2014

Effectiveness of Technology-Integrated Instruction on High School Students' Mathematic Achievement Scores

Michele Lee Ramsay
Walden University

Walden University

COLLEGE OF EDUCATION

This is to certify that the doctoral study by

Michele Ramsay

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Katherine Norman, Committee Chairperson, Education Faculty
Dr. Joanna Karet, Committee Member, Education Faculty
Dr. Michelle Brown, University Reviewer, Education Faculty

Chief Academic Officer

Eric Riedel, Ph.D.

Walden University
2014

Abstract

Effectiveness of Technology-Integrated Instruction on High School Students' Mathematic Achievement Scores

by

Michele Lee Ramsay

MA, Kean University, 2002

BS, Georgian Court University, 1996

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

December 2014

Abstract

In an effort to improve mathematics retention and increase assessment scores, the public school district under study implemented Study Island into their Grade 9 algebra program. Study Island is a commercialized web-based program, customized to specific state standards and applied as a supplemental instructional tool. The purpose of this study was to determine the effectiveness of Study Island with general education students and to determine whether the effectiveness of replacing some traditional mathematic instruction with technology was beneficial. The theoretical foundation stemmed from Bloom's work on mastery learning, which holds that children can learn if given the proper environment and tools. The research question investigated algebra students' possible academic growth through the use of Study Island software ($N = 56$). A nonequivalent pretest-posttest quasi-experimental design was employed to measure student mathematics achievement between students who participated in the technology program ($n = 28$) and those who did not ($n = 28$), controlling for preexisting differences in mathematics achievement. The study occurred over a 10-week period, with 90 minutes of daily mathematics instruction. Final results were determined using pre- and postcourse mathematic assessments and by applying analysis of covariance (ANCOVA). Results suggested the use of Study Island had a statistically significant influence on increased mathematic assessment scores. These results support the use of Study Island by the local district to increase mathematics achievement for all students. Implications for positive social change include identifying the effectiveness of a technology treatment, which can contribute to improved student achievement and encourage non-traditional approaches to teaching mathematics.

Effectiveness of Technology-Integrated Instruction on High School Students'

Mathematic Achievement Scores

by

Michele Lee Ramsay

MA, Kean University, 2002

BS, Georgian Court University, 1996

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

December 2014

Dedication

I dedicate the successful completion of my doctoral degree to my family and friends. I would not be where I am today without the wonderful cadre of people in my inner circle that has supported me throughout life. I am so thankful to have you in my life and I partake in my life’s accomplishments with you.

I would be remorse if I did not recognize my elementary teacher, Mrs. Annette Monaco for helping me to understand the importance of education and perseverance. Having a learning disability made learning a mammoth challenge in the early years; her belief in my abilities reshaped my future.

Acknowledgments

A very special thank you and acknowledgment to my grandmother, Virginia Anderson, whom throughout life has given me immeasurable encouragement and confidence to never settle for less than my best; thank you for always cheering me on, reminding me of how proud you are of me, and providing me the self-assurance to pursue my dreams. To my son, Nickolas, thank you for turning down the video game volume and allowing me to work when I should have been playing. To my husband, Walt, I truly appreciate all the love, guidance, and optimism you have afforded me throughout this journey; your countless nights of being Mr. Mom provided me with the essential time needed to be successful. You championed my desire to attain a doctoral degree, even when I doubted my own capabilities; thank you for always being my number one advocate. To my brother, Johnny, and my sister, Holly, thank you for paving the way for me throughout the varied facets of life. Your experiences, triumphs, and challenges have steered me in choosing the right path and taught me to love the fruits it bore. Lastly to my mother, Patricia, you have invariably been the anchor in our family and my role model, your endless commitment to helping others within our community through volunteerism and hard work is eternal to the woman I have become.

I want to thank my committee: Dr. Norman, Dr. Karet, and Dr. Brown for taking the time to work with me. I have benefited greatly from all the scholarly suggestions, comments, and the encouragement I have received from each of you throughout the writing and editing process of my project study.

Table of Contents

List of Tables

List of Figures

Section 1: The Problem

Introduction

There is a greater need for improvement in mathematics amongst students in the United States than in any other area of study. Global competitiveness and core standards requirements aim to ensure U.S. students are prepared for postsecondary educational and professional opportunities (Mathis, 2010). However, secondary mathematics achievement in the United States declined from a number 24 ranking in 2003 to number 31 in 2009 (Organization for Economic Co-operation and Development [OECD], 2010). Additionally, secondary student mathematics scores did not significantly improve from 1973 to 2008, whereas scores improved for both 9 and 13 year-olds (Buckley, 2013). When U.S. students are being outranked academically by their peers in Asia and Europe, low achievement mathematics scores at the secondary level become a concern as they increase the disadvantage for future U.S. graduates who compete in a global economy.

United States President Barack Obama reiterated the importance of competing in the world job market and encouraged a call for advancements in the technological workforce (United States Department of Education [USDOE], 2010). The president emphasized the importance of every American student achieving at high levels of proficiency in English and mathematics, as well as becoming college and career-ready prior to high school graduation. President Obama proposed that student achievement be assessed through the use of core standards, curriculum, and standardized assessments. In response to the U.S. Department of Education’s Race to the Top initiative, the Partnership for Assessment of Readiness for College and Careers (PARCC) developed an assessment aligned to the core content standards (PARCC, 2014). In 2014-2015, the PARCC assessment will be administered to 22 federally funded states, including New Jersey—the state in which this study is conducted. The assessment uses a computer-based test delivery to assess students' knowledge and skills in both language arts and mathematics for Grades 3 through 11 (PARCC, 2014).

This doctoral study project investigates the effectiveness of technology-integrated instruction on high school students' mathematics achievement scores in ninth grade algebra classes. In Section 1, I address a school district's problem of low student mathematic scores. Identification of the problem prompted the need for an evaluation of a computer-based program used to improve mathematics comprehension. I then detail how the Seashell School District's (pseudonym) local problem relates to poor student mathematics performance at the state, national, and global level. I reported the results of a web-based, technology-integrated program that is added into the mathematics class and its effectiveness on improving mathematics scores. Additionally, I presented a rationale for the study on the local level, suggesting that a problem exists with the traditional approach used to teach mathematics. I also explored research on technological advancements to improve student learning in mathematics and enhance instruction. Research questions were posed to guide the study. Lastly, through a literature review, I explored the reasons why researchers have indicated technology-integrated instruction as a significant improvement with regard to technology, classroom inclusion, and mathematic comprehension.

Definition of the Problem

On a local level, general education students in the Seashell School District (SSD) in the state of New Jersey perform below advanced proficient on standardized mathematics tests (New Jersey Department of Education, 2013). This is linked to a challenge the nation is facing: Secondary students are underperforming in mathematics (Matthews, 2007). Despite district administrators' use of highly qualified instructional staff, after school tutoring, technology, curriculum with the state and national standards, and implementation of smaller class sizes, the mathematical achievement level remains stagnant (New Jersey Department of Education, 2013). Scores continue to parallel state average proficiency levels, regardless of the current interventions in place used to improve mathematics scores. A need identified by stakeholders within the district is to ensure individual mathematical achievement at high levels through accountability of current practices (T. Parlapanides, personal communication, April 2, 2013).

The district has identified mathematics as a discipline in need of improvement, and now it seeks to determine what type of technology-integrated instruction can be used to close the mathematical learning gap, and prepare students for the future computer-based assessment. New Jersey collaborated with other states in the United States to develop next-generation, computer-based assessments to provide stakeholders with feedback on students' progress toward college and career preparation (Clarke-Midura, Dede, & Norton, 2011). Two components of PARCC's vision are addressed in the local problem: measuring mathematic comprehension skills, and use of technology in assessments. However, barriers still exist in determining the appropriate technology program to positively impact student achievement. After obstacles such as proper implementation, technical support, equitable access, and sustained funding are addressed, this study will focus on the effectiveness of the technology treatment in the mathematics classroom (Darling-Hammond & Adamson, 2010).

Over the past 6 years, the district has integrated Study Island (2013), a web-based software program shown to increase students' mastery of mathematical concepts (T. Parlapanides, personal communication, April 2, 2013). The program allows students to practice answering questions in a standardized format related to questions found on the state exit exam. Annual technology cost, combined with classroom time for computer lab access for using the Study Island program, the district is requesting a program review to determine if the current software is successful in increasing high school students' mathematical scores.

Rationale

Evidence of the Problem at the Local Level

The local school district's superintendent indicated a need to develop solutions to drive curriculum and determine the effectiveness of technology integration (T. Parlapanides, personal communication, April 2, 2013). The purpose of this research is to examine the effectiveness of technology in helping students improve their learning in mathematics, as measured by test scores. The results were used to propose an action plan for addressing the issue of low mathematics scores in the Seashell School District.

The study took place in a suburban, regional school district in central New Jersey. As noted in the New Jersey State Report Card Narrative (2011), Seashell School District has a diverse student population of 1,502 students from five towns. The district's economic factor is labeled as group B with 32.6% of the students receiving free and reduced lunch, while 0.7% have limited English proficiency, and 15.6% are classified as special education students.

According to the New Jersey state historical test data (2011), 24.3% of students in the Seashell High School (pseudonym) reportedly scored only partially proficient in the mathematics section of the High School Proficiency Assessment (HSPA), whereas the state average was 24%. On the Scholastic Assessment Test (SAT), SHS students' average score was 468 on the mathematics section, while the state average was 517. The National Center for Educational Statistics reported an alarming trend happening across the country: Mathematics scores in public schools have declined compared to public schools in other countries (NCES, 2007).

Wiggins and McTighe (2007) emphasized the importance of monitoring the progress of educational programs then adjusting district goals to appropriately respond to student needs. One of Seashell School District's performance objectives for the 2011-2012 school year was to have a 10% reduction in students who did not attain the adequate yearly progress (AYP) in mathematics on the HSPA. The district included technology in the mathematics curriculum as an approach to improve mathematic literacy skills. The state report card (2011) indicated that the district offered an adequate number of computers per 100 students, which was 3.8% compared to the state average of 3.1% and the district students have access to four computer labs. Therefore, technology supply should have been sufficient for the current year. The district currently seeks to determine if the technology integration, specifically Study Island, will yield improvements in mathematics results on assessments.

Seashell School District struggles to reach advanced proficiency in mathematics with its general education students and seeks alternative strategies. The district shares this frustration with most educational leaders who feel unable to supply the means to ensure success for all students (Wheatley & Friese, 2007). At the same time, they are looking to close the achievement gap and guarantee that all students are progressing academically. After looking closely at the present school environment and taking into consideration the district's future performance objectives and professional learning goals, the district sought to establish individualized goals for increased student achievement and to integrate technology into the learning process (SSD Narrative, 2011). Emphasizing the integration of effective technology treatment provides teachers with another tool to increase student achievement levels in mathematics.

Evidence of the Problem from the Professional Literature

With the globalization of the American economic system, unskilled and uneducated workers will find their wages depressed if they are not proficient in core subject content areas such as English and mathematics (Bloom, 1968; Wagner, 2008). Bloom (1968) argued that educators need to find successful ways to teach children the basic skills to operate in a larger society. Employment by U.S. citizens in science, technology, engineering, and mathematics (STEM) are disappearing overseas because there are not enough qualified applicants in the U.S. to fill these jobs (Friedman, 2005). United States Department of Labor (2013) statistics for 2011 indicated the highest unemployment level is among those without a college education. Of those without a high school diploma, 13.7% are unemployed. Of those with a high school diploma 0.5% are unemployed. Of those with a bachelor's degree or higher, 4.4% are employed. Concurrently, Choi and Chang (2011) reported that students with mathematical success have higher career aspirations, they further suggested that students' perceptions of mathematics achievement have long-term effects.

United States students are struggling to compete with their peers at the international level in mathematics as indicated by their overall performance assessment conducted by the Program for International Student Assessment (PISA) and the National Assessment of Educational Progress (NAEP). Additionally, 36% of incoming college students are required to take remedial courses in mathematics. This lack of readiness is obvious by the number of students scoring below proficient on standardized tests (Synder & Dillow, 2012). Therefore, poor student preparation, in core subjects could affect future education and employment status.

Definitions

Adequate yearly progress (AYP): A state's measure of progress toward the goal that all students will meet academic standards in reading/language arts and mathematics (Pilli & Aksu, 2013).

High School Proficiency Assessment (HSPA): A grade 11 assessment used to determine students' proficiency levels in mathematics, reading, and writing and used in the state of New Jersey as a graduation requirement (New Jersey Department of Education, 2013).

No Child Left Behind (NCLB): A U.S. Federal Legislation Act of 2001 based on theories of standards-based education reform requiring all publicly funded schools to achieve 100% proficient scores in reading, language arts, and mathematics by the year 2014 (Friedman, 2005).

Partnership for Assessment of Readiness of College and Careers (PARCC): An assessment aligned with the common core state standards used to assess students' mathematics and English skills in grades 3 through 11, and help measure future success in college and career readiness. Funded by the United States Government, the assessments will be used to improve student achievement by aligning K-12 education with the expectation of postsecondary schools and employers (PARCC, 2014).

Race to the Top: A grant program funded by the U.S. Department of Education, awarding monies to schools that increase student assessment scores (Mathis, 2010).

Realtime: A secure internet-based information portal purchased by the Seashell School District for administrators, teachers, parents, and students to access information pertaining to student assignments, grades, and attendance in their school ("Realtime," n.d.).

Study Island: Commercialized computer web-based program purchased to help students increase their mathematics and English comprehension. The program is designed to help students master content standards through individualized learning paths (Study Island, 2013).

Significance

This study investigated whether integrating technology-assisted instruction improved student learning in mathematics. Therefore, it becomes of interest to other school districts and scholars in the field of education who seek to create an engineering technology-infused climate of success with student participation. Furthermore, the study highlighted the importance placed on student achievement and standardized testing in the area of mathematics.

Student proficiency in the language arts and mathematics is a graduation requirement in the state of New Jersey and across the United States. Consequently, there is a need to increase test scores with the use of technology-integrated instruction focusing on mathematical skills. The goal of this study is to provide research-based evidence on the effectiveness of Study Island, and to statistically determine its effects on mathematics assessment scores. The results will help inform policymakers, educators, and parents on how mathematics instruction can improve student mathematics performance. It will also encourage non-traditional approaches to teaching mathematics. Additionally, the study findings will help stakeholders determine if Study Island is effective in aiding general education and lower-performing mathematics students at the secondary level.

In the larger educational context, under NCLB requirements, schools that cannot reach Adequate Yearly Progress (AYP) expectations of 100% proficiency by the year 2014 need to develop an action plan to help students improve their weaknesses and achieve higher scores. At this time, the mathematics scores in the Seashell School District are below advanced proficient on various assessments: state exit exams, the SAT, and students' postsecondary entrance exams. The goal of this research project was to investigate if technology-integrated instruction improves student learning in mathematics and therefore become a plan of action needed to increase assessment scores.

To prepare today's students to compete in a knowledge-based and technology-driven global economy, students will need to be skilled in the areas of science, technology, engineering, and mathematics (American Society of Mechanical Engineers [ASME], 2010). With that in mind, there are a significant number of students who are graduating from secondary schools and entering college without the knowledge and skills needed to be successful in college-level work as noted by the increase in students required to take remedial mathematics courses (Feldman & Zimbler, 2012).

Research Question

The fundamental research question is: What effect does integrating Study Island into high school algebra instruction have on student achievement in Seashell School District general education students? Related hypotheses include:

H_0: There is no significant difference in the mathematics achievement scores of students who participated in the technology-integrated mathematics instruction and those who participated in mathematics instruction without technology-integration, controlling for preexisting differences in mathematics achievement.

H_1: There is a significant difference in the mathematics achievement scores of students who participated in the technology-integrated mathematics instruction and those who participated in mathematics instruction without technology-integration, controlling for preexisting differences in mathematics achievement.

I employed a quasi-experimental approach with a nonequivalent pretest-posttest design which, according to Creswell (2012), is used to measure student achievement when both groups accepted the same pretest and posttest. The same teacher taught both groups for this school-sponsored intervention, Group 1 was the treatment group in which the Study Island program was integrated with regular mathematics instruction. Group two was a control group who did not participate in Study Island, but received the same mathematics instruction without the technology treatment. The fundamental goal of the study was to provide data to the school district administration so they may make a determination whether to discontinue Study Island or continue the implementation of the program within the district's mathematics curriculum.

The independent variable (categorical) in this study consisted of two groups with two levels, intervention and control. The dependent variable (continuous) of the study were the students' posttest scores in mathematics. The covariate in the study was their pretest scores. To control extraneous variables, a single mathematics teacher teaching multiple basic algebra class was used to ensure similar mathematics instruction to both groups within the field. Student participants had similar characteristics: age, grade, and basic mathematics intelligence. For consistency of instruction, classes were held in the same classroom each day during the study. Potential covariates that could have had an impact on the study were the teacher's perceptions with regards to the use of technology in the classroom and the lack of experience the teacher has in using the technology software.

Review of the Literature

Introduction

A preliminary inspection of the current research literature on the subject of integrating-technology into a mathematics curriculum centered on five key areas: *computer-assisted instruction, technology in schools*, *perceptions and attitudes towards technology*, *integrating technology*, and *uses of assistive technology*. Research was drawn primarily from recent publications in peer-reviewed journals. The review begins with the theoretical framework followed by the problem of improving mathematical achievement. Finally, the Study Island program, which is the web-based instruction provided by the district referenced in this study, is discussed.

School districts currently endure mounting pressure from the media and parents to improve instruction. The United States Department of Education's response was to create the No Child Left Behind Act of 2001, centering on achievement scores as a measurement of student success (Friedman, 2005). In the 21st century, excelling at a skill or displaying strength in a particular academic area is not enough to compete in the global arena (Wagner, 2008). Students must be proficient in all areas in which they are measured by standardized testing (Kress & Lake, 2013). The question remains as to which tools are available for educators to use when teaching every child.

Theoretical Framework

Seeking effective solutions to educate all students at their diversified level of understanding can be a huge obstacle to tackle. Fortunately, there are theorists in the field of education that have spent countless years developing answers to these complicated questions. This study stems from the work completed by Bloom (1981) on mastery learning, based on the theory that all children can learn if given the proper learning environment and tools.

