is there a significant difference between eighth grade student mean scores who used the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to ethnicity?

Findings

The first research question addressed the relationship between eighth grade student scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student test scores on the Science: Structure of Matter domain on the Georgia CRCT. Analysis of the data rejected the null hypothesis and provided evidence that a moderately positive relationship exists between student scores on the Study Island program in the Science: Matter section and the Science: Structure of Matter domain on the Georgia CRCT. The differences between these means were 5.614 points.

The second research question addressed the difference between mean test scores on the Science: Structure of Matter domain on the Georgia CRCT of eighth grade students who used the web-based Study Island program to review Matter and those eighth grade students who did not use the program. Analysis of the data rejected the null hypothesis and showed a significant difference between the mean scores in favor of students who used the web-based Study Island program. Students who used the Study Island program had a 6.5-point higher mean score than those who did not use the program.

The third and fourth research questions addressed whether the Study Island program affected eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to gender and ethnicity. Analysis of the data revealed a significant difference between student mean scores in the Science: Matter subsection of the web-based Study Island program and eighth grade student mean scores on the Science: Structure of Matter domain on the Georgia CRCT in regards to ethnicity.

Implications

The results of this study demonstrated that the use of Study Island Science: Matter can have a positive effect on student test scores on the Georgia CRCT Science: Structure of Matter domain. These findings validate Grinager's (2006) observations concerning schools exploring the use of computer-assisted instruction as a means for increasing student achievement. They add additional support to the findings of computer-assisted instruction being incorporated into the general classroom having a positive effect on student achievement. Hannafin and Foshay (2008) focused on the academic area of math and discovered that students in a classroom using a CAI program increased their scores on the state standardized test significantly more than those in a traditional setting, adding further support that the Study Island program could be a difference-maker in increasing student achievement. These findings further endorsed the works of Burns, Klingbeil, and Ysseldyke (2010) who found significant increases in math, Kim et al.'s (2006) research that confirmed an increase in reading comprehension, as well as Kingsley and Boone (2006) who found increases in social studies based on the use of CAI within the classroom.

In regards to science, these findings echo the results and provide reinforcement for CAI's use within the science content area and specifically its use in physical science. Bayraktar's (2009) study showed small positive increases in student scores in general science curriculum, while Spires, Rowe, Mott, and Lester's (2011) focus on CAI's role in the life sciences also showed a significant increase. Liao and She (2009) and Guzeller and Dogru (2011) were two reports that echoed this study's findings by showing increases in student achievement in the physical sciences.

The results of this study also maintain the findings of Kay (2011) who concluded that CAI should be tailored to specific content and be used as a resource for learning. These results also lend themselves to support Kara's (2007) research that the use of CAI could increase student retention of information or skill. Ysseldyke and Bolt's (2007) findings of positive and consistent gains while using CAI at a higher implementation rate could also be supported.

The results did, however, contradict the findings of Tienken and Maher (2008) who found that the use of a CAI program to review math skills had a negative effect on student test scores. Yu, She, and Lee's (2010) findings also painted a different picture of the use of CAI in science by revealing no significant difference in student scores. These conflicts in findings raise further questions about the use of CAI within the classroom as well as what instructional methods should be employed when implementing CAI.

Recommendations

Although the findings in this study give credit to the use of Study Island for eighth grade students focusing on the Structure of Matter domain on the Georgia CRCT, it is important to recognize the need for additional study. The first research question focused on the correlation between student mean scores on the Structure of Matter domain on the Georgia CRCT and their scores on the Study Island program for Science: Matter section and the relationship was found to be moderately positive. Additional research should seek to understand whether the correlation between the mean scores is significantly affected by student use of the Study Island program. Further research should employ an experimental design in which the researcher can have more control over variables. Variables such as student time spent on the program, frequency of which a student uses the program, the number of questions students must attempt to be included in the study, the student's level of knowledge, and the way the program is implemented within the classroom are examples of variables that could have strongly impacted the findings within this research. These findings could be further enhanced by obtaining a much greater sample size representative of the general population.

Through the second research question, I discovered that students using the web-based Study Island program for Science: Structure of Matter had a significantly greater CRCT score than those who did not use the program. Future research should look at additional domains within the eighth grade science curriculum such as Force and Motion or Energy Transformation. It would also be beneficial to examine the use of Study Island in the Earth and Life sciences as well as the other academic subjects in math, reading comprehension, English/language arts, and social studies.

The third and fourth research questions examined the differences of student mean scores on the Structure of Matter domain on the Georgia CRCT in regards to gender and ethnicity. Although minority students did not appear to benefit as well as nonminority students from using Study Island, the sample included fewer than 30 minority students. A larger sample size may yield improved data for examining this question much closer. Future research should employ a true experimental design focusing specifically on gender and ethnicity as the key independent variables within the study.