Bloom classified educational goals and objectives and turned that into what is known today as Bloom's Taxonomy. This multitiered level of thinking consists of six subsets of cognitive levels, each with its own complexity. In the cognitive process dimension we can take something concrete such as an algebraic problem at the factual level and move towards abstract at the metacognitive level because the software program is able to personalize in a way that is understandable to its users.

Also contributing to this study's theoretical framework is the constructivist approach, through a pragmatic philosophy that confirms knowledge is gained through problemsolving. Dewey (1938) captured the significance of the constructivist view of learning with his belief that all individuals are unique and receive experiences in different ways. Dewey also added that people can determine when they are exposed to events and activities, allowing the soul to grow, fueling their desire to fulfill a purpose, and acquiring the necessary impulse control.

The purpose of this study was to investigate whether integrating the mathematical software known as Study Island into the curriculum and classroom environment would result in an increase in student assessment scores. In this circumstance, providing the ideal learning environment and exposing students to interactive technology can be used as a tool in the approach towards having the greatest impact for sustaining mathematical skills, as well as increasing assessment scores.

Gardner's theory of multiple intelligence (1985) contributes to the two previous theorists by asserting that students learn in multiple ways. With this in mind, the role of technology and incorporating innovative multimedia web applications to foster the students' application of problem solving provides connections to other kinds of student learning. In Gardner's theory, schools would be expected to teach to the child's interests and capabilities. Jackson, Gaudet, McDaniel, and Brammer (2011) stated that when students are given the ability to recognize their strengths and weaknesses and capitalize on them in a fun and interactive environment they can generate academic success and thus create an environment for sustainable change.

Computer-Assisted Instruction and Mathematics

The discussion over whether to incorporate technology into schools is being replaced with a need to explore and discover the best technology programs that generate the most effective results. Reports extracted from the National Council of Teachers of Mathematics website stress the necessity of integrating computer technologies into mathematics education (Bremner, 2013). One of the most appealing aspects of technology inclusion is its ability to be adapted to individual student needs and operate at varying degrees. Ideally a classroom teacher can use the technology as supplemental support, where students can operate independently within the same classroom at the same time, and all can work at their individual functional level (Graves, Abbitt, Klett, & Changhua, 2009).

Technologies, such as interactive whiteboards and wireless slates, allow teachers to easily differentiate instruction. Seo and Bryant (2009) examined means to facilitate mathematics performance with special needs student through a metastudy of computer-assisted instruction (CAI). Their study used five different commercial CAI programs: SPARK-80, Millken Math Sequence, Galaxy Math, and Math Blaster. The results of the study revealed that students in the CAI group outperformed students in teacher led education. The availability of technology and use of web-based mathematics programs allow for supporting learning outside of the classroom.

Pilli and Aksu (2013) examined the educational software Frizbi Mathematics 4 and focused on three aspects: mathematic achievement, retention, and attitude. The study compared lecture-based instruction versus incorporating Frizbi mathematics software. The results of the study showed a significant difference in favor of the software. Attitudes towards learning mathematics increased as well as student retention of mathematical skills. Through the use of technology devices, teaching and learning have changed. Teachers now have the option of offering students an active and practical learning environment, which can help develop more concrete learning experiences (Pilli & Aksu, 2013).

Cheung and Slavin (2012) conducted a meta-analysis study of over 60,000 school age participants; overall analysis resulted in positive outcomes with the use of educational technology applications to enhance reading literacy. The authors noted more evidence correlated with positive outcomes when educators received extensive professional development rather than simply implementing the product without professional development of those who implemented it. A year later, in 2013, Cheung and Slavin conducted another meta-analysis study. This study focused on mathematic achievement through k-12 classrooms with the use of educational technology applications. Of the 56,886 students who took part in the study, 25,331 were from the secondary level. In the study of mathematics, Cheung and Slavin (2013) showed positive results with modest effects compared to the previous study of only small increases in literacy. One result of the study was that, among the technology applications used in mathematics classrooms, those that incorporated computer-assisted instruction (CAI) demonstrated the largest outcome (Cheung & Slavin, 2013).

The hunt for creative ways to teach mathematics that will gather and hold the students' attention can be a challenge for educators. Ke (2013) incorporated CAI and examined the potential by using mathematics, computer-based games as an anchor for tutors and training. These mathematics-based games provided students with structured play, simulated visualization, and substance-related problem-solving. The study, conducted with middle school aged students, indicated progression in mathematics skills and showed improvement on standardized test scores (Ke, 2013). The study's findings are consistent with Choi, Jung, and Baek (2013), who also reported positive results in the students' attitudes towards mathematics education with the inclusion of games in the learning process. They further suggested that gaming stimulated learning of the students' different abilities. Shin, Sutherland, Norris, and Soloway (2012) conducted a quasi-experimental study with different experience levels and examined the effects of game-technologies in mathematics. The results of the study revealed that game-technology improves students' performance in algebra.

Effectiveness of Technology in Schools

Technology is readily available throughout the United States, although the question remains as to whether schools are prepared for technological advancements. The current generation .are known as digital natives, living in a fast-paced informational,age; most will comprehend best with the assistance of technological knowledge (Kebritchi, 2010). Williamson et al. (2010) emphasized a need to restructure education to meet the requirements of a future technology-based workforce, rather than the current service-type activities employed. Future careers dependent upon technology knowledge will include occupations as computer engineers, computer support specialists, database administrators, data processing equipment repairs, and system analysis. Computers are increasingly affecting education and fueling information, as well as the way students learn in today's schools (An & Reigeluth, 2011). Classrooms can be outfitted with interactive whiteboards, LCD projectors, wireless laptops, smart TVs, e-books, and other technological tools. The ability of students to utilize assistive devices and computers in school will become more pervasive and the lessons incorporating technology will increase. The influence of technology on education will be redefined and reorganized in the future.

A recent study emphasized the need for technology to create learning environments that are stimulating, innovating, and can prepare students for future employment (Lewis, 2010). Emerging trends in interactive online learning and teaching suggests fostering the use of technology in schools (Graves, Abbitt, Klett, & Changhua, 2009). Incorporating interactive digital learning creates a motivational environment for students to excel in education (Woolf et al., 2010). A study conducted by Yourstone, Kraye and Albaum (2008) on the use of electronic clicker devices in the classroom showed that providing students with a means for immediate feedback contributes to significant increases in achievement of learning. In the United States, there are increasing numbers of computers within the schools. Ease of use and the availability of teacher resources have policymakers increasing technology budgets to support computer-assisted instruction within the classrooms (Smolin & Lawless, 2011). The implication is that technology will be in the schools, but the extent of proper implementation and usefulness remains unclear.

Perceptions and Attitudes towards Technology

Attitudes surrounding instructional tool programming can play a role in the success or failure of the program's execution. The majority of teachers value technology-integrated into their classrooms. Perceptions of inefficiency and difficulty arise from a deeper understanding of the software and ease of management (Berlin & White, 2012). Various high schools surveyed indicated that if students and teachers are to advance in the age of technology, training and teaching need to accompany the equipment; simply purchasing computers and programs is not enough to raise standardized test scores (Chapman, Masters, & Pedulla, 2010). Districts should take caution when implementing technology into any discipline if they only employ top down training and ignore teachers' perceptions (Bourgonjon et al., 2013). Consequently, success of any new program relies on standards suggested by the manufacturer that need to be implemented in order to achieve program success. This suggests that if a new program is not accompanied with adequate preparation and materials, the program's success rate could be diminished.

Support for and from the teacher remained a factor when developing teacher technology competency. Increased technology infuses success in the classroom (Chen, Looi, & Chen, 2009). Excluding teachers from the discussions of the academic program implementations within their classrooms could result in teacher resistance towards implementing any given program. When teachers are asked to participate in professional development, a correlation is expressed in relation to increased student achievement and teacher confidence in the new strategy proposed for implementation (Billing and Freeman, 2010). Otherwise, if the top-down management is not careful, a lack of technology training could cultivate a teacher’s fear of what is embedded in the software integration of the curriculum that could negatively shape concepts learned in the classroom (Freier, 2009). Professional development is essential to the proper execution and success of the program.

Integrating Technology Into the Mathematics Curriculum

Instruction should be individualized and adaptive, as it is unreasonable to assume that all students are identical in a classroom and learn at the same pace. The optimal classroom environment combines direct instruction with interactive exploratory technological software (Nickerson & Zodhiates, 2013). Technology-integrated within the curriculum can provide remediated instruction in an area of weakness, as long as the human teacher remains a part of the instructional environment (Qualls & Sherrell, 2010).

The incorporation of technology into the curriculum can be proposed as an aid to learning or create a debate to its effectiveness (Atkinson, Thrasher, & Coleman, 2010).

There is no one-size-fits-all when educating a classroom full of diversified students. By creating an environment that offers additional tools to be utilized within a curriculum, fostering individualized instruction could bring forth student success. A review of recent reports on preparing students for the 21st century global workforce suggested a need to focus on technology training and increased mathematics skills composed of ill-structured problems (Kelley & Kellan, 2009). As future studies evolve, the current literature review suggests a trend in using digital means to research diverse learning. Technology has the potential to provide frequent and immediate feedback, and ultimately increase student academic development (Kyriakides & Creemers, 2008; Yeh, 2010). Any implementation of new products to enhance teaching and learning should require a guarantee that the product is researched-based, and appropriate training is provided to the staff implanting the product (Bourgonjon et al., 2013). More specifically, if these claims are true, integrating technology into the curriculum should be beneficial to the improvement of overall test scores.

A fair amount of technology-integrated instruction in the classroom incorporates technology-based gaming to teach and review mathematical concepts. In 2010, Bourgonjon, Valcke, Soetaert, and Schellens surveyed 858 students to determine their acceptance of game-based technologies and learning. Study results indicated that 63% of students prefer video-gaming with education. Another survey administered to 858 parents by Bourgonjon, Valcke, Soetaert, deWever and Schellens (2011) focused on parent's acceptance of digital game-based learning in the classroom with secondary school aged children. Fifty-eight percent of the parents favored technology education that utilized gaming features to foster learning opportunities in the classroom. In 2013, Bourgonjon et al. conducted a similar survey to the previous two, but focused on the teachers' perceptions of incorporating game-based technologies into their teaching. Of the 505 teachers surveyed, 57% expressed agreement to game-based learning. Each of the above surveys mentioned to the simplicity of use with technology infusion paralleled to harmony of using the software to learn.

Purposes of Assistive Technology

Assistive technology, if implemented properly within a classroom, is used to enhance the school experience of pupils. Cullen, Levitt, Robertson, and Sandoff (2013) suggested that underperforming schools should equip students with technology and move away from the traditional paradigms that failed to meet the students' needs in the past. Bouck and Flanagan (2009) suggested the essential tool to learning was technology because it can be used to influence students by engaging them in the process. Koedinger, McLauglin, and Heffernan (2010) showed computer instruction assisted student learning and caused an increase in students' standardized test scores. The researchers suggested that the use of technology offers a less threatening learning environment so students could work individually on their areas of weakness, an environment that is not always available in the traditional curriculum delivery (Koedinger, McLauglin, & Heffernan, 2010). Hussain et al., (2011) envisioned schools in the future using computer-based programs to bridge the gap between work and schooling, allowing students to learn through play and use practical simulations to perform real life tasks.

To pick out the stressors used to satisfy the requirements of high stakes testing, Lancaster, Schumaker, Lancaster, and Deshler (2009) led a study focusing on the students, teachers, and schools involved in testing. Solutions confirmed that students' use of targeted test-taking responses increased with the use of computerized programs, which afterwards became a test taking strategy. In diverse classrooms, differentiating instruction with computer-based platforms is more efficient compared to traditional lectures, because it allows students to be taught at a degree appropriate to their individual needs (Aud et al., 2012). Assistive technology also holds the potential to bring equality to the classroom. Students of varying disabilities and financial disadvantages can use technology to virtual attend venues they could not otherwise be present at or afford, such as or including national zoos, museums, and monuments (Malcom & Malcom, 2011).

Study Island

Presently there is an unlimited number of software and Internet-based programs that can provide visual demonstrations, calculations, and practice problems to aid in teaching mathematical concepts. Study Island is a web-based program available 24 hours a day that claims to provide teachers and students with the educational tools needed to increase mathematics and reading literacy. The software has the capability to offer game-based learning combined with instruction, a characteristic that can be turned on or off by the instructor. The Study Island website provides case studies on specific schools, showing results in student achievement and testimonials on how educators from several states implemented the program into their course of study. Additionally, the website offers foundational and statistical research and provides an overview of how the program has increased student achievement and is also aligned to state and national standards.

A list of case studies from the Study Island website explains the benefits of Study Island as it is applied in several states throughout the United States. Several schools in the state of Michigan used Study Island to increase standardized test scores as well as remedial mathematics and language skills. In 2006, Study Island reported that 13.08% of Study Island users increased their mathematical scores from 61.89% to 72.70%, while the scores of non Study Island test takers only increased by 9.90% (Study Island, 2012). In 2007, a school in Texas with a rating of acceptable on their state exam incorporated Study Island into the classroom and in one year achieved the rating of exemplary in the area of mathematics. In the Texas case study, Study Island users reported a 98% passing scores compared to only 69% passing standardized testing in mathematics from the previous year (Study Island, 2012). Baldwin Park School District in California incorporated Study Island in grades K-12; from 2008-2011, they reported significant gains on their standardized tests in both English and mathematics. The district also raised their overall academic performance index by 65 points (Study Island, 2011). The Assistant Superintendent in California, Arturo Ortega, said it was important to note that they did not just mandate the program, but rather offered support through weekly professional development training (Study Island, 2011).

Study Island is a technology research-based program, that offers instructional strategies and progress-monitoring to impact student achievement beyond the textbook lesson (Magnolia Consulting, 2012). The program aims to align classroom tests with state standards, use progress data to modify instruction, provide individual goals and student-specific feedback, and uses games and symbolic rewards to motivate the students (Magnolia Consulting, 2012). The program uses differentiated instruction providing lessons customized to meet students' needs and automatically prescribes remediation when a student does not master a skill (Study Island, 2011). In mathematics, Study Island incorporates research-based instructional strategies: uses interactive activities, videos, and animations. It also assesses students' understanding and mastery, allows teachers the control to set the frequency of problems, and to adjust to students' ability levels (Magnolia Consulting, 2012). However, the research on Study Island is conducted by Study Island's own consulting firm, which indicates potential for bias. Consequently, additional research should be conducted to determine if a specific technology platform used to supplement mathematic instruction is effective with a particular school district's population.

The purpose of using Study Island in the study district is to provide mathematic students with skill and drill exercises to complement the mathematics instruction given by the academic teacher. Study Island lessons provide individualized practice problems based on students' baseline testing, while providing students with immediate feedback and increased leveling as student mastery increases. Students have the ability to use the web-based software from any Internet-based computer maintained within the school or from home.

Implications

This study has implications for positive social change. It offers an alternative to the traditional approaches of teaching mathematics. The study's outcome will help guide policymakers in their decision-making process, with regard to renewing a budgeted item based upon its effective results for increasing students' mathematic comprehension and application. The research looks at traditional lecture-based mathematics instruction compared to lectures, combined with individual computer-based learning instruction through a web-based software program known as Study Island. Study Island claims to increase mathematics assessment scores; therefore, this study investigated the effectiveness of the program when used with secondary mathematics students.

Possible project directions based on anticipated findings of the data collection and analysis included, but are not restricted to, an executive report and PowerPoint presentation to the Board of Education and district policymakers. The written report may benefit a possible future study of the program. The findings may have the potential of providing alternatives to traditional mathematic instruction.

Summary

In response to the requirements set by federal laws such as NCLB and Race to the Top, federal funding for public schools is required to meet academic proficiency levels in both mathematics and English. This section identifies the local problem of students' stagnant scores in mathematics as measured by standardized testing. The study may initiate the need for determining if there is a benefit to incorporating technology-integrated instruction into the traditional mathematic lessons. I then present the need for determining the effectiveness of the technology web-based software Study Island to investigate claims of increased student mathematic comprehension. Additionally, research is presented to show how the local problem exists at state, national, and global levels.

The following chapters include the research methodology, information about the technology-integrated instruction, project research findings and their interpretation. A review of literature, implications for social change, and recommendations based on the project findings are also presented.

Section 2: The Methodology

Introduction

In this section, I describe the quantitative research methods used to determine if technology-integrated instruction resulted in higher scores on the textbook assessments compared to traditional teacher directed lessons. The students were selected from ninth grade algebra classes and separated into two groups. The groups were categoried by teacher-led instruction (TLI) and technology-integrated instruction (TII). By evaluating the outcomes of the posttest scores compared to the baseline data, this study investigated the effectiveness of the technology-integrated software Study Island.

I begin Section 2 with a rationalization of the quasi-experimental design chosen, including a justification for selecting this quantitative approach. A detailed description of the setting and the sample is discussed, including a description of the population and the reason behind choosing the research sample. In summation, I explain the study treatment, technology-integrated instruction using the Study Island web-based program. The instrumentation and materials section includes information on the data collection tools used, and the McGraw Hill textbook generated assessment. A detailed analysis of the data that was collected and the steps that were used to ensure the protection of the participants' rights is explained.

Justification

The aim of this study was to investigate the effectiveness of the teachnology integrated instruction Study Island. Seashell School District purchased the commercialized web-based software to help improve students' mathematics achievement scores on standardized tests. The quasi-experimental design worked best for this study because it allowed for comparing a representative population of below average and average students divided purposefully into experimental and control groups. In the final analysis, I determined if the students who received the technology treatment scored higher than those who used only the text-based curriculum.

The Study Island program currently used in the Seashell School District assesses students' performance levels and provides practice mathematics problems based on students' individualized levels. The software is also capable of adjusting the difficulty level based on student success or weakness. Each lesson consists of 10 problems and after each exercise students can receive ribbons as incentives for reaching the teacher-determined mastery level. If the level of achievement is not met, students will be reassigned an additional exercise with the repetition of similar problems until they reach an average score of 70%. The program is based on individual student performance from the initial baseline test. Future sessions are geared toward mastery and increase with difficulty as student accuracy rates increase. The sessions can be completed with or without teacher interventions. Teachers and district designated officials have access to detailed student data reports on the students' assigned levels, the number of problems attempted and the number of problems completed with accuracy. Study Island currently compliments the teacher-led instruction without hindrance in a skill and drill format, used at the teacher's discretion.

Research Design

A comparison group provided an opportunity to analyze archival data and compare academic performance and growth in two treatment groups. The quasi-experimental design used over a 10-week period was appropriate for this study. In this research design, one group was considered the control (no technology treatment) and one considered the treatment group (receiving Study Island technology-integrated instruction). The study used a nonequivalent pretest-posttest design in which both the experimental group and the control group were administered the same pretest and the same posttest. The experimental group received the Study Island treatment intervention sponsored by the school district (Creswell, 2012). Due to the availability of the participants for the study, a quasi-experimental design was preferred and frequently used because the study group was already intact. When using this design approach, the potential for internal validity threats such as maturation, selection, and mortality was addressed (Creswell, 2012).

Setting and Sample

Seashell School District is a public 7th through 12th grade school district, located in a suburban section of the Northeastern United States. The total population is 1,502 students, and the student body is predominately classified as Caucasian with an average socioeconomic status.

Nonrandom sampling was the most appropriate choice as I was able to evaluate the academic progress of a specific sample already intact. All participants from the school were sampled to ensure students had similar experiences, teacher quality, and resources (Creswell, 2012). The population selected represented a ninth grade algebra class. The delimitation was that special education and honors students were excluded from the study, and only those immersed in the school's algebra curriculum and receiving the school provided instruction and intervention were included.

The rationale for this sampling frame, as described by Creswell (2012), was a group of individuals who share common characteristics. The sample included ninth grade mathematic students placed in the basic level mathematics' class as identified by a state assessment exam. Students who scored less than 200 were categorized as below proficient on their grade 8 New Jersey Assessment of Skills and Knowledge (NJ ASK) test. The below proficient general education students were then placed in a basic skills class based on their standardized test scores. Participants in this study included 56 ninth grade students enrolled in an algebra course; 28 received the Study Island technology treatment and 28 did not attend the computer lab; they remained in the classroom and received teacher-based instruction.

Instrumentation and Materials

Students in both the treatment and control group were taught mathematics using the district's board-approved McGraw-Hill, Glencoe Algebra 1 mathematics textbook (McGraw-Hill, 2011). The control group received five, 90-minute mathematic sessions per week using the assigned textbook. The treatment group received four 90-minute mathematic sessions using the assigned mathematics textbook and one 90-minute technology-integrated instruction session per week. The district sponsored technology program, Study Island, is a web-based standards mastery program used to provide remediation in an interactive and flexible instructional program.

McGraw-Hill algebra mathematics textbook assessment tests were the instruments used for this study. They had test-retest reliability. Only one version of the instrument was used, and each participant in the study completed the instrument at two different intervals (pre and posttest) (Creswell, 2012). Each exam consisted of 50 multiple choice questions related to the content discussed in the textbook chapter. The assessment was given in a pencil and paper format with an allotted time frame of 90-minutes. Content validity was established by content experts (McGraw-Hill, 2011). Upon completion of the assessment, the instructor graded the tests and documented the grades in the district's electronic record keeping system known as Realtime. Grades then became accessible by the student, parent, and administration.

Statistical analysis was used to examine the means of the two groups that were tested. The dependent variable was the mean of student scores from a pretest taken from the Seashell School District mathematics textbook. The independent variable was the group with two levels; the first level consisted of 28 purposely selected students in a ninth grade algebra class who did not receive the technology treatment and the second consisted of 28 purposely selected students from another ninth grade algebra class who received the technology treatment.

Data Collection and Analysis

The quantitative method of this study included collecting the data (archival) and conducting the analysis. After receiving approval from the institutional review board

(IRB) the superintendent of the school district was asked to provide the data, because he is the only one in the district with access to archived data. Coded data was stored on the researcher's personal computer and protected with a password.

A spreadsheet was constructed to compare and analyze test scores (appendix D). Scores from week 1 were utilized as a pretest and compared to the week 10 posttest scores. The spreadsheet had three columns and 56 rows of coded data. The superintendent changed the names of the participants to protect their identities and provided the requested data. Participant identity was kept confidential with the superintendent of schools. The flash drive utilized for this study was stored in a locked file cabinet in the home of the researcher for the duration of the study and will remain in the file cabinet for 5 years after the project completion. The flash drive will then be destroyed and disposed of accordingly.

The data was analyzed using the IBM SPSS Statistics software version 21 to determine if differences existed between the two independent variables (intervention and control groups), dependent variable of posttest scores and the covariate of pretest scores as recommended by Triola (2012). An analysis of covariance (ANCOVA) was used to determine the relationship between mathematical scores and intersections between the technology treatment and control group while applying statistical control to the curriculum. Scores indicated whether the technology-integrated lessons resulted in higher mathematics scores, lower scores or resulted in no statistically significant impact. A p value of less than .05 indicated statistical significance. The results section answered the hypothesis question and summarized the raw data, staying close to statistical findings without drawing implications or meanings from them (Triola, 2012). A table showed correlations between variables, the significance levels, and the case numbers. The figure summarizes the information presented in a scatterplot matrix; providing a descriptive picture of the linear relationships between variables (Creswell, 2012).

Inferential statistics was used to reach conclusions that go beyond the immediate data, and more complex statistical procedure included the ANCOVA. The independent variable had two levels: the control group (traditional instruction) and the intervention group (technology-infused instruction). The dependent variable was the scores on the posttest assessment displayed on an interval scale because the distances between each incremental value were thought to be equal (Triola, 2012). A covariate (pretest scores) was a continuous control that was not directly related to the outcome.

In this study, I looked at the disaggregated test scores of the 28 ninth grade students who participated in the technology treatment compared to the other 28 students placed in the control group. The primary data source for this study was the students' pre and posttest scores from the mathematics curriculum textbook at SHS. The interval level of measurement created from the archival data collected between the two groups showed the difference that exists between them (Triola, 2012).

Assumptions, Limitations, Scope and Delimitations

Assumptions made by the researcher include:

1. It was assumed that students affected in this study attended class every day and actively engaged in the math lessons, whether being taught in the classroom or a computer lab.

2. It was assumed that the teacher provided the same instructional lessons in the computer lab as in the classroom.
3. It was assumed that Study Island is a reputable assistive-technology tool and statistical reports generated by the Study Island software are accurate.

The study had four limitations which are noted as follows:

1. Only 2 ninth grade algebra classes were included in the study. Therefore, the sample size could be a concern to researchers who want to consider a bigger population of students tested. The sample included intact groups as opposed to a random selection and did not reflect academic skill or diversity.
2. The technological tool used in this study was bound to the commercial product known as Study Island.
3. Because I was not involved in selecting the classes to administer the treatment or in training the teacher to use the Study Island software, I can not verify the caliber of education provided.
4. The project study was limited to one general education algebra course, categorized in the school program handbook as a college preparation program of study. The class group did not include students classified as special needs or high academic honor students.

The scope of the study included 56 ninth grade students in a college preparatory algebra course at Seashell High School that received technology-integrated instruction through the web-based commercialized program Study Island. The study used a pretest and posttest to provide student data submitted from two separate algebra classes, whereas one class received traditional mathematic lessons throughout the week, and one class received technology-integrated instruction once per week, for a 10 week period.

Delimitations in the study include:

1. Because the concept of technology-integrated instruction is not taught in some teacher preparation programs, nor is it a mandated technique, different teachers may see the use of web-based programs in dissimilar ways. Therefore, results incorporating technology into the classroom education can vary widely from teacher to teacher.
2. The study was delimited to analyzing the effect on results (test scores) of a technology-integrated treatment (Study Island) on student achievement for 28 students scheduled in a ninth grade algebra course. These students' test scores were compared with results from 28 students in the non-treatment group that received traditional mathematic instruction in the classroom.

Measures for the Protection of Human Participants

Since individual student scores are considered confidential, measures were taken to protect the participants' rights (Creswell, 2012). Permission to use the archived testing data was received from the district superintendent of schools and the Walden University International Review Board (IRB approval #06-26-14-0297582). All data was collected as part of the usual classroom process and stored on the district's electronic grading system as well as safeguarded through the guidance department. As a researcher, I was mindful of the potential for danger and always sought to cause no harm to research participants. Through completion of the IRB application, I have ensured Walden

University that my research was abiding by ethical and legal compliance. Additionally, I received ethical guidance when conducting the research. Because the data was archival, additional assurances are explained, stating that the teacher from which the data was obtained from the superintendent was in no danger of job loss, mockery or reprisal from staff or the community, as well as administrative discipline (Creswell, 2012). A guarantee of anonymity came from the removal of any identifying data from the test scores and stored in a secure location to assure confidentiality.

Results

I investigated archived test score data to determine the effectiveness of technology-integrated instruction on high school students' mathematic achievement in the Seashell School District, located in New Jersey. A statistical analysis was employed to determine if the Study Island software program affected scores while controlling for the pretest. Archival data were obtained by the superintendent of schools from the Realtime records database.

A one-way analysis of covariance (ANCOVA) was utilized to evaluate the impact of an intervention while controlling for pretest score. The standard for an ANCOVA is an alpha set at .05, the alpha level was the criterion used in this study to gauge statistical significance. If after running the ANCOVA analysis a *p*-value of less then .05 is obtained, that indicates a significant difference between the groups (Triola, 2012). Two groups of ninth grade algebra students (N = 56) were the focus of the study. Group A was identified as a control group that received 90-minutes of traditional mathematics instruction five days a week. Group B was identified as the treatment group that received

90-minutes of traditional mathematics instruction four days a week and one 90-minute session on technology-integrated instruction using Study Island software as the intervention. Study Island was examined in this study through an analysis of archived mathematic assessment scores from group A and B, on the pretest and posttest over a 10-week integration period. A control for pretest (covariate) was used to determine if the intervention had an effect on the outcome. The independent variable, type of instruction, included 2 levels: traditional instruction and technology-integrated instruction. The dependent variable was the archived posttest scores and the covariate was the archived pretest scores. The scores from the pretest and posttest were entered in IBM SPSS v21 for analysis, and all inferential tests were run using alpha =.05.

The research question was: What is the effect of the integration of the Study Island technology program with high school algebra instruction on the student achievement of general education students in the Seashell School District? Related hypotheses include:

H_0: There is no significant difference in the mathematics achievement scores of students who participated in the technology-integrated mathematics instruction and those who participated in mathematics instruction without technology-integration, controlling for preexisting differences in mathematics achievement.

H_1: There is a significant difference in the mathematics achievement scores of students who participated in the technology-integrated mathematics instruction and those who participated in mathematics instruction without technology-integration, controlling for preexisting differences in mathematics achievement.

Before running the ANCOVA test and testing the hypothesis, I tested several assumptions:

1. Independence.
2. Interval scale.
3. Error in correlation.
4. Homogeneity of variance.
5. Covariate is measured without error and is reliable.
6. The linear relationship between outcome variable and covariate.
7. The regression relationship between covariate and dependent variable.

The first two assumptions were met; observations were independent of each other, and the covariate (pretest) was measured on an interval scale. The second assumption ideally should have been done prior to the intervention, but this study referenced archival data. To check this assumption I ran a correlation test. The covariate and dependent variable should be related, and the relationship should be linear at each combination of the levels of the independent variable. The output showed that posttest and pretest are positively correlated with a correlation value of .841, $p < .001$. The correlation was significant, and I have met the assumption that the covariate and dependent variable are correlated, as shown in Table 1.

Table 1

Correlations

		Covariate – Pretest	DV – Posttest
Covariate – Pretest	Pearson Correlation	1	.838**
	Sig. (2-tailed)		.000
	N	56	56
DV – Posttest	Pearson Correlation	.838**	1
	Sig. (2-tailed)	.000	
	N	56	56

**. Correlation is significant at the 0.01 level (2-tailed).

Levene's Test for the equality of error variances was used to determine the fourth assumption; if the research violated the assumption of the variety between groups (means that the covariate should not differ between groups). Table 2 outcome, p (.995) > α (.05) confirmed the assumption of homogeneity of variance was not violated.

Table 2

Levene's Test of Equality of Error Variances

Dependent Variable: Posttest Scores

F	*Df*1	*Df*2	Sig.
.000	1	54	.995

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a. Design: Intercept + Pretest + Group

The fifth assumption was to check for linearity; a scatterplot was run to make sure the covariate was related to the outcome. Lines were used to identify the relationship between the two groups. In Figure 1, the lines appear to be traveling in a general linear fashion; therefore, the research has not violated the assumption of a linear relationship.

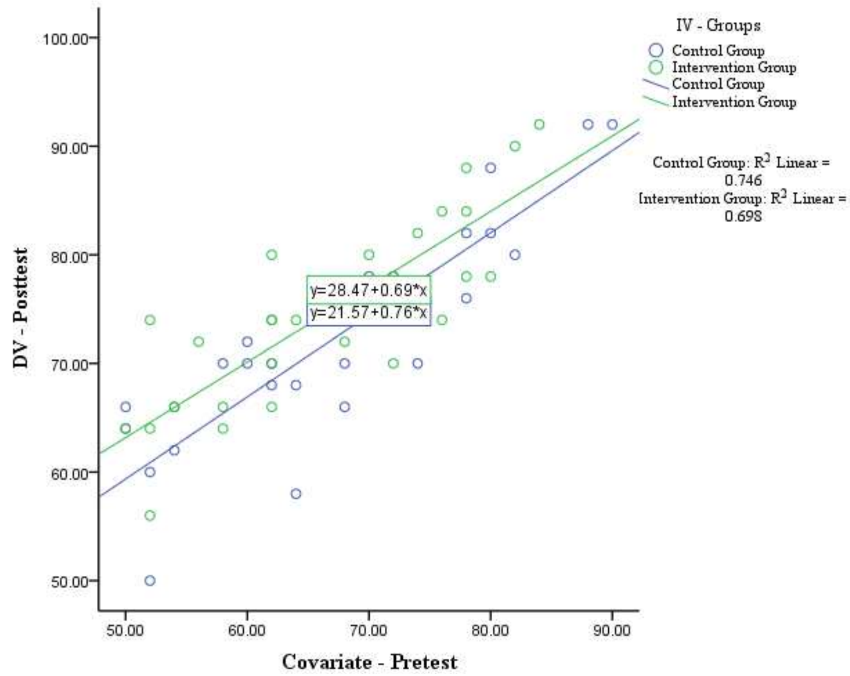

Figure 1. Linear Relationship

To ensure there was no interaction between the covariate and the treatment, because the lines are not traveling parallel throughout the plot, I checked to see if there was a statistically significant interaction between the covariate and the treatment. The statistical analysis technique, setting the alpha level set .05, is the standard for an ANCOVA test used in this analysis. The α is the criterion used to gauge statistical significance, if a $p < .05$ is obtained, and there is a significant difference (Triola, 2012). Looking at the output of groups times pretest, the results suggested the interaction was not significant, $F(1,52) = 0.245$, $p = .623$. Outcome indicates the means that the factor (group, $M = 16.54$) and covariate (pretest, $M = 3339.66$) do not interact, then the assumption of homogeneity of regression slopes was not violated as shown in Table 3. Additionally, it supported the earlier conclusion from the scatterplot, as shown in Figure 1, that it appeared these groups are similar in trending data.

Table 3

Univariate Analysis of Variance

Tests of Between-Subjects Effects
Dependent Variable: DV – Posttest

Source	Type III Sum of Squares	*Df*	Mean Square	*F*	Sig.
Corrected Model	3405.302[a]	3	1135.101	46.017	.000
Intercept	868.856	1	868.856	35.224	.000
Group	16.541	1	16.541	.671	.417
Pretest	3339.660	1	3339.660	135.390	.000
Group * Pretest	6.049	1	6.049	.245	.623
Error	1282.680	52	24.667		
Total	307361.000	56			
Corrected Total	4687.982	55			

a. R Squared = .726 (Adjusted R Squared = .711)

After checking the assumptions, the ANCOVA test was run, to include the covariate in the analysis to control for differences on the independent variable. The purpose of using an ANCOVA was to evaluate the relationship between the covariate and the dependent variable while controlling for the factor.

Descriptive statistics were used in order to summarize the data before using a covariate to remove any bias from the variables. Fifty-six mathematic test scores (N = 56) were looked at in this study, as shown in Table 4. The mean score at the onset appeared to show that students in the intervention group had a mean higher score at 74% (M = 74.29, SD = 8.772) than the control group at 73% (M = 72.75, SD = 9.770), but this does not show statistical significance.

Table 4

Descriptive Statistics

Dependent Variable: DV – Posttest

IV – Groups	Mean	Std. Deviation	*N*
Control Group	72.7500	9.77004	28
Intervention Group	74.2857	8.77225	28
Total	73.5179	9.23234	56

When running the ANCOVA analysis, the covariate is included in the analysis to control for the difference on the independent variable. The aim of this analysis is to access the relationship between the covariate and the dependent variable while controlling for the factor. The ANCOVA test, results shown in Table 5, examined the effect between the variables. The group had a significance value of .04, less then .05, indicating the groups were significantly different from each other, $F(1, 53) = 4.43$, $p = .04$. The estimated marginal mean for the traditional instruction ($M = 72.127$) and technology-integrated instruction ($M= 74.909$); adjusted based on the covariate evaluated at the following values: covariate – pretest = 66.8571. The partial effect size, η_p^2 is .077, explains the likelihood (7%) that this difference would be present in the population at large. To determine the influence of the covariate, the pretest $p < .001$ indicated the covariate had a significant effect on the outcome. Roughly 72% of the results are explained by the pretest variance, and that confirmed that the pretest was a good measure to use to determine the effect of the intervention on increased mathematic scores.

Table 5

Tests of Between-Subjects Effects

Dependent Variable: DV – Posttest

Source	Type III Sum of Squares	*Df*	Mean Square	*F*	Sig.	Partial Eta Squared
Corrected Model	3399.253[a]	2	1699.627	69.899	.000	.725
Intercept	864.245	1	864.245	35.543	.000	.401
Pretest	3366.236	1	3366.236	138.439	.000	.723
Group	107.623	1	107.623	4.426	.040	.077
Error	1288.729	53	24.316			
Total	307361.000	56				
Corrected Total	4687.982	55				

a. R Squared = .725 (Adjusted R Squared = .715)

A Bonferroni post-hoc test, as shown in Table 6, was run to compare the outcome of the control group to the intervention group. The post-hoc test is similar to a series of *t*-tests except they are more stringent. The tests were not pre-planned and only used when the null hypothesis is rejected. I can conclude that a technology intervention does have a statistically significant effect while controlling for pretest score. The results indicated the statistical significance difference $p(.04)$ $\alpha(.05)$, and, therefore, the null hypothesis was rejected. The results suggested that different teaching methods, traditional or technology-integrated, do affect mean post assessment scores.

Table 6

Pairwise Comparisons

Dependent Variable: DV – Posttest

(I) IV - Groups	(J) IV – Groups	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Control Group	Intervention Group	-2.782*	1.322	.040	-5.433	-.130
Intervention Group	Control Group	2.782*	1.322	.040	.130	5.433

Based on estimated marginal means
*. The mean difference is significant at the .05 level.
b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Conclusion

In this paper, I studied the effect of a district's use of an online tool used to increase mathematic assessment scores of students. Ninth grade algebra students (*N* = 56) archived test scores were collected to determine the effectiveness of Study Island, the technology intervention purchased by the Seashell School District. A quasi-experimental nonequivalent (pretest and posttest) control-group design, quantitative research study was utilized to determine the effectiveness of integrated-technology for increasing mathematic achievement scores. The IBM SPSS v21 predictive analytics software was utilized to perform the descriptive statistics and ANCOVA to answer the research question.

Archived pretest and posttest McGraw Hill Algebra assessment scores from 56 participants were analyzed. The control group (no technology) had 28 participants. The experimental group (technology intervention) also had 28 participants. The McGraw Hill Algebra pretest scores were used as the covariate. Data were collected during the teacher's routine assessments, over a 10 week period, and students were not asked to participate in the study. The appropriateness of the research method was backed by Creswell (2012), who suggested alternating a treatment with a posttest measure and the summative analysis would consist of comparing the pre and posttest measures to indicate a change in data over time.

Archived data were analyzed using IBM SPSS v21. An ANCOVA was completed for the posttest and group variables while controlling for the pretest (covariate). The results show that there is a significant effect with the online tool when infused into the mathematics instruction. The comparison between the treatment and control group had a significance value of .04, less then .05, indicating the groups were significantly different from each other, $F(1, 53) = 4.43$, $p = .04$.

The data supported the rejection of the null hypothesis for the research question and showed Study Island had a significant effect on mathematics achievement. Overall, this study found a significance across the posttest, when the pretest was controlled, as the covariate. Some potential explanations can be the small sample size. Statistically, the Study Island software resulted in a significant difference when the program was infused into the mathematics instruction when compared to traditional methods of mathematics instruction.

The research design chosen allowed for an analysis to determine the treatment effect of infusing Study Island on secondary mathematics students. Groups were found to be significantly different ($p < 0.05$): traditional instruction (M = 72.750, SD = 9.770), technology-integrated instruction (M = 74.285, SD = 8.772); adjusted means for the traditional instruction (M = 72.127) and the technology-integrated instruction (M= 74.909). The results of this data analysis confirmed that infusing an online instructional tool lead to an increase in mathematic performance growth. The results of this study are in line with the findings reported by the Study Island Corporation and their claim to increase student academic performance. The following section presents the project and a second literature review.

Section 3: The Project

Introduction

The purpose of this study was to investigate the effectiveness of technology integrated-instruction on students' mathematical scores before and after intervention was administered, through an analysis of covariance. A quantitative method using a quasi-experimental design measured numerically nonequivalent pretest and posttest scores to determine if technology integrated-instruction produced an effect on student mathematic algebra achievement. According to Creswell (2012) the experimental group and the control group take the same pretest and posttest, but only the experimental group received the treatment; this design gave me the ability to statistically reveal any comparisons or correlations in the data that resulted between test scores and technology.

Section 3 will further discuss the project to be developed based on the research findings from Section 2. The implementation process and evaluation of the project are outlined in this section as well as a scholarly rationale for the selected project backed by a plan to include potential resources, barriers, and a timeline for execution. A summary will discuss how the project will enact social change on the national and local level.

Description and Goals

This project will include the creation and implementation of (1) a presentation to district program implementation stakeholders and (2) a professional development presentation for district administration and the professional development committee. The purpose of the presentation to stakeholders is to train them in the district sponsored curriculum-integrated software, Study Island, and review the research concerning the program's impact on student mathematical achievement. The purpose of the professional development presentation will be to provide data garnered from within the Seashell High School to confirm the effects of the Study Island program when infused within the mathematics classroom instruction and to suggest training for additional discipline staff on the benefits of technology-integration and proper program implementation.

The goal of this study was to investigate the effectiveness of Study Island technology-infused software purchased by a local school district when integrated into the mathematics curriculum, as measured by student achievement. Therefore, the following research question served as the basis for addressing the research problem investigated: What is the effect of the integration of the Study Island technology program with high school algebra instruction on the student achievement level of general education students in the Seashell School District?

The presentation of the research findings and benefits of integrating technology into the curriculum will be supported with scholarly literature. The presentation and potential professional development training will expose educators to alternative methods of teaching through the use of online software that can provide outside-of-the-classroom learning opportunities for their students. A system of support will be proposed to the district stakeholders as a measure to assist educational staff on software implementation and difficulties that could arise during its use.

Rationale

It is necessary to investigate the effectiveness of education-based programs to impart knowledge to future learners. Equally important is the role of the researcher to report on ineffective programs so that educators and policymakers have sound data to support a need to seek out additional resources to create a more effective learning environment. The rationale behind selecting a quasi-experimental design was to determine if a relationship existed between specific variables (technology treatment and textbook assessments) by collecting data with predetermined instruments that yield statistical data (Creswell, 2012).

As teachers are crucial to effective technology integration (Joyce & Calhoun, 2012) it remains rational to develop a plan that offers educators components of a professional development training model geared toward effective technology infusion. Meeting with key stakeholders provides me an opportunity to convince them of the need to renew the software license and continually seek alternative approaches to increase student achievement. I intend to use my meeting as the venue to teach stakeholders the current online-software sponsored by the district and suggest additional needs assessment surveys be conducted with the staff on enhancing teachers' knowledge and use of technology.

Review of the Literature

The basis for this study was to investigate the effect of a school sponsored online program. If teachers provided a technology tool to a students' learning environment, would that software-infusion increase their cognitive mathematic levels of understanding as shown on formative assessments? The second literature review, based on the analysis of the research completed, addresses a problem of low achieving mathematical assessments and technology-infused software used to remediate the problem. Peer-reviewed scholarly articles were accessed through books, journals, and databases such as EBSCO (Elton B Stephens Company), ERIC (Educational Resource Informational Center), SAGE Journals Online, ProQuest and GoogleScholar.com. The key words I used in the research: *accountability*, *traditional instruction*, *technology-integrated instruction*, *barriers with technology, and professional development opportunities.*

Technology Integration and Accountability

Since the enactment of NCLB; strong demands have been placed on school districts to offer more rigorous course work with an expectation that students will excel higher each year as reported on their standardized achievement tests. School districts are concerned with accountability and the difficulty to meet NCLB standards with every student. Beginning academic year 2014, all public schools within the United States should have reached 100% proficiency in the disciplines of mathematics and English as documented on state standardized test data (Aspen Institute, 2010; NCLB, 2002). The United States government developed this education policy with hopes of closing the achievement gap and making school districts offer standards-based education reform, so that no child is left behind (NCLB, 2002). NCLB standards extrinsically motivated school districts to seek program effectiveness for increasing student achievement.

The importance of attaining AYP (adequate yearly progress) has some school districts providing compensatory education in an effort to meet the NCLB requirements (Spencer, 2009). In an attempt to provide supplementary remediation and enrichment activities to students that go beyond the traditional curriculum of instruction, school districts have enacted compensatory education. The purchase of educational software such as Study Island, used by the district of study, was an attempt for all students in the district to have uninterrupted access. Educational software can then be offered day or night to supplement the district's instruction in an attempt to gain academic success.

The majority of high school mathematics classes have been taught using the traditional lecture format. Historically, the instructor would provide direct instruction, first presenting new material, then modeling the procedure, followed by thinking aloud and guided practice, providing feedback and corrections, and finally allowing students to engage and practice (Hodara, 2011). Face-to-face instruction with students followed by questioning, practice problems, and discussions has been consistently used for many generations (Hodara, 2011). However, the question of which format of learning adequately meets the learning styles of all students in the classroom is still under debate; further research is needed to confirm an ideal learning environment for today's students.

Technology integrated-instruction is an additional system for learning that is becoming an essential part of education in the 21st century (Patadia & Ramani, 2014). Bonham and Boylan (2011) suggested this format of instruction not only meets the interests of today's learners, but allows students to receive instant feedback making this format more effective than traditional lecture based instruction. Today's technological advancements engage the student learner through visual methods of graphics, animation, and interfacing with peers all over the world (Hodara, 2011). Compared to traditional classrooms, technology infused lessons afford students the ability to learn at their own pace, allowing multiple learners in the room opportunities to work on their level of understanding (Bonham & Boylan, 2011). In the Seashell school district, Study Island is infused with the curriculum by means of remediation practice of concepts already taught and drills to strengthen the new concepts.

Zavarella's and Ignash's (2009) study findings suggested that retention rates were slightly higher among computer-based courses verses the traditional courses taught in mathematics. Three of their studies defended the use of computer integration in the classroom and did not find a statistically significant difference in the students that received traditional instruction compared to those infused with technology (Bonham & Boylan, 2011; Patadia & Ramani, 2014; Ramani & Patadia, 2012). The differences in technology-infused results could hinder how the technology in infused. Joyce and Calhoun (2012) emphasized a need for educators to shift from trying to master the technical skills necessary to use technology to educators being taught how to effectively incorporate the technology into their lessons.

Technology-integration enables schools to offer additional academic time that is not confined to the institutions' seat time. On average, public schools in the United States offer 6 hours of instructional time for 180 days a year. Correlations that have been made regarding time on task and student performance outcomes have policy-makers seeking alternatives to expanding the school day. The National Education Commission on Time and Learning (NCTL) developed a database of over 655 schools that offered expanded time in schools; their research confirmed that students receiving expanded learning time outperformed students with only six hours of instruction per day (Farbman, 2009). Additional evidence confirms that a relationship exists between additional time and achievement. Witkow (2009), examined 702 ninth graders, half whom studied outside of school daily for two weeks, and compared their achievement to that of their peers who did not reinforce their studies outside of school. Study outcomes revealed that students who spend more time learning increased their achievement scores (Witkow, 2009).

As an incentive to encourage students to access the Study Island remedial software outside of school hours, the district runs contests with prizes based on time spent using the software and achievement within the program. A possible future study could investigate if students' increased academic learning time has an effect on assessment scores.

Technology

Educational institutions continually seek methods to improve student learning. Combining the need to achieve student success with the unlimited potential of technology has school districts budgeting large amounts of funding to support the inclusion of technology. Studies in the literature support increased standardized test scores with the merger of technology in the curriculum (Clarke-Midura, Dede, & Norton, 2011; Lancaster, Schumaker, Lancaster, & Deshler, 2009; Yourstone, Kraye, & Albaum, 2008). Additional studies support increases in students' intrinsic motivation to learn and the ability to process information easier because the content knowledge was presented in various learning formats, through technology integration (Cheung & Slavin, 2012; Choi, Jung & Baek, 2013; Graves, Abbitt, Klett, & Changhua, 2009). Even though barriers to technology integration exist such as limited resources, attitudes and beliefs, a district can combat that with clear vision statements, technology plans, and professional development to sustain the school improvement initiative (An & Reigeluth, 2011).

Professional Development Opportunities

In an attempt by school districts to increase the use of technology in the classroom, teachers must be made aware of its purpose and operation (Davis, 2011). Billing (2010) argued that teachers are often blamed for ineffective technology integration. For that reason, teachers must be trained on the benefits of the district sponsored programs and means to integrate it into daily lessons. Research conducted by Ketter (2010) further affirmed the idea that professional growth is indispensable to effective technology infusion in classroom lessons.

For successful technology integration to occur, a unified vision for creating professional development opportunities grounded in technology practices requires a commitment by all stakeholders. Trainings need to be ongoing, systematic, and goal-oriented to ensure effective implementation by the instructional staff (Davis, 2011). A plan of action should include specific skills and the knowledge-base necessary for teachers to operate the program. Providing teacher contact time, follow-up discussions, and meaningful activities that reflect their degree of programming expertise will provide the teachers with confidence to take part in technology-based professional learning communities (An & Reigeluth, 2011).

Personalizing professional development trainings to discuss specific district barriers to effective technology integration can save time and increase teacher interest (Hattie, 2009). Teachers can complete needs assessments to ascertain their current degree of expertise with using the district software, practice additional activities, and then implant the new software skills into their lessons while aligning to district curriculum standards (Billing, 2010). These teacher led learning opportunities encourage teachers to customize instruction to promote pupil ownership of their own learning.

A review of literature on providing professional development about the benefits of integrating technology with instruction spotlighted some key advantages. Technology-assisted instruction with a program such as Study Island allows for individualized exercise, self paced learning, and positive reinforcement (Magnolia Consulting, 2012). Technology software contains components that can motivate students, allowing for repeated practice. Bremner (2013) discovered through research that providing students with concrete symbols found in online programs, contingent upon the achievement of a special goal, will increase performance levels. Web-based programs can afford parents the opportunity to help their children achieve academic success, through online access to the program from their homes and access to ongoing status reports (Hattie, 2009). More importantly, technology-assisted instruction can provide immediate feedback on assessment data for teachers to use to tweak teaching practices, drive curriculum, and remediate instruction. These advantages become beneficial to teachers, parents, and students since they can monitor student progress and help students move towards mastery.

Implementation

Once the study is approved by Walden University, project implementation will commence. I will hold a meeting with stakeholders in the district of study for the purpose of outlining and discussing the study's findings. Stakeholders within the district responsible for program implementation and renewal include curriculum supervisors, principals, superintendent of schools, and Board of Education curriculum committee members. At this meeting, I will share my findings through a PowerPoint presentation on the effectiveness of the district-sponsored Study Island software as used in the ninth-grade mathematics curriculum. Key objectives to the presentation will include:

- Presenting priority information regarding the project study data analysis.
- Conducting illustrative demonstrations using the Study Island software.
- Guiding trainees' practice in assessing the essential elements of the program.
- Discussing potential barriers and means to troubleshooting.

Due to my extensive literature review, I will request to be made part of the professional development committee to discuss proper program implementation. Additionally, if the stakeholders decide to renew the Study Island program license, I will volunteer to provide professional development training throughout the program's inception within the district, based on the literature review and study findings.

Potential Resources and Existing Supports

The district has already budgeted funds to be used as supplemental instruction, allowing students access to academic software beyond the regular school day to remediate education. This investigation confirms that Study Island is beneficial and should be renewed, as the product to provide student-remediated instruction throughout the day. Professional development training can be offered to staff during one of the four professional development training days scheduled in the school calendar. The location for the training will be held within the local school district and no additional expenses are required to run the training. Ideally, the initial training will be the first of many to help support instructional staff on ways to incorporate the software into their lessons and suggested activities to encourage use outside of the classroom.

If the district's technology coordinator is committed to this project, it should increase its overall effectiveness and impact. Currently his responsibilities are to maintain the district's website, renew and repair computer software, provide assistance with technical difficulties, and monitor teachers' use of technological resources as well as generate reports. With the permission of the superintendent of schools, a request will be made for the coordinator to update the website to include the host link to log into the Study Island. Greater access to the program could increase overall educator and student traffic while increasing student achievement in mathematics and it's usefulness to the district.

Potential Barriers

The most detrimental barrier of this project would be if the stakeholders were unwilling to renew the Study Island software license. Budget cuts in public education across the state of New Jersey may also prohibit the Board of Education from sponsoring technology-integrated instruction due to web-based hosting costs. If the local school district continues to perform at and below the proficiency level in mathematics, the district may be more inclined to allocate funding for the engineering fees. The cost of the software is set by the commercialized product and considered relatively low, considering that the district population is approximately 1500 students and the cost is 19 million dollars per year, as shown on the public board minutes.

Additional potential barriers would include the lack of instructional staff incorporation of the software into their teaching and scheduling conflicts that could arise with providing computer science laboratory time for teachers and students and granting access to interact with the program during the school day. With the many changes going on within the state of New Jersey in regards to aligning the curriculum with core content standards, introducing a new state standardized assessment (PARCC) and a new teacher evaluation system, the instructional staff may be hesitant to incorporate technology into their daily lessons, regardless of how beneficial the program may be for students. Thus, it would be necessary at some point during professional development days to make clear to instructional staff that implementing this software, in the long run, could increase their instructional time and reduce the amount of time they usually use to remediate concepts.

Equipment failure would be a final concern for both the students and staff. A guarantee from the district to ensure its Internet server, technical hardware, and the hosting license to the Study Island site remain functional is imperative to a successful integration plan. Accessibility to the on-site technology coordinator can provide the classroom support of technical assistance in a timely manner; additionally Study Island through its online site support offers technical assistance and answers to frequently asked questions.

Proposal for Implementation and Timetable

Prior to sharing my findings with all stakeholders, I will implement the PowerPoint presentation at my monthly district administration meeting. The presentation will include a review of the results, a short demonstration on how the Study Island program is used in the district, and a discussion on strategies to incorporate Study Island into all disciplines throughout the district. Once the presentation has been shared with district level administration I will present to all district stakeholders responsible for program evaluation and renewal. If the stakeholders feel it is necessary, I will present my study and provide a demonstration of the district-purchased software to the Board of Education and community, at their next scheduled Board of Education meeting. The timetable for presentation will be within 2 months of the initial district administration meeting.

Acceptance by the district stakeholders to implement the Study Island software throughout the district will increase the likelihood that the proper professional development training will occur. It remains important to gain necessary approvals so that I can underscore the tenets of the technology-based infusion into the curriculum and assist in professional development training to the district.