Future research could also include student, teacher, and parent perceptions of the Study Island program and how those perceptions affect its use within the classroom as well as outside the classroom. An examination of instructional methods when using the program and their influence on student achievement could also be another important avenue for research.

Limitations

Through this study sought to determine the differences and possible relationship that could exist between student mean scores on the web-based Study Island Science: Matter program and student mean scores on the Georgia CRCT Science: Structure of

Matter domain. As a result of the methodology used, a number of limitations were encountered and should be considered when reviewing the results. One limitation of the study was the number of extraneous variables that could have direct implications on the results. These variables included the student's age; prior knowledge of the content, time spent using the program, motivation, attitude towards the subject area, comfort level in using technology. Additional variables also included the teacher the student had during the instructional period as well as the format in which the curriculum was presented.

Another limitation of the study was the sample size. This was limited by the researcher's access to viable data for both the Study Island program and student Georgia CRCT scores. Due to the size of the sample the findings within this study cannot be generalized to general population. The use of Georgia CRCT data instead of Georgia Milestones Test data were also a limitation. This occurred as a result of Georgia releasing a new standardized test after the initial research was concluded. Although these limitations existed, the recognition of these variables provided the researcher with an understanding and an awareness of differences concerning variables and relationships that could warrant further study.

Conclusion

The null hypotheses of this study stated there was no difference or relationship between student mean scores on the web-based Study Island Science: Matter program and student mean scores on the Georgia CRCT Science: Structure of Matter domain. The results of the study demonstrate there was a moderately positive relationship and positive differences in student scores when using the web-based Study Island Science: Matter program to review for the Georgia CRCT Science: Structure of Matter domain. These findings support previous research and findings that CAI can improve student learning and increase student achievement.

Administrators can use these findings to support data-driven decisions on using CAI in the classroom and even purchasing the Study Island program for teachers and students. With the addition of previous research supporting the findings in this study, administrators can feel confident providing their teachers with resources aligned to their state's curriculum shown to increase student scores. Administrators should assist teachers with implementation by first presenting them with the data on how its use can increase student achievement. A brief presentation, providing teachers with results from various studies, would allow teachers the chance to ask questions and allow them to join in the implementation instead of it being forced upon them. Next, they must provide training for teachers on how to use the Study Island specifically within their content areas. One way to do this would be to have teachers who have used the program provide ideas, hints and answer questions teachers may have about the implementation. If they know how to use it effectively, teachers would be more willing to use the program more effectively. Administrators must also make sure computers are available, connected, and working properly so teachers can use CAI without having to deal with technical issues. Having a dependable technology base of equipment and technicians available as issues arise is essential. By taking these steps, teachers will be able to use CAI and Study Island in a more effective manner than just making it available.

Teachers can also gain information from these findings to help make data-driven decisions about how they implement CAI and Study Island within their classrooms. Specifically, physical science teachers can use the Study Island program within their classrooms to provide remediation for students struggling with various concepts, review for those students who need practice, or supplemental support for students ready for more of a challenge. Although this study did not address other content areas, teachers may use these findings to begin examining CAI and Study Island's effect in other content areas and domains. The data provided through the Study Island program can give teachers an edge in designing their instruction, monitoring student progress, assessing student understanding and then modifying their instruction as needed.

Understanding CAI and Study Island can have a positive effect on their child's achievement further adds to the importance of these findings for parents. Parents can spend time with their children at home reviewing content and questions supplied by Study Island. Areas that students may struggle with can be completed with parents with the help of in-program lessons. Knowing what content and concepts students struggle with and then knowing Study Island can help can empower parents to feel more relaxed about helping their students at home. Parents can also have the ability to use data provided by the Study Island program to track their child's progress through the content area's domains and ensure they work on the areas needed most. Giving parents the ability to see their child's progress and provide them with a tool that enables them to support and build their child's learning and understanding allows them to make data-driven decisions about their child's education as well.

Data-driven decision making is not just for the adults. Students can also make data-driven decisions for themselves by analyzing their scores and pinpointing areas for improvement. They can be further encouraged in knowing they are using their time wisely while investing it into a program that has evidence to support its ability to increase their achievement. Students may choose to use the program independently to help them study and review material, prepare for tests, and self-assess what they think they know in future content. Whether administrator, teacher, parent, or student, with the right tools, research and resources, growth in student achievement does not have to be an elusive reality.

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APPENDIX A:

Eighth Grade Science Georgia Performance Standards

Georgia Performance Standard S8P1: Students will examine the scientific view of the Structure of Matter.

a. Distinguish between atoms and molecules.
b. Describe the difference between pure substances (elements and compounds) and mixtures.
c. Describe the movement of particles in solids, liquids, gases, and plasmas states.
d. Distinguish between physical and chemical properties of matter as physical (i.e., density, melting point, boiling point) or chemical (i.e., reactivity, combustibility).
e. Distinguish between changes in matter as physical (i.e., physical change) or chemical (development of a gas, formation of precipitate, and change in color).
f. Recognize that there are more than 100 elements and some have similar properties as shown on the Periodic Table of Elements.
g. Identify and demonstrate the Law of Conservation of Matter.