Roles and Responsibilities of Student and Others

My role is to incorporate the research findings into a project and to present my findings to the curriculum supervisors, principals, superintendent, and Board of Education curriculum committee members. I will present my research findings through the use of a PowerPoint presentation and demonstration of the Study Island software. I will also share a plan in which I will volunteer to provide professional development training to the staff. Ideally, I will be responsible for securing permission through the professional development committee to carry on training during a professional day and for providing all printed materials for teachers to reference when implementing the software within their classrooms. The purpose and goals of the training are to share a best practice with fellow educators to facilitate adult learning. Discussions could spark a future study to determine if the local district could benefit from a qualitative study on the program's effectiveness as noted by users, thus expanding my role as a practitioner, scholar, and agent of change.

Project Evaluation

The project evaluation used in the district for professional development trainings is outcomes-based. The evaluation is suited for measuring the overall training success as determined by participant implementation of the knowledge received. The district professional development committee has developed and provides a standard district professional development evaluation survey that is used after the training to determine the effectiveness of the trainer. The goal of the professional development training for this project is to empower instructional staff with the knowledge to access the district sponsored software, set program benchmarks to measure student success, and activate content that reinforces lessons learned in the classroom. The performance of the program can be measured through the programs, data analysis reports and teacher summative responses to district surveys. The initial rating of the two hour training will supply important data concerning how the training needs to be shifted and what other needs the instructors may have to successfully infuse the software into their course of study. The professional development presentation can be modified after the initial training to reflect the needs identified by the professional development participants and to reflect the needs of the district.

An outcome-based evaluation is desirable to ascertain if any impact is obtained in student achievement through the Study Island program. Instructional staff can use benchmark tests supplied with the program, teacher-made formative assessments, or district-adopted curriculum summative assessments to measure student achievement from the use of the technology-infused program.

Instructional staff, paraprofessionals, curriculum supervisors, and principals are the key stakeholders in the district who will be invited to attend the professional development training in support of increased student achievement. The motivating factor behind the shared research is to ensure the local school district is providing the best instructional support possible for students within the district. The local school district should experience an increase in standardized test scores if program implementation is executed properly, an expected effect that would restore the reputation of the district in the local community as a successful academic institution. Most importantly, struggling students will be provided with another instrument to apply outside of the traditional classroom to strengthen academic areas of demand.

Implications Including Social Change

Partially proficient and proficient mathematic achievement is a concern locally, at the state level, and nationally. In this project I addressed the pupils in my local district that experienced below proficient achievement scores in the field of mathematics as documented in their exam scores. The project has become important because it addresses an area of need and offers reassurance that differentiated instruction by means of technology-integrated instruction purchased by the district is being implemented and found to be effective in remediating instruction needed by students. The benefits of conducting this project study will help drive instruction in the future and request that professional development occur in multiple subjects to allow for greater use of the software outside of the mathematics curriculum.

Local Community

The professional growth task for instructors created as the result of this project has outstanding potential to enact social change. The research was conducted as an investigation to determine if the district sponsored software was effective in the discipline of mathematics, to assist stakeholders in the decision to renew the yearly contract. However, adding the professional development component about how to implement the software and integrate the software into the curriculum will increase school wide staff awareness to the program. All stakeholders and possibly similar public school districts in the state can reap the benefits of the anticipated residual effect of the training and program implantation.

Low-achieving mathematic scores become important to scholars, families, teachers, administrators, and community partners because scores will affect college admission, job applications, and entry level employment in the residential district. As accountability increases and teachers are at present responsible for student growth objectives, instructional staff will benefit if student standardized test scores increase. The administrators benefit through an increase in district rankings within the county. A higher school ranking can lead to an increase in college acceptances as well as raise the confidence of graduating students with basic skills, to be productive members of the work force. The communities at large benefit by being able to draw employees from within their community; employed graduates will have a disposable income to shop within the community and productive schools positively affect the property value of homes within the community.

Far-Reaching

My study will be significant in the larger context by providing other school districts experiencing similar troubles in the field of mathematics and achievement scores with a tool to provide additional instructional time and a way to remediate learning outside the traditional education method. Specifically, through data analysis, I provide reassurance that Study Island was beneficial to ninth-grade low performing algebra students. School districts with similar demographics can use the findings of this study to persuade their stakeholders in purchasing the Study Island software to potentially raise mathematics scores of students across the country.

Overall, these issues are a concern to national government officials because our youth will meet difficulties when competing in the worldwide economic system. If school districts seek out program effectiveness and implement the products into their learning environment that are proven to increase achievement scores, the United States could potentially document an increase in rankings compared to mathematics scores of other countries in the world.

Conclusion

Classrooms are abounding with diversity; differentiating learning to educate every child has become a challenge for educators. Traditional classroom settings only partly allow instructors to differentiate their teaching, while each student requires resources that are reactive to their singular needs. Hattie's (2009) research revealed that students must be actively emerged in their learning with access to multiple paths to problem solve. Going beyond the traditional instruction enables students to utilize tools that best match their strengths in learning. Study Island allows access to students in school and from home, and the program does not require a large learning effort on behalf of the instructors because they do not need to adapt their teaching to the tool. Due to the low implementation barriers and the low cost per pupil software licenses, integration of the Study Island program is a cost savings to the district compared to other instructional tools. Furthermore, this paper contributes to the literature on technology infused online tools and its effect on secondary algebra education. In section 4, I will discuss the many possibilities for future research on the subject.

Section 4: Reflections and Conclusions

Introduction

Stagnant and below proficient mathematic scores in secondary schools are a concern nationally and locally. This study emerged to investigate the effectiveness of a technology-infused software, known as Study Island. A local school district located in Central Eastern New Jersey purchased the software to improve mathematical test scores, but never analyzed the selected software. The purpose of the study was to compare the effectiveness of traditional lessons to the effectiveness of technology-infused lessons on student success as evaluated by pre and post assessment in two algebra classrooms. I employed a quantitative quasi-experimental nonequivalent group design to investigate the technology-infused software. Data were analyzed using IBM SPSS software and running an analysis of covariance (ANCOVA).

The project study focused on the Study Island commercialized software used for 90 minutes a week in a single algebra classroom compared with the teacher-centered traditional lecture method used throughout the week in a similar algebra classroom. Student achievement was measured through a pretest and posttest. Once permission was received to use archival data, I performed an ANCOVA using IBM SPSS v.21 software to analyze the data statistically, with the pretest being the covariate. The final section will contain an overview of the project strengths and limitations, examination of myself as a scholar, followed by a discussion of implications for social change and recommendations for future research.

Project Strengths

The primary goal of the study was to address the effectiveness of technology-infused software into the mathematics curriculum as measured by student achievement on improved mathematic assessments. This study was of interest to the local district because their mathematic scores are not proficient as expected by NCLB standards and the software is an annual investment in the school district. In my opinion, Study Island is a beneficial component of the Seashell School District's mathematics curriculum for reasons that go beyond the data analysis in this project study. The cost of renewing the software license each school year, for the entire student population, is minimal compared to per student commercialized software packages claiming the same success rates. Study Island has the means periodically to update its software with the changes in state policies without passing the costs onto the district. Whereas textbook companies must reprint materials and charge districts a great amount of money to replace outdated material. Additionally, with the adoption of PARCC, New Jersey is now administering computer-based standardized testing; Study Island provides the same testing format, allowing students to experience the testing procedures ahead of time. The Study Island curriculum can help supplement classroom instruction as well as provide students with an alternative way to learn the same concepts taught in the classroom, in the comfort of their home, and can be accessed twenty-four hours a day. Additionally, Study Island can individualize instruction to students' level of comprehension and increase or decrease levels of difficulty to challenge the students and provide a means to get the extra practice they need to solve challenging concepts.

The professional development training proposed for this project study will adjoin the technology integration initiatives already in place by the district and will assist with overcoming the barriers to effective technology integration. Unequivocally, the study's findings revealed that the Study Island online software was a viable means for increasing mathematic assessment scores. However, the software's implementation is limited and additional students could benefit from the program if introduced to the software strengths within various district disciplines.

Recommendations for Remediation of Limitations

An analysis of the project's limitation in addressing the problem of below proficient mathematic assessment scores uncovered factors that require consideration. Study population, sample size, and researcher bias are recognized as limitations. A summary of possible future research studies is recommended to avoid the above-mentioned limitations.

The data analysis established that there was a positive correlation to support Study Island and its benefits for increased mathematical achievement. The correlation was not overwhelmingly strong, but statistical evidence supports Study Island was effective in mathematical performance, $p(.04)$ $\alpha(.05)$. Low sample size ($N = 56$), could have resulted in the low p value. Another limitation was the sample population, ninth-grade algebra students. Expanding the sample population to additional subject fields or seeking out a comparable school with similar demographics could enlist a large sample size and provide results from a larger comparison group. In this investigation, a single teacher taught both the control and intervention algebra classrooms. The teacher's knowledge of the Study Island software, as well as perceptions, could have been a factor regarding the infusion of Study Island into their lessons; a factor that was not measured in this study.

For more than sixteen years, I have been employed in the district of study and served as a special education teacher, assistant principal, and director of special services. In this capacity, I have had my own perceptions and beliefs regarding the technology integration and district-sponsored professional development. Hence, I addressed a research problem that looked at archival quantitative data on the effectiveness of the software on assessment scores. When I designed my project, my bias may be acted upon by the decision to design a professional development training to address effective technology integration into curriculums. I want to challenge the status quo and develop training that encompasses the results of my research findings and the knowledge gained through the literature review.

A PowerPoint presentation on the findings will be backed by literary research to support any suggestions made to the staff on proper software implantation. The district stakeholders will then have a decision to make regarding incorporating the topic of effective technology integration into the professional development trainings. If the professional development committee is not employed to perform the training, I will remind the stakeholders that I have volunteered my services.

A few recommendations for future research have come forth as a result of this study. The recommendations below are intended for both future researchers and school personnel.

1. A comparison study using another software program infused into the curriculum could be completed. Utilizing a mixed-methods or qualitative study to portray the perceptions of the instructor and pupils regarding the software could help to identify any variables and bias that could bear on program execution.
2. A comparison study using additional mathematics curriculums, such as geometry, Algebra 2, or statistics will be used to allow for additional learners at various mathematic learning levels. Possibly investigating the traditional 40-minute schedule compared to the 90-minute block schedule used in this subject field may indicate a difference in the outcome.
3. The archived data in this study was performed over a ten-week period; a future study could investigate the infusion of technology over a year and compare standardized assessment as well as teacher-made formative assessments. Through an extension of the data collection period, additional variables can be considered when trying to determine what teaching strategy is more beneficial to student achievement.

Scholarship

Scholarship can come from a variety of sources; it is a process in which one gains knowledge. Through collecting data, conducting research, and constructing meaning, I feel more empowered as a scholar to make conclusive arguments regarding the research. Differentiating between literatures to determine if it was scholarly was a difficult task when I first began this journey. I quickly realized the massive amount of literature available and that I had to determine its professionalism and validity. Throughout the doctoral program, I developed the skills necessary to conduct research and access databases including EBSCO, ERIC, ProQuest, and SAGE to ensure I met saturation in my review of scholarly literature.

Specific to the educational arena, scholarship involves the continuous search for new strategies, and it becomes the responsibility of the scholar to add new techniques to enhance learning. In today's technology-advanced society, programs are being offered daily attesting to increase student learning. It becomes the scholar's responsibility to continually seek and evaluate effective practices for the student population at hand and motivate the students to become life-long learners.

Project Development and Evaluation

In an effort to enact change, it was necessary to create a timeline and outline to represent the project. The presentation needed to be more than presenting findings from the research. I want to educate community stakeholders on the effectiveness of online mathematics program and the benefits of renewing the district program licenses.

Creating and producing a meaningful project based on the research findings is vital to me to solidify the doctoral journey. I have conducted extensive research into the Study Island software, and the benefits of integrating technology into teaching practices. The time spent researching the topic has provided me with the knowledge and confidence to develop a presentation to support technology integration in the classroom. I want to ensure my first scholarly contribution to education has a positive impact on the instructional practices of those around me. The anticipated feedback that I will receive from teachers and educational leaders will shed light on the district's efforts to effectively utilize technology to increase student learning.

Leadership and Change

It takes a strong leader to embrace change and to gain the respect and confidence of others, to encourage them to accept the same changes. An effective leader possesses the power to self-evaluate and be cognizant of what practices need change. The leader must be wise enough to stimulate change for the advancement of the students. Leaders must also lead by example and not expect others to perform their work.

As an educational leader, I am a lifelong learner committed to the stakeholders of this study. My program for success includes a display of exuberance for the work and systematically seeks to create learning environments that positively affect all students at their individual stages of need. Irrespective of how much change is required, educators and stakeholders should not be complacent with the status quo and should continually investigate best practices to improve overall student learning.

Through this process, I have understood that increasing student achievement is not an isolated effort. It requires a leader with the ability to create relationships with fellow educators and community stakeholders to enlist them in concepts towards achieving student success. Therefore, the research portion of this project becomes secondary to the project development and the willingness of stakeholders to accept the researcher’s suggestions. Being an educational leader in the district, I will demonstrate the skills and practices necessary to facilitate learning where change remains inevitable.

Self-Analysis as Scholar

The dissertation process has extended my skills in finding relevant research to investigate the problem. During the 2013-2014 school year, I was a full-time special services director in the school district setting of this study. I conducted this study in my local setting because I wanted to know if an online education program, sponsored by the district, had the ability to increase ninth-grade student's mathematical achievement. Throughout my courses in the doctoral program, I learned how to develop and execute a plan of attack to address a program review in the educational field.

As an educator, I see the importance of trying out and validating educational programs that will enable pupils to go upward to increase their chances for successful personal and professional futures. Even though the Study Island software was the primary program under study, my intent was to offer readers literary research and statistical analyses to be applied to technology programs with similar characteristics. Additionally, I believe teachers and educational stakeholders would like to know the effectiveness of the program with the population they teach, prior to program implementation. After training staff on Study Island, teachers will be empowered to design lessons based on their specific curricular needs to strengthen targeted skills. Through this journey, I have come to understand the importance of supporting my beliefs with facts, researching topic saturation in literature reviews, and making conclusions from statistics. I have learned that research articles need to be peer reviewed for validity, and an improper statistical method can contribute to incorrect conclusions. As a scholar, I have improved my communication skills, especially through technology and strive to grow in my scholarly endeavors.

Self-Analysis as Practitioner

Today's students are unfamiliar with a universe that is not digitally driven for information and amusement. Becoming an educational leader to this generation should be no different. As a practitioner, I acknowledge the importance of consistent curriculum revisions and delivery methods. If inclined to remain with the status quo, we lose the natural procession of our learners and we do not satisfy their learning potential.

As an educator in the 21st century, engulfed in technology that is accessible twenty-four hours a day, it becomes essential to conduct research on the effectiveness of the technology employed within the classroom. I have found the skills necessary through Walden University's Ed.D program for Educational Leaders to not simply perform the research necessarily, but to convey the findings to enact social change. As a practitioner, I am ready and eager to explore additional educational programs in the future.

Analysis of Self as Project Developer

Understanding that people do not accept change easily and understanding educators' uncomfortable feelings when asked to adapt their way of teaching to something new is the first necessary step to enacting change. I recognized from former professional development trainings, in order for the training to be a success and assumed by the staff, I need to take heed to the educators' concerns, especially the veteran staff who can easily influence others and who often fear technology integration. I will need to ask for their support on the infusion of technology into the curriculum, prior to the actual training of the staff on strategies to use with the software in the classroom. As a means of gaining their interest, I will begin with showing them my statistical findings, benefits of incorporating the software and conclude with the shortcoming I have discovered through the various literature reviews. I will acknowledge their trial and error tabulations and suggest approaches that I have found successful for proper program implementation. Most importantly, I need to reassure the staff that I will be available throughout the year, for troubleshooting discussions and additional training on an as required basis.

The Project's Potential Impact on Social Change

The project study includes an overall reflection on the significance of addressing the problem of low performing mathematics assessment scores at the local and national level. The project's potential impact on social change at the local level is to assist mathematics teachers in evaluating different techniques for conveying algebra instruction for student engagement and improved knowledge retention. This study can affect social change beyond the local district by providing data on the inclusion of technology-infused instruction in classrooms. The study results on student knowledge retention can also impact how algebraic instruction is delivered to positively affect students achievement.

Specifically, the statistical analysis on the effects of Study Island will enlighten mathematic teachers at the local level on the benefit of using different types of instructional methods. The data will support the teacher's use of the Study Island software to improve student retention, resulting in increased algebraic assessment scores. Additionally, there is reason to investigate if the instructors are capable of incorporating technology software into the instruction: the students will benefit from individualized instruction and result in better-educated adults.

Implications, Applications, and Recommendations for Future Research

Even though this study was limited to a small group of students for a period of just 10 weeks, the results confirm that utilizing technology-infused education, mainly Study Island, positively impacts students. It is recommended that all teachers in the disciplines of mathematics be instructed in the use of Study Island and how the software can be incorporated into the classroom and used as a supplemental assignment outside of the classroom. Furthermore, technology-infused instruction should become a component of the curriculum through-out the school year, instead of only months prior to statewide assessments. It is suggested that professional development programs include the Study Island software as part of the mathematics preparation program. Through these measures, academically reaching every student at their level of understanding is a universal concern that can be achieved through the use of technology.

As more and more school districts purchase educational technology-based licenses for programs such as Study Island for their students' use, the need will arise to determine the success of the educational plan. Even though the results from this survey are confined due to the small sample size, it should help districts understand the value in researching program effectiveness and possibilities for change.

The Study Island software was used in the investigation of the study curriculum. A future study would be beneficial over an entire year which determines if the use of the Study Island software brings students into the higher levels of thinking, as suggested by

Gardner in the theoretical research. Additionally, the effect size showed the intervention accounted for just a modest part of the difference. A future study using more students would suggest if the purpose of the Study Island software and teacher-directed teaching, in fact, has more effect on the final result. Since only two sections of algebraic classes were used in the study, future studies could include other mathematics curriculums.

The degree to which the teacher participants feel confident in program infusion will depend upon professional development training. Navigating around the program in a training session will allow staff to become more open to technology use and grow to the point of wanting to incorporate the program into their lessons. It is important to design a curriculum to meet the needs of every child.

Conclusion

Student achievement in mathematics has declined in the United States, to the point that American students are no longer considered leaders in the academic arena (Aud et al., 2012). Accountability on how students perform on state and national assessments is a national concern as well as a concern for most schools in the nation. To engage students in their academics and encourage eagerness for students' to challenge themselves, teachers need to seek alternative means to engage the learner in other lessons and find a means to reach learners at every level.

This study was guided by the research question "What is the effect of the integration of the Study Island technology program with high school algebra instruction on the student achievement level of general education students in the Seashell School District?" The study was conducted through the use of a quantitative quasi-experimental nonequivalent control group design to determine if technology-infused instruction in concert with teacher-led instruction resulted in higher growth mean scores compared to only teacher-led instruction on the end-of-unit tests in mathematics. The participants for this study (*N*=56) were ninth-grade algebra students from a suburban high school in Central Eastern New Jersey. Archived data from the 2013-2014 school years were collected and analyzed.

A review of the literature demonstrated the importance of utilizing a form of teaching schemes to engage young learners in and outside of the schoolroom, to achieve maximum student performance. Instructors and administrators are held accountable for annual student growth. Providing the teachers with a mixture of strategies to enhance instruction will help instructors to teach to all student learners. As instructional leaders strive to adapt to the requirements of accountability on standardized testing and the need to prepare students to be successful in the 21st century, technological effective teaching tools become a resource to the teacher's curriculum cache that will prepare our students for the future.

References

American Society of Mechanical Engineers. (2010). Strengthening pre-college science, technology, engineering & mathematics (STEM) education in the U.S.: A technology literacy and workforce imperative. *General Position Paper*. Retrieved from http://www.asme.org/about-asme/get-involved/advocacy-government-relations/policy-publications/capitol-update/may-14-2010-capitol-update#asmebog

An, Y. J., & Reigeluth, C. (2011). Creating technology-enhanced, learner-centered classrooms: K–12 teachers' beliefs, perceptions, barriers, and support needs. *Journal of Digital Learning in Teacher Education*, *28*(2), 54-62.

Atkinson, J. K., Thrasher, E. H., & Coleman, P. D. (2010). Simulation software's effect on college students spreadsheet project scores. In *Academic and Business Research Institute Conference. Orlando*. Retrieved from http://aabri.com/manuscripts/10645.pdf

U.S. Department of Education, National Center for Education Statistics. (2012). The condition of education 2012 (NCES 2012-045). Retrieved from http://nces.ed.govpubseach

Berlin, D. F., & White, A. L. (2012). A longitudinal look at attitudes and perceptions related to the integration of mathematics, science, and technology education. *School Science & Mathematics*, *112*(1). 20-30.

Bloom, B.S. (1968). Learning for mastery. *Evaluation Comment, 1*(2), (unpaginated).

Bloom, B.S. (1981). *All our children learning.* New York, NY: McGraw-Hill.

Billing, S. (2010, September). Professional development for service-learning practitioners. *National Service-Learning Clearinghouse*. Retrieved from http://www.servicelearning.oorg/instant_info/fact_sheets/k-12_facts/professional_development

Bouck, E. C., & Flanagan, S. (2009). Assistive technology and mathematics: What is there and where can we go in special education. *Journal Of Special Education Technology*, *24*(2), 17-30.

Bourgonjon, J., Grove, F. D., Smet, C. D., Van Looy, J., Soetaert, R., & Valcke, M. (2013). Acceptance of game-based learning by secondary school teachers. *Computers & Education*, *67*(1), 21-35. Retrieved from http://sfxhosted.exlibrisgroup.com/waldenu?sid=google&auinit=J&aulast=Bourgonjon&atitle=Acceptance+of+game-based+learning+by+secondary+school+teachers&id=doi:10.1016/j.compedu.2013.02.010

Bourgonjon, J., Valcke, M., Soetaert, R., De Wever, B., & Schellens, T. (2011). Parental acceptance of digital game-based learning. *Computers & Education, 57*(1), 1434-1444. Retrieved from http://www.sciencedirect.com.ezp.waldenulibrary.org/science/article/pii/S036013151100008X

Bourgonjon, J., Valcke, M., Soetaert, R., & Schellens, T. (2010). Students' perceptions about the use of video games in the classroom. *Computers & Education, 54*(4), 1145-1156. Retrieved from http://ac.els cdn.com.ezp.waldenulibrary.org/S0360131509003121/1-s2.0-S0360131509003121-main.pdf?_tid=91aa6084-8051-11e3-a74e-00000aab0f02&acdnat=1390057537_03e1e30d5e5d4411746c8cac45d85be6

Bremner, A. (2013, May). Technology from the classroom: Singing and gaming to math literacy. *National Council of Teachers of Mathematics*. Retrieved from www.nctm.org/tcmgames

Buckley, J. (2013). National Assessment of Educational Progress: 2012 Trends in Academic Progress. Retrieved from http://nces.ed.gov/whatsnew/commissioner/remarks2013/06_27_2013.asp

Chapman, L., Masters, J., & Pedulla, J. (2010). Do digital divisions still persist in schools? Access to technology and technical skills of teachers in high needs schools in the United States of America. *Journal of Education for Teaching: International Research and Pedagogy*, *36*(2), 239-249.

Chen, F. H., Looi, C. K., & Chen, W. W. (2009). Integrating technology in the classroom: A visual conceptualization of teachers' knowledge, goals and beliefs. *Journal Of Computer Assisted Learning*, *25*(5), 470-488.

Cheung, A. C., & Slavin, R. E. (2012). How features of educational technology applications affect student reading outcomes: A meta-analysis. *Educational Research Review*, *7*(3), 198-215. Retrieved from http://www.sciencedirect.com/science/article/pii/S1747938X12000401

Cheung, A. C., & Slavin, R. E. (2013). The effectiveness of educational technology applications for enhancing mathematics achievement in K-12 classrooms: A meta-analysis. *Educational Research Review*, *9*, 88-113. Retrieved from http://www.sciencedirect.com/science/article/pii/S1747938X13000031

Choi, B., Jung, J. & Baek, Y. (2013). In what way can technology enhance student learning? : A preliminary study of Technology Supported learning in Mathematics. In R. McBride & M. Searson (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2013* (pp. 3-9). Chesapeake, VA: AACE. Retrieved from http://www.editlib.org/p/48061.

Choi, N., & Chang, M. (2011). Interplay among School Climate, Gender, Attitude toward Mathematics, and Mathematics Performance of Middle School Students. *Middle Grades Research Journal, 6*(1). 15-28.

Clarke-Midura, J., Dede, C., & Norton, J. (2011). Next generation assessments for measuring complex learning in science. *The road ahead for state assessments*, 27-40. Retrieved from http://www.ocde.us/CommonCoreCA/Documents/Road_ahead_for%20State%20Assessments_May_2011_Renniecenterforeducationresearchpolicy.pdf#page=31

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Boston, MA: Pearson Education Inc.

Cullen, J. B., Levitt, S. D., Robertson, E., & Sadoff, S. (2013). What can be done to improve struggling high schools?. *Journal of Economic Perspectives*, *27*(2), 133-52.

Darling-Hammond, L., & Adamson, F. (2010). Beyond basic skills: The role of performance assessment in achieving 21st century standards of learning. *Stanford*

Center for Opportunity Policy in Education (SCOPE), Stanford University, School of Education. Retrieved from https://edpolicy.stanford.edu/sites/default/files/beyond-basic-skills-role-performance-assessment-achieving-21st-century-standards-learning-report_0.pdf

Davies, R. (2011). Understanding technology literacy: A framework for evaluating educational technology integration. *Techtrends: Linking Research & Practice to Improve Learning*, *55*(5), 45-52. doi:10.1007/s11528-011-0527-3

Dewey, J. (1938). *Experience and education*. New York, NY: Touchstone.

Feldman, R. S., & Zimbler, M. (2012). Improving College Student Success: The Challenges and Promise of Developmental Education. Retrieved from http://mcgrawhillresearchfoundation.org/wpcontent/uploads/2012/09/Development-Education-FeldmanFinal1242981312-2.pdf

Freier, Nathan G. (2009). "Accounting for the child in the design of technological environments: A review of constructivist theory." *Children, Youth and Environments, 19(*1): 144-169.

Friedman, M.I. (2005). *No school left behind: How to increase student achievement.* Columbia, SC: EDIE.

Friedman, T (2005). *The world is flat: a brief history of the twenty-first century*. New York, NY: Farrar, Straus and Giroux.

Gardner, H. (1985). *Frames of mind: The theory of multiple intelligences*. Basic books.

Graves, S.N., Abbitt, J., Klett, M.D., & Changhua, W. (2009). A mentoring model for interactive online learning in support of a technology innovation challenge grant.

Journal of Computing in Teacher Education, *26*(1), 5-16.

Hattie, J. (2009). *Visible learning - A synthesis of over 800 meta-analysis relating to achievement*. New York, NY: Routledge.

Hussain, T., Feurzeig, W., Cannon-Bowers, J., Coleman, S., Koenig, A., Lee, J., Menaker, E., Moffitt, K., Murphy, C., Pounds, K., Roberts, B., Seip, J., Sounders, V., & Wainess, R. (2011). Development of Game-Based Training Systems: Lessons Learned in an Inter. *Instructional Design: Concepts, Methodologies, Tools and Applications. Volume I, 1*, 431. Retrieved from https://wikis.uit.tufts.edu/confluence/download/attachments/24905467/Chapter_Hussain_etal_June1_cameraready_BlackAndWhite_FINAL.pdf

Jackson, A., Gaudet, L., McDaniel, L., & Brammer, D. (2011). Curriculum integration: The use of technology to support learning. *Journal of College Teaching & Learning (TLC)*, *6*(7).

Joyce, B.R. & Calhoun, E. (2012). *Realizing the promise of 21st century education: An owner's manual.* Thousand Oakes, CA: Sage.

Ke, F. (2013). Computer-game-based tutoring of mathematics. *Computers & Education 60*(1), 448-457. Retrieved from http://www.sciencedirect.com/science/article/pii/S0360131512002023

Kebritchi, M. (2010). Factors affecting teachers' adoption of educational computer games: A case study. *British Journal of Educational Technology*, *41*(2), 256-270.

Kelley, T., & Kellan, N. (2009). A theoretical framework to guide the re-engineering of technology education. *Journal of Technology Education*, *20*(2), 37-49.

Koedinger, K. R., McLaughlin, E. A., & Heffernan, N. T. (2010). A quasi-experimental evaluation of an on-line formative assessment and tutoring system. *Journal of Educational Computing Research*, *43*(4), 489-510. doi:10.2190/EC.43.4.d

Kress, T.M., & Lake, R. (2013) We saved the best for you. Retrieved from https://www.sensepublishers.com/media/1476-we-saved-the-best-for-you.pdf

Kyriakides, L. & Creemers, B.P.M. (2008). Using a multidimensional approach to measure the impact of classroom-level factors upon student achievement: A study testing the validity of the dynamic model. School Effectiveness and School Improvement, *19*(2), 183-205. doi: 10.1080/09243450802047873

Lancaster, P. E., Schumaker, J. B., Lancaster, S. C., & Deshler, D. D. (2009). Effects of a computerized program on use of the test-taking strategy by secondary students with disabilities. *Learning Disability Quarterly*, *32*(3), 165-179.

Lewis, R. (2010). The effectiveness of computer-assisted instruction on student math achievement. Retrieved from http://media.proquest.com/media/pq/classic/doc/3144032211/fmt/ai/rep/NPDF?_s=Cg7RX%2BrjqWdmTgmooCWmNjdvTlU%3D

Malcom, L.E., & Malcom, S.M. (2011). The double blind: The next generation. *Harvard Educational Review*, *81*(2), 162-172. Retrieved from http://www.magnet.fsu.edu/about/howwework/diversity/documents/Malcom_article.pdf

Magnolia Consulting (2012). *Developing student literacy skills: How Study Island aligns with best practice.* Retrieved from http://www.magnoliaconsulting.org

Mathis, W.J. (2010). The "Common Core" standards initiative: An effective reform tool. *Boulder and Tempe: Education and the Public Interest Center & Education Policy Research Unit*. Retrieved from http://epicpolicy.org/publications/common-core-standards

Matthews, C.M. (2007). Science, engineering, and mathematics education: Status and issues (98-871 STM). Washington, DC: Congressional Research Service. Retrieved from http://digitalcommons.ilr.cornell.edu/crs/37

McGraw-Hill. (2011). Corporate responsibility 2011 review. Retrieved from http://www.mcgraw-hill.com/Content/cr/2011-corporate-responsibility-review.pdf

National Center on Educational Statistics. (2007). Trends in international mathematics and science study (TIMSS). Retrieved from http://nces.ed.gov/timss/faq.asp

New Jersey Department of Education (2013). School report card achieves 2011. Retrieved from https://education.state.nj.us/rc/index.html

New Jersey Department of Education (2013). ASK test score achieves 2011. Retrieved from http://www.nj.gov/education/assessment/es/njask/

Nickerson, R.S., & Zodhiates, P.P. (Eds.). (2013). *Technology in education: looking forward 2020.* Hillsdale, NJ: Routledge.

No Child Left Behind (NCLB) Act of 2002, Pub. L. No. 107-110, § 115, Stat. 1425

OECD (2010). PISA 2009 results: What students know and can do – student performance in reading, mathematics and science (Volume 1). OECD Publishing. 07 Dec 2010. Retrieved from http://www.oecd.org/pisa/pisaproducts/46619703.pdf

Partnership for Assessment of Readiness for College and Careers. (2014). PARCC Assessments. Retrieved from http://parcconline.org/parcc-assessment.

Pilli, O., Aksu, M. (2013). The effects of computer-assisted instruction on the achievement attitudes and retention of fourth grade mathematics students in North Cyprus. *Computers & Education, 62*(1) 62-71. Retrieved from http://www.sciencedirect.com/science/article/pii/S0360131512002321

Qualls, J.A., & Sherrell, L.B. (2010). Why computational thinking should be integrated into the curriculum. *Journal of Computing Sciences in Colleges, 25*(5). 66-71.

Seo, Y., Bryant, D.P. (2009). Analysis of studies of the effects of computer-assisted instruction on the mathematics performance of students with learning disabilities. *Computers & Education 53*(1), 913-928. Retrieved from http://www.sciencedirect.com/science/article/pii/S0360131509001213

Shin, N., Sutherland, L. M., Norris, C. A., & Soloway, E. (2012). Effects of game technology on elementary student learning in mathematics. British Journal of Educational Technology, *43*(4), 540-560. doi:10.1111/j.1467-8535.2011.01197.x

Smolin, L., & Lawless, K. A. (2011). Evaluation Across Contexts: Evaluating the Impact of Technology Integration Professional Development Partnerships. *Journal of Digital Learning in Teacher Education, 27*(3). 92-98.

Snyder, T. & Dillow, S. (2012). Digest of education statistics 2011 (NCES 2012-001). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC: U.S. Government Printing Office. Retrieved from nces.ed.gov/pubs2012/2012001.pdf

Study Island (2011). *Baldwin Park students improve achievement on California standards tests.* Retrieved from http://www.studyisland.com/web/uploadedFiles/www.studyisland.com/Content/Results/Case_Studies/Baldwin%20Park%20CA%20Case%20Study%202011%20FINAL.pdf

Study Island (2012). *Lincoln K-8 choice school improves student performance on the Minnesota comprehensive assessment with Study Island*. Retrieved from http://www.studyisland.com/web/uploadedFiles/www.studyisland.com/Content/Results/Case_Studies/Lincoln%20K-8%20MN%20Case%20Study%202010%20FINAL.pdf

Study Island (2012). *Transforming acceptable into exemplary*. Retrieved from http://www.studyisland.com/web/uploadedFiles/www.studyisland.com/Content/Results/Case_Studies/SC120003_Hachar%20Elementary%20Case%20Study.pdf

Study Island (2013). *Case studies, testimonials, foundational and statistical research.* Retrieved from http://www.studyisland.com/web/results

Triola, M. F. (2012). *Elementary statistics technology update.* (11th ed.). Boston, MA: Pearson Education, Inc

United States Department of Education (2010, March). A blueprint for reform: The reauthorization of the elementary and secondary education act. Retrieved from http://www.2.ed.gov/policy/elsec/leg/blueprint/blueprint.pdf

United States Department of Labor. (2013). 2011 Annual Averages – Household Data – Tables from Employment and Earnings. Retrieved from http://www.bls.gov/cps/cps_aa2011.htm

Wagner, T. (2008). *The global achievement gap*. New York, NY: Perseus Book Group.

Wheatley, M., Friese. D. (2007). Beyond networking: How large-scale change really happens. *School Administrator, 64*(4), 35-39.

Wiggins, G., & McTighe, G. (2007). *Schooling by design: Mission, action, and achievement.* Alexandria, VA: Association for Supervision & Curriculum Development.

Williamson, D. M., Bennett, R., Lazer, S., Bernstein, J., Foltz, P. W., Landauer, T. K., & Sweeney, K. (2010). Automated scoring for the assessment of common core standards. *White Paper*. Retrieved from https://research.collegeboard.org/publications/automated-scoring-assessment-common-core-standards

Woolf, B. P., Arroyo, I., Muldner, K., Burleson, W., Cooper, D.G., Dolan, R., & Christopherson, R.M. (2010). The effect of motivational learning companions on low achieving students and students with disabilities. Intelligent *Tutoring Systems*, *1*, 327-337.

Yeh, S.S. (2010). The cost effectiveness of 22 approaches for raising student achievement. *Journal of Education Finance, 36*(1), 38-75.

Yourstone, S.A., Kraye, H.S., & Albaum, G. (2008). Classroom questioning with immediate electronic response: Do clickers improve learning? *Decision Sciences Journal of Innovative Education, 6,* 75-88.

Appendix A: The Project Deliverable

Introduction

The purpose of this study was to investigate the effectiveness of technology integrated-instruction on students' mathematical scores before and after intervention was administered, through an analysis of covariance. A quantitative method using a quasi-experimental design measured numerically nonequivalent pretest and posttest scores to determine if technology integrated-instruction produced an effect on student mathematic algebra achievement. According to Creswell (2012) the experimental group and the control group take the same pretest and posttest, but only the experimental group received the treatment; this design gave me the ability to statistically reveal any comparisons or correlations in the data that resulted between test scores and technology.

Goals

This project will include the creation and implementation of (1) a presentation to district program implementation stakeholders and (2) a professional development presentation for district administration and the professional development committee. The purpose of the presentation to stakeholders is to train them in the district sponsored curriculum-integrated software, Study Island, and review the research concerning the program's impact on student mathematical achievement. The purpose of the professional development presentation will be to provide data garnered from within the Seashell High School to confirm the effects of the Study Island program when infused within the mathematics classroom instruction and to suggest training for additional discipline staff on the benefits of technology-integration and proper program implementation.

The goal of this study was to investigate the effectiveness of Study Island technology-infused software purchased by a local school district when integrated into the mathematics curriculum, as measured by student achievement. Therefore, the following research question served as the basis for addressing the research problem investigated: What is the effect of the integration of the Study Island technology program with high school algebra instruction on the student achievement level of general education students in the Seashell School District?

The presentation of the research findings and benefits of integrating technology into the curriculum will be supported with scholarly literature. The presentation and potential professional development training will expose educators to alternative methods of teaching through the use of online software that can provide outside-of-the-classroom learning opportunities for their students. A system of support will be proposed to the district stakeholders as a measure to assist educational staff on software implementation and difficulties that could arise during its use.

Rationale

It is necessary to investigate the effectiveness of education-based programs to impart knowledge to future learners. Equally important is the role of the researcher to report on ineffective programs so that educators and policymakers have sound data to support a need to seek out additional resources to create a more effective learning environment. The rationale behind selecting a quasi-experimental design was to determine if a relationship existed between specific variables (technology treatment and textbook assessments) by collecting data with predetermined instruments that yield statistical data (Creswell, 2012).

As teachers are crucial to effective technology integration it remains rational to develop a plan that offers educators components of a professional development training model geared toward effective technology infusion (Joyce & Calhoun, 2012). Meeting with key stakeholders provides me an opportunity to convince them of the need to renew the software license and continually seek alternative approaches to increase student achievement. I intend to use my meeting as the venue to teach stakeholders the current online-software sponsored by the district and suggest additional needs assessment surveys be conducted with the staff on enhancing teachers' knowledge and use of technology.

Project Review of the Literature

The basis for this study was to investigate the effect of a school sponsored online program. If teachers provided a technology tool to a students' learning environment, would that software-infusion increase their cognitive mathematic levels of understanding as shown on formative assessments? The second literature review, based on the analysis of the research completed, addresses a problem of low achieving mathematical assessments and technology-infused software used to remediate the problem. Peer-reviewed scholarly articles were accessed through books, journals, and databases such as EBSCO (Elton B Stephens Company), ERIC (Educational Resource Informational Center), SAGE Journals Online, ProQuest and GoogleScholar.com. The key words I used in the research: *accountability*, *traditional instruction*, *technology-integrated instruction, barriers with technology, and professional development opportunities.*

Technology Integration and Accountability

Since the enactment of NCLB; strong demands have been placed on school districts to offer more rigorous course work with an expectation that students will excel higher each year as reported on their standardized achievement tests. School districts are concerned with accountability and the difficulty to meet NCLB standards with every student. Beginning academic year 2014, all public schools within the United States should have reached 100% proficiency in the disciplines of mathematics and English as documented on state standardized test data (Aspen Institute, 2010; NCLB, 2002). The United States government developed this education policy with hopes of closing the achievement gap and making school districts offer standards-based education reform, so that no child is left behind (NCLB, 2002). NCLB standards extrinsically motivated school districts to seek program effectiveness for increasing student achievement.

The importance of attaining AYP (adequate yearly progress) has some school districts providing compensatory education in an effort to meet the NCLB requirements (Spencer, 2009). In an attempt to provide supplementary remediation and enrichment activities to students that go beyond the traditional curriculum of instruction, school districts have enacted compensatory education. The purchase of educational software such as Study Island, used by the district of study, was an attempt for all students in the district to have uninterrupted access. Educational software can then be offered day or night to supplement the district's instruction in an attempt to gain academic success.

The majority of high school mathematics classes have been taught using the traditional lecture format. Historically, the instructor would provide direct instruction, first presenting new material, then modeling the procedure, followed by thinking aloud and guided practice, providing feedback and corrections, and finally allowing students to engage and practice (Hodara, 2011). Face-to-face instruction with students followed by questioning, practice problems, and discussions has been consistently used for many generations (Hodara, 2011). However, the question of which format of learning adequately meets the learning styles of all students in the classroom is still under debate; further research is needed to confirm an ideal learning environment for today's students.

Technology integrated-instruction is another format for learning that is quickly becoming an integral part of education in the 21st century (Patadia & Ramani, 2014). Bonham and Boylan (2011) suggested this format of instruction not only meets the interests of today's learners, but allows students to receive instant feedback making this format more effective than traditional lecture based instruction. Today's technological advancements engage the student learner through visual methods of graphics, animation, and interfacing with peers all over the world (Hodara, 2011). Compared to traditional classrooms, technology infused lessons afford students the ability to learn at their own pace, allowing multiple learners in the room opportunities to work on their level of understanding (Bonham & Boylan, 2011). In the Seashell school district, Study Island is infused with the curriculum by means of remediation practice of concepts already taught and drills to strengthen the new concepts.

Zavarella's and Ignash's (2009) study findings suggested that retention rates were slightly higher among computer-based courses verses the traditional courses taught in mathematics. Three of their studies defended the use of computer integration in the classroom and did not find a statistically significant difference in the students that received traditional instruction compared to those infused with technology (Bonham & Boylan, 2011; Patadia & Ramani, 2014; Ramani & Patadia, 2012). The differences in technology-infused results could hinder how the technology in infused. Joyce and Calhoun (2012) emphasized a need for educators to shift from trying to master the technical skills necessary to use technology to educators being taught how to effectively incorporate the technology into their lessons.

Technology-integration enables schools to offer additional academic time that is not confined to the institutions' seat time. On average, public schools in the United States offer 6 hours of instructional time for 180 days a year. Correlations that have been made regarding time on task and student performance outcomes have policy-makers seeking alternatives to expanding the school day. The National Education Commission on Time and Learning (NCTL) developed a database of over 655 schools that offered expanded time in schools; their research confirmed that students receiving expanded learning time outperformed students with only six hours of instruction per day (Farbman, 2009). Additional evidence confirms that a relationship exists between additional time and achievement. Witkow (2009), examined 702 ninth-graders, half whom studied outside of school daily for two weeks, and compared their achievement to that of their peers who did not reinforce their studies outside of school. Study outcomes revealed that students who spend more time learning increased their achievement scores (Witkow, 2009).

As an incentive to encourage students to access the Study Island remedial software outside of school hours, the district runs contests with prizes based on time spent using the software and achievement within the program. A possible future study could investigate if students' increased academic learning time has an effect on assessment scores.

Technology

Educational institutions continually seek methods to improve student learning. Combining the need to achieve student success with the unlimited potential of technology has school districts budgeting large amounts of funding to support the inclusion of technology. Studies in the literature support increased standardized test scores with the merger of technology in the curriculum (Clarke-Midura, Dede, & Norton, 2011; Lancaster, Schumaker, Lancaster, & Deshler, 2009; Yourstone, Kraye, & Albaum, 2008). Additional studies support increases in students' intrinsic motivation to learn and the ability to process information easier because the content knowledge was presented in various learning formats, through technology integration (Cheung & Slavin, 2012; Choi, Jung & Baek, 2013; Graves, Abbitt, Klett, & Changhua, 2009). Even though barriers to technology integration exist such as limited resources, attitudes and beliefs, a district can combat that with clear vision statements, technology plans, and professional development to sustain the school improvement initiative (An & Reigeluth, 2011).

Professional Development Opportunities

In an attempt by school districts to increase the use of technology in the classroom, teachers must be made aware of its purpose and operation (Davis, 2011). Billing (2010) argued that teachers are often blamed for ineffective technology integration. For that reason, teachers must be trained on the benefits of the district sponsored programs and means to integrate it into daily lessons. Research conducted by Ketter (2010) further affirmed the idea that professional growth is indispensable to effective technology infusion in classroom lessons.

For successful technology integration to occur, a unified vision for creating professional development opportunities grounded in technology practices requires a commitment by all stakeholders. Trainings need to be ongoing, systematic, and goal-oriented to ensure effective implementation by the instructional staff (Davis, 2011). A plan of action should include specific skills and the knowledge-base necessary for teachers to operate the program. Providing teacher contact time, follow-up discussions, and meaningful activities that reflect their degree of programming expertise will provide the teachers with confidence to take part in technology-based professional learning communities (An & Reigeluth, 2011).

Personalizing professional development trainings to discuss specific district barriers to effective technology integration can save time and increase teacher interest (Hattie, 2009). Teachers can complete needs assessments to ascertain their current degree of expertise with using the district software, practice additional activities, and then implant the new software skills into their lessons while aligning to district curriculum standards (Billing, 2010). These teacher led learning opportunities encourage teachers to customize instruction to promote pupil ownership of their own learning.

A review of literature on providing professional development about the benefits of integrating technology with instruction spotlighted some key advantages. Technology-assisted instruction with a program such as Study Island allows for individualized exercise, self paced learning, and positive reinforcement (Magnolia Consulting, 2012). Technology software contains components that can motivate students, allowing for repeated practice. Bremner (2013) discovered through research that providing students with concrete symbols found in online programs, contingent upon the achievement of a special goal, will increase performance levels. Web-based programs can afford parents the opportunity to help their children achieve academic success, through online access to the program from their homes and access to ongoing status reports (Hattie, 2009). More importantly, technology-assisted instruction can provide immediate feedback on assessment data for teachers to use to tweak teaching practices, drive curriculum, and remediate instruction. These advantages become beneficial to teachers, parents, and students since they can monitor student progress and help students move towards mastery.

Implementation and Target Audience

Once the study is approved by Walden University, project implementation will commence. I will hold a meeting with stakeholders in the district of study for the purpose of outlining and discussing the study’s findings. Stakeholders within the district responsible for program implementation and renewal include curriculum supervisors, principals, superintendent of schools, and Board of Education curriculum committee members. At this meeting, I will share my findings through a PowerPoint presentation on the effectiveness of the district-sponsored Study Island software as used in the ninth-grade mathematics curriculum. Key objectives to the presentation will include:

- Presenting priority information regarding the project study data analysis.
- Conducting illustrative demonstrations using the Study Island software.
- Guiding trainees' practice in assessing the essential elements of the program.
- Discussing potential barriers and means to troubleshooting.

Due to my extensive literature review, I will request to be made part of the professional development committee to discuss proper program implementation. Additionally, if the stakeholders decide to renew the Study Island program license, I will volunteer to provide professional development training throughout the program's inception within the district, based on the literature review and study findings.

Potential Resources

The district has already budgeted funds to be used as supplemental instruction, allowing students access to academic software beyond the regular school day to remediate education. This investigation confirms that Study Island is beneficial and should be renewed, as the product to provide student-remediated instruction throughout the day. Professional development training can be offered to staff during one of the four professional development training days scheduled in the school calendar. The location for the training will be held within the local school district and no additional expenses are required to run the training. Ideally, the initial training will be the first of many to help support instructional staff on ways to incorporate the software into their lessons and suggested activities to encourage use outside of the classroom.

If the district's technology coordinator is committed to this project, it should increase its overall effectiveness and impact. Currently his responsibilities are to maintain the district's website, renew and repair computer software, provide assistance with technical difficulties, and monitor teachers' use of technological resources as well as generate reports. With the permission of the superintendent of schools, a request will be made for the coordinator to update the website to include the host link to log into the Study Island. Greater access to the program could increase overall educator and student traffic while increasing student achievement in mathematics and it's usefulness to the district.

Outline Components and Timetable

Prior to sharing my findings with all stakeholders, I will implement the PowerPoint presentation at my monthly district administration meeting. The presentation will include a review of the results, a short demonstration on how the Study Island program is used in the district, and a discussion on strategies to incorporate Study Island into all disciplines throughout the district. Once the presentation has been shared with district level administration I will present to all district stakeholders responsible for program evaluation and renewal. If the stakeholders feel it is necessary, I will present my study and provide a demonstration of the district-purchased software to the Board of Education and community, at their next scheduled Board of Education meeting. The timetable for presentation will be within 2 months of the initial district administration meeting.

Acceptance by the district stakeholders to implement the Study Island software throughout the district will increase the likelihood that the proper professional development training will occur. It remains important to gain necessary approvals so that I can underscore the tenets of the technology-based infusion into the curriculum and assist in professional development training to the district.

Professional development training for staff in the district will occur in three sessions, as outlined in Table A1. Session one and two will occur prior to the start of school in two of the three professional development district-wide training sessions. Session three will occur in October as an evaluation of how the Study Island program is being implemented and to serve as a time for additional training and feedback.

Table A1
Timeline of Professional Development Training Sessions

Time	**Session One**	**Session Two**	**Session Three**
8:00 AM to 8:30 AM	Sign-in & Continental Breakfast	Sign-in & Continental Breakfast	Sign-in & Continental Breakfast
8:30 AM to 8:50 AM	Introductions & Announcements	Introductions & Study Island Sign-in Procedures	Introductions & Announcements
8:50 AM to 9:30 AM	Pre-assessment Questionnaire; Discussion	Data Questionnaire; Discussion	Study Island Implementation Reflection
9:30 AM to 10:30 AM	Presentation on Digital Learning and Review of Technology Literature	Project Study Data Collection & Analysis; Presentation of Results	Accessing Student Data; Analyzing Student Data; Reflection
10:30 AM to 11:15 AM	Video Presentation – Infusing Technology in the Classroom	Illustrative Demonstrations using the Study Island Software	Progress Monitoring Features; Additional Assignments Outside of School
11:15 AM to 12:30 PM	Lunch	Lunch	Lunch
12:30 PM to 1:40 PM	Integration of Technology into Lesson Plans – Guest Speaker	Guiding Trainees' Practice in Assessing the Essential Elements of the Program	Advantages and Disadvantages of Technology Integration; Program Supports
1:40 PM to 2:40 PM	Best Practices of Technology Implementation; Discussion	Discussing Potential Barriers and Means to Trouble Shooting; Strategies to Incorporate Study Island in Various Disciplines	Professional Development Post-assessment; Address Needs for Future Trainings
2:40 PM to 3:00 PM	Reflection Questions; Sign-out	Reflection Questions; Sign-out	Reflection Questions; Sign-out

Study Data Collection and Analysis

The quantitative method of this study included collecting the data (archival) and conducting the analysis. After receiving approval from the institutional review board (IRB) the superintendent of the school district was asked to provide the data, because he is the only one in the district with access to archived data. Coded data was stored on the researcher's personal computer and protected with a password.

A spreadsheet was constructed to compare and analyze test scores. Scores from week 1 were utilized as a pretest and compared to the week 10 posttest scores. The spreadsheet had three columns and 56 rows of coded data. The superintendent changed the names of the participants to protect their identities and provided the requested data. Participant identity was kept confidential with the superintendent of schools. The flash drive utilized for this study was stored in a locked file cabinet in the home of the researcher for the duration of the study and will remain in the file cabinet for 5 years after the project completion. The flash drive will then be destroyed and disposed of accordingly.

The data was analyzed using the IBM SPSS Statistics software version 21 to determine if differences existed between the two independent variables (intervention and control groups), dependent variable of posttest scores and the covariate of pretest scores as recommended by Triola (2012). An analysis of covariance (ANCOVA) was used to determine the relationship between mathematical scores and intersections between the technology treatment and control group while applying statistical control to the curriculum. Scores indicated whether the technology-integrated lessons resulted in higher mathematics scores, lower scores or resulted in no statistically significant impact. A *p* value of less than .05 indicated statistical significance. The results section answered the hypothesis question and summarized the raw data, staying close to statistical findings without drawing implications or meanings from them (Triola, 2012). A table showed correlations between variables, the significance levels, and the case numbers. The figure summarizes the information presented in a scatterplot matrix; providing a descriptive picture of the linear relationships between variables (Creswell, 2012).

Inferential statistics was used to reach conclusions that go beyond the immediate data, and more complex statistical procedure included the ANCOVA. The independent variable had two levels: the control group (traditional instruction) and the intervention group (technology-infused instruction). The dependent variable was the scores on the posttest assessment displayed on an interval scale because the distances between each incremental value were thought to be equal (Triola, 2012). A covariate (pretest scores) was a continuous control that was not directly related to the outcome.

In this study, I looked at the disaggregated test scores of the 28 ninth-grade students who participated in the technology treatment compared to the other 28 students placed in the control group. The primary data source for this study was the students' pre and posttest scores from the mathematics curriculum textbook at SHS. The interval level of measurement created from the archival data collected between the two groups showed the difference that exists between them (Triola, 2012).

Presentation of Results

I investigated archived test score data to determine the effectiveness of technology-integrated instruction on high school students' mathematic achievement in the Seashell School District, located in New Jersey. A statistical analysis was employed to determine if the Study Island software program affected scores while controlling for the pretest. Archival data were obtained by the superintendent of schools from the Realtime records database.

A one-way analysis of covariance (ANCOVA) was utilized to evaluate the impact of an intervention while controlling for pretest score. The standard for an ANCOVA is an alpha set at .05, the alpha level was the criterion used in this study to gauge statistical significance. If after running the ANCOVA analysis a *p*-value of less then .05 is obtained, that indicates a significant difference between the groups (Triola, 2012). Two groups of ninth-grade algebra students ($N = 56$) were the focus of the study. Group A was identified as a control group that received 90-minutes of traditional mathematics instruction five days a week. Group B was identified as the treatment group that received 90-minutes of traditional mathematics instruction four days a week and one 90-minute session on technology-integrated instruction using Study Island software as the intervention. Study Island was examined in this study through an analysis of archived mathematic assessment scores from group A and B, on the pretest and posttest over a 10 week integration period. A control for pretest (covariate) was used to determine if the intervention had an effect on the outcome. The independent variable, type of instruction, included 2 levels: traditional instruction and technology-integrated instruction. The dependent variable was the archived posttest scores and the covariate was the archived pretest scores. The scores from the pretest and posttest were entered in IBM SPSS v21 for analysis, and all inferential tests were run using alpha =.05.

The research question was: What is the effect of the integration of the Study Island technology program with high school algebra instruction on the student achievement of general education students in the Seashell School District? Related hypotheses include:

> H_0: There is no significant difference in the mathematics achievement scores of students who participated in the technology-integrated mathematics instruction and those who participated in mathematics instruction without technology-integration, controlling for preexisting differences in mathematics achievement.
>
> H_1: There is a significant difference in the mathematics achievement scores of students who participated in the technology-integrated mathematics instruction and those who participated in mathematics instruction without technology-integration, controlling for preexisting differences in mathematics achievement.

Before running the ANCOVA test and testing the hypothesis, I tested several assumptions:

8. Independence.
9. Interval scale.
10. Error in correlation.
11. Homogeneity of variance.
12. Covariate is measured without error and is reliable.

13. The linear relationship between outcome variable and covariate.

14. The regression relationship between covariate and dependent variable.

The first two assumptions were met; observations were independent of each other, and the covariate (pretest) was measured on an interval scale. The second assumption ideally should have been done prior to the intervention, but this study referenced archival data. To check this assumption I ran a correlation test. The covariate and dependent variable should be related, and the relationship should be linear at each combination of the levels of the independent variable. The output showed that posttest and pretest are positively correlated with a correlation value of .841, $p < .001$. The correlation was significant, and I have met the assumption that the covariate and dependent variable are correlated, as shown in Table 1.

Table 1

Correlations

		Covariate – Pretest	DV – Posttest
Covariate – Pretest	Pearson Correlation	1	.838**
	Sig. (2-tailed)		.000
	N	56	56
DV – Posttest	Pearson Correlation	.838**	1
	Sig. (2-tailed)	.000	
	N	56	56

**. Correlation is significant at the 0.01 level (2-tailed).

Levene's Test for the equality of error variances was used to determine the fourth assumption; if the research violated the assumption of the variety between groups (means that the covariate should not differ between groups). Table 2 outcome, p (.995) > α (.05) confirmed the assumption of homogeneity of variance was not violated.

Table 2

Levene's Test of Equality of Error Variances

Dependent Variable: Posttest Scores

F	*Df*1	*Df*2	Sig.
.000	1	54	.995

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a. Design: Intercept + Pretest + Group

The fifth assumption was to check for linearity; a scatterplot was run to make sure the covariate was related to the outcome. Lines were used to identify the relationship between the two groups. In Figure 1, the lines appear to be traveling in a general linear fashion; therefore, the research has not violated the assumption of a linear relationship.

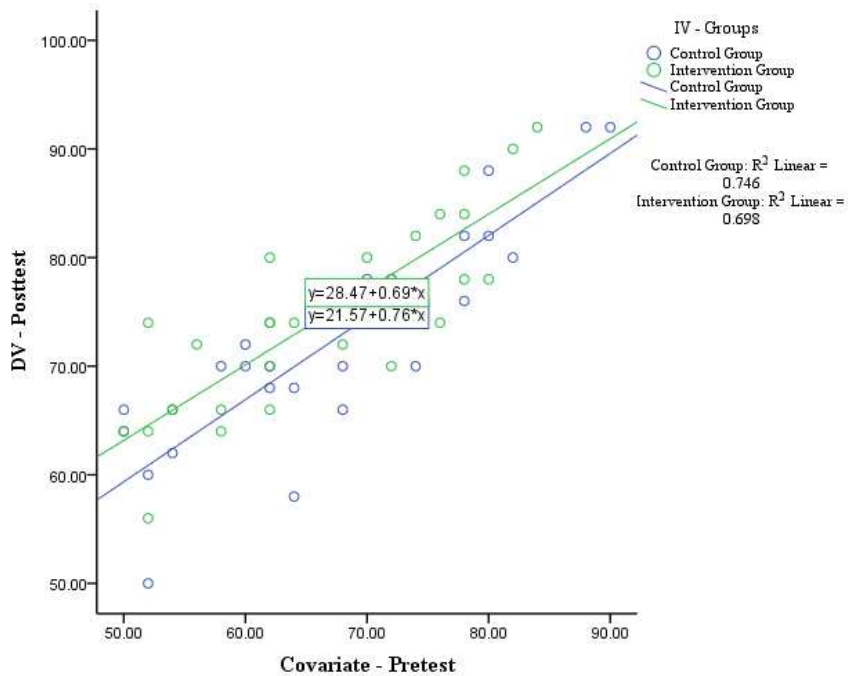

Figure 1. Linear Relationship

To ensure there was no interaction between the covariate and the treatment, because the lines are not traveling parallel throughout the plot, I checked to see if there was a statistically significant interaction between the covariate and the treatment. The statistical analysis technique, setting the alpha level set .05, is the standard for an ANCOVA test used in this analysis. The α is the criterion used to gauge statistical significance, if a $p < .05$ is obtained, and there is a significant difference (Triola, 2012). Looking at the output of groups times pretest, the results suggested the interaction was not significant, $F(1,52) = 0.245$, $p = .623$. Outcome indicates the means that the factor (group, $M = 16.54$) and covariate (pretest, $M = 3339.66$) do not interact, then the assumption of homogeneity of regression slopes was not violated as shown in Table 3. Additionally, it supported the earlier conclusion from the scatterplot, as shown in Figure 1, that it appeared these groups are similar in trending data.

Table 3

Univariate Analysis of Variance

Tests of Between-Subjects Effects
Dependent Variable: DV – Posttest

Source	Type III Sum of Squares	*Df*	Mean Square	*F*	Sig.
Corrected Model	3405.302[a]	3	1135.101	46.017	.000
Intercept	868.856	1	868.856	35.224	.000
Group	16.541	1	16.541	.671	.417
Pretest	3339.660	1	3339.660	135.390	.000
Group * Pretest	6.049	1	6.049	.245	.623
Error	1282.680	52	24.667		
Total	307361.000	56			
Corrected Total	4687.982	55			

a. R Squared = .726 (Adjusted R Squared = .711)

After checking the assumptions, the ANCOVA test was run, to include the covariate in the analysis to control for differences on the independent variable. The purpose of using an ANCOVA was to evaluate the relationship between the covariate and the dependent variable while controlling for the factor.

Descriptive statistics were used in order to summarize the data before using a covariate to remove any bias from the variables. Fifty-six mathematic test scores (N = 56) were looked at in this study, as shown in Table 4. The mean score at the onset appeared to show that students in the intervention group had a mean higher score at 74% (M = 74.29, SD = 8.772) than the control group at 73% (M = 72.75, SD = 9.770), but this does not show statistical significance.

Table 4

Descriptive Statistics

Dependent Variable: DV – Posttest

IV – Groups	Mean	Std. Deviation	*N*
Control Group	72.7500	9.77004	28
Intervention Group	74.2857	8.77225	28
Total	73.5179	9.23234	56

When running the ANCOVA analysis, the covariate is included in the analysis to control for the difference on the independent variable. The aim of this analysis is to access the relationship between the covariate and the dependent variable while controlling for the factor. The ANCOVA test, results shown in Table 5, examined the effect between the variables. The group had a significance value of .04, less then .05, indicating the groups were significantly different from each other, $F(1, 53) = 4.43$, $p = .04$. The estimated marginal mean for the traditional instruction ($M = 72.127$) and technology-integrated instruction ($M= 74.909$); adjusted based on the covariate evaluated at the following values: covariate – pretest = 66.8571. The partial effect size, η_p^2 is .077, explains the likelihood (7%) that this difference would be present in the population at large. To determine the influence of the covariate, the pretest $p < .001$ indicated the covariate had a significant effect on the outcome. Roughly 72% of the results are explained by the pretest variance, and that confirmed that the pretest was a good measure to use to determine the effect of the intervention on increased mathematic scores.

Table 5

Tests of Between-Subjects Effects

Dependent Variable: DV – Posttest

Source	Type III Sum of Squares	*Df*	Mean Square	*F*	Sig.	Partial Eta Squared
Corrected Model	3399.253[a]	2	1699.627	69.899	.000	.725
Intercept	864.245	1	864.245	35.543	.000	.401
Pretest	3366.236	1	3366.236	138.439	.000	.723
Group	107.623	1	107.623	4.426	.040	.077
Error	1288.729	53	24.316			
Total	307361.000	56				
Corrected Total	4687.982	55				

a. R Squared = .725 (Adjusted R Squared = .715)

A Bonferroni post-hoc test, as shown in Table 6, was run to compare the outcome of the control group to the intervention group. The post-hoc test is similar to a series of *t*-tests except they are more stringent. The tests were not pre-planned and only used when the null hypothesis is rejected. I can conclude that a technology intervention does have a statistically significant effect while controlling for pretest score. The results indicated the statistical significance difference $p(.04)$ $\alpha(.05)$, and, therefore, the null hypothesis was rejected. The results suggested that different teaching methods, traditional or technology-integrated, do affect mean post assessment scores.

Table 6

Pairwise Comparisons

Dependent Variable: DV – Posttest

(I) IV - Groups	(J) IV – Groups	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Control Group	Intervention Group	-2.782*	1.322	.040	-5.433	-.130
Intervention Group	Control Group	2.782*	1.322	.040	.130	5.433

Based on estimated marginal means
*. The mean difference is significant at the .05 level.
b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Learning Outcomes

My role is to incorporate the research findings into a project and to present my findings to the curriculum supervisors, principals, superintendent, and Board of

Education curriculum committee members. I will present my research findings through the use of a PowerPoint presentation and demonstration of the Study Island software. I will also share a plan in which I will volunteer to provide professional development training to the staff. Ideally, I will be responsible for securing permission through the professional development committee to carry on training during professional days and for providing all printed materials for teachers to reference when implementing the software within their classrooms. The purpose and goals of the training are to share a best practice with fellow educators to facilitate adult learning. Discussions could spark a future study to determine if the local district could benefit from a qualitative study on the program's effectiveness as noted by users, thus expanding my role as a practitioner, scholar, and agent of change.

Project Evaluation

The project evaluation used in the district for professional development trainings is outcomes-based. The evaluation is suited for measuring the overall training success as determined by participant implementation of the knowledge received. The district professional development committee has developed and provides a standard district professional development evaluation survey that is used after the training to determine the effectiveness of the trainer. The goal of the professional development training for this project is to empower instructional staff with the knowledge to access the district sponsored software, set program benchmarks to measure student success, and activate content that reinforces lessons learned in the classroom. The pre and post assessments along with the data questionnaires will be gathered before and after the Study Island sessions. The performance of the program can be measured through the programs, data analysis reports and teacher summative responses to district surveys. The initial rating of the two hour training will supply important data concerning how the training needs to be shifted and what other needs the instructors may have to successfully infuse the software into their course of study. The professional development presentation can be modified after the initial training to reflect the needs identified by the professional development participants and to reflect the needs of the district.

An outcome-based evaluation is desirable to ascertain if any impact is obtained in student achievement through the Study Island program. Instructional staff can use benchmark tests supplied with the program, teacher-made formative assessments, or district-adopted curriculum summative assessments to measure student achievement from the use of the technology-infused program.

Instructional staff, paraprofessionals, curriculum supervisors, and principals are the key stakeholders in the district who will be invited to attend the professional development training in support of increased student achievement. The motivating factor behind the shared research is to ensure the local school district is providing the best instructional support possible for students within the district. The local school district should experience an increase in standardized test scores if program implementation is executed properly, an expected effect that would restore the reputation of the district in the local community as a successful academic institution. Most importantly, struggling students will be provided with another instrument to apply outside of the traditional classroom to strengthen academic areas of demand.

Session One: Pre-Assessment Questionnaire

This questionnaire is for your benefit and will be used in today's training session.
Please circle the option that fits your experience the best.

---

1. Do you know how to use a web browser such as; Firefox, Chrome, or Internet Explorer) to get around the internet?
   - Yes, I frequently browse the internet.
   - Sometimes, but I really don't have much exposure to it.
   - No, but I am willing to learn new things.

2. How comfortable are you working with technology in the classroom?
   - I find working with computers interesting.
   - I always seem to mess up the system's settings.
   - I do not like computers, but I understand their importance in today's education.

3. Do you know how to turn your system on and off properly?
   - Yes, I know my system's shut down procedure.
   - Yes, I just press the power button to exit
   - No, but I am willing to learn the process.

4. How will you handle the situation if your computer (or software) freezes at any point during your lesson?
   - I expect internet connection issues and will provide an alternate assignment.
   - I will call tech support and ask for assistance.
   - This is my greatest fear and it will cause a lot of frustration.

5. How will you handle the situation if the internet connection is interrupted during a lab period?
   - I will use the lab time to verbally teach the topic at hand.
   - I will provide extensions on assignments.
   - I will get very upset and take the students back to the classroom.

Session Two: Technology Data Questionnaire

This questionnaire is for your benefit and will be used in today's training session.
Please circle the option that best expresses your experience level.

---

1. How do you feel about using technology data for student feedback?
   - I don't have time to download internet data.
   - I am nervous about it. I am not sure how to access it.
   - I am excited to utilize the systems quick feedback response.

2. Are you comfortable with file management on your computer, such as saving student data and moving around files to different directories or drives?
   - Yes, I am pretty comfortable with the process.
   - Somewhat, but sometimes I can't find where the files are saved.
   - No, but I will ask colleagues for assistance.

3. How good are you at providing directions on internet assignments and retrieving responses?
   - I prefer to verbally discuss assignments with the class.
   - I have difficulty understanding software steps and frequently require clarification.
   - I can provide directions on my own and respond to student's questions.

4. Will you be able to set aside some time to participate in weekly online learning with your students?
   - Yes, I have budgeted time for this software and extended learning.
   - Not weekly, but I can commit to monthly interaction.
   - Maybe, my schedule varies from week to week.

5. How regularly will you be able to log onto the internet to work on implementing new software into your curriculum.
   - Only once a week.
   - As often as it requires.
   - I don't know for sure.

Session Three: Post-Assessment Questionnaire

Please provide feedback on the professional development training you received.

1. Did you find the time spent out of the classroom to learn new strategies beneficial?

2. Do you feel confident in applying the new material/strategies to your teaching cache?

3. Describe benefits gained from these training sessions.

4. Do you believe the implementation of these new strategies will alter students' academic proficiency?

5. Provide suggested topics that would benefit you in future training sessions.

Software Trainer Notes

Session 1:

- Set up laptop and lightbox to orally review study literature.
- Access district sponsored PD360 professional development videos on technology.
- Introduce district teacher trainer to present training on incorporating technology into lesson plans.
- Further use district teacher trainer to discuss best practices with uses of technology-infused into curriculum.

Session 2:

- Participants will require login information to access the Study Island program.
- Demonstrate the two approaches to using Study Island; student-paced and teacher-led.
- Review the goal of the Study Island Program.
- Instruct participants to click on the LESSON for a demo.
- Review professional development teacher resources.
- Discuss standards alignment.
- Review the different icons on the screen.
- Explain that retests are not designed to be diagnostic
- Review assigning lessons, number of questions, pass percentage.
- Discuss program statistics screen and grading.
- Discuss game mode and rewards system.
- Show how to print out worksheets.
- Discuss software compatibility with classroom response systems.
- Review parent notification icon.
- Refer participants to tutorials for additional help.
- Review how message center can be activated and used with students/parents.
- Discuss teacher functions (i.e. Adjust student difficulty).

Session 3:

- Discuss using the class grade book.
- Review student report features (individual and class).
- Explore blue ribbon contests.
- Demonstrate removing sessions.
- Review help and contact buttons.
- Discuss reproduction restrictions.
- Handout printed resources and links.

Appendix B: Raw Data Set

0	72.00	76.00	1	78.00	78.00
0	68.00	70.00	1	80.00	78.00
0	78.00	76.00	1	78.00	84.00
0	50.00	66.00	1	62.00	80.00
0	58.00	70.00	1	52.00	74.00
0	66.00	77.00	1	62.00	74.00
0	52.00	50.00	1	50.00	64.00
0	68.00	66.00	1	78.00	88.00
0	60.00	70.00	1	52.00	56.00
0	62.00	70.00	1	52.00	64.00
0	60.00	72.00	1	58.00	64.00
0	72.00	78.00	1	56.00	72.00
0	88.00	92.00	1	62.00	74.00
0	74.00	70.00	1	62.00	66.00
0	64.00	68.00	1	74.00	82.00
0	68.00	76.00	1	68.00	72.00
0	64.00	58.00	1	82.00	90.00
0	50.00	64.00	1	64.00	74.00
0	80.00	88.00	1	72.00	70.00
0	70.00	78.00	1	58.00	66.00
0	52.00	60.00	1	84.00	92.00
0	54.00	62.00	1	72.00	78.00
0	74.00	76.00	1	54.00	66.00
0	62.00	68.00	1	70.00	80.00
0	80.00	82.00	1	76.00	74.00
0	78.00	82.00	1	76.00	84.00
0	90.00	92.00	1	62.00	70.00
0	82.00	80.00	1	54.00	66.00

Curriculum Vitae

Michele Lee Ramsay

Pine Beach, NJ 08741
mramsay@centralregional.net

Summary of Qualifications

- 10 years of diverse teaching and educational experience in the classroom and 7 years in Administration.
- Energetic, resourcesful and dedicated educator who continually initiates projects and programs to enhance learning.
- Outstanding ability to establish cooperative, professional learning communities and strengthen relationships with parents, staff, and fellow administrations.
- Dedicated to professional growth through ongoing continuing education.
- Technical experience in multimedia and educational software, computer-assisted instructional programs: Blackboard, Study Island, Odyssey Ware.

Education and Certifications

Doctorate of Education (Ed.D.), Administrative Leadership and Teaching
Walden University, Minneapolis, MN 2014

Masters in Education (M.Ed.), Administration
Kean University, Union, NJ 2002

Bachelor of Liberal Arts
Georgian Court University, Lakewood, NJ 1996

Certifications

NJ State Elementary Education 1996
NJ State Special Education (K-12) 1996
NJ State Supervisor 2002
NJ State Principal 2006

Career Highlights

Director of Special Services, Grades k-12 2013 - Present
Central Regional School District, Bayville, NJ / Hugh J. Boyd Elementary, Seaside Heights, NJ
Oversee the Central Regional School District 7-12 and Seaside Heights School District special education child study team, teachers, and paraprofessionals; a staff of 86 professionals.

- Supervise a budget of over 2 million dollars.
- Conduct monthly child study meetings, department meetings, and staff trainings.
- Observe all staff using the Marzano iObservation model
- Interpret standardized testing data and develop programs to increase student achievement.
- Serve on numerous