Study Island Georgia Physical Science: Matter Sample Questions

1. Megan left her bicycle outside on the patio while she went on vacation for several weeks. When she returned, Megan discovered a reddish substance, rust, on the handlebars of her bicycle. The rust is an example of a(n) __________.
    a. element
    b. mixture
    c. atom
    d. compound
2. Which of the following definitions characterizes an element?
    a. can only be broken down by chemical means
    b. contains a basic combination of two or more substances
    c. can be separated through physical means
    d. contains only one type of atom

3. An individual with an excellent sense of smell is handed a bottle of perfume. After smelling the perfume, he reports that the perfume contains a predominant smell of roses with a faint touch of vanilla. If the perfume is made of water, rose essence, and a splash of vanilla, what type of substance is the perfume most likely to be?
   a. element
   b. compound
   c. mixture
   d. gas
4. What happens when heat is removed from a liquid and it cools?
   a. The energy content decreases, and the speed of its particles decreases.
   b. The energy content decreases, and the speed of its particles increases.
   c. The energy content increases, and the speed of its particles remain the same.
   d. The energy content decreases, and the speed of its particles increases.
5. In a chemical reaction, the total mass of the reactants is 10.0 grams. The total mass of the products must be:
   a. exactly 10.0 grams.
   b. more than 10.0 grams.
   c. less than 10.0 grams.
   d. exactly 20.0 grams.

APPENDIX B:

Institutional Review Board Oversight Screening Form for Graduate Student Research

Valdosta State University Graduate School

Institutional Review Board Oversight Screening Form for Graduate Student Research

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Project Title: Study Island as a Tool for Test Preparation on the Georgia Criterion-Referenced Competency Test

Name: William Matthew Faircloth

Faculty Advisor: Dr. Brian Gerber

Department: Curriculum, Leadership, and Technology

Please indicate the academic purpose of the proposed research:

☒ Doctoral Dissertation
☐ Master's Thesis
☐ Other:

E-mail: mattfaircloth@lowndes.k12.ga.us

Telephone: 229-630-7613

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1. ☐ YES ☒ NO Will you utilize *existing identifiable private* information about living individuals? "Existing" information is data that were previously collected for some other purpose, either by the researcher or, more commonly, by another party. "Identifiable" means that the identities of the individuals can be ascertained by the researcher by name, code number, pattern of answers, or in some other way, regardless of whether or not the researcher needs to know the identities of the individuals for the proposed research project. "Private" information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place or information provided for specific purposes that the individual can reasonably expect will not be made public (e.g., a medical record or student record).

   Note: If you are using data that: (1) are publicly available; (2) were collected from individuals anonymously (i.e., no identifying information was included when the data were first collected); (3) will be de-identified before being given to the researcher, (i.e., the owner of the data will strip identifying information so that the researcher cannot ascertain the identities of individuals); or (4) do not include any private information about the individuals, regardless of whether or not the identities of the individuals can be ascertained, your response to Question 1 should be NO.

2. ☐ YES ☒ NO Will you *interact* with individuals to obtain data? "Interaction" includes communication or interpersonal contact between the researcher and the research participant, such as testing, surveying, interviewing, or conducting a focus group. It does not include observation of public behavior when the researcher does not participate in the activities being observed.

3. ☐ YES ☒ NO Will you *intervene* with individuals to obtain data? "Intervention" includes manipulation of the individual or his/her environment for research purposes, as well as using physical procedures (e.g., measuring body composition, using a medical device, collecting a specimen) to gather data for research purposes.

If you answered YES to ANY of the above questions, your research is subject to Institutional Review Board oversight. Please discard this form and complete and submit an IRB application. Do not begin your research until your application has been reviewed by the IRB and you are informed of the outcome of the review.

• • • • • • • • • • • •

If you answered NO to ALL of the above questions, your research is not subject to Institutional Review Board oversight. Stop here, sign below, secure your faculty advisor's signature, and submit this form to the Graduate School. Please remember that, even though your project is not subject to IRB oversight, you should still observe ethical principles in the conduct of your research.

STUDENT CERTIFICATION: I certify that my responses to the above questions accurately describe my proposed research.

Student's Signature: [signature] Date: 12-13-14

FACULTY ADVISOR CERTIFICATION: I have reviewed the student's proposed research and concur that it is not subject to Institutional Review Board oversight.

Faculty Advisor's Signature: [signature] Date: 12-13-14

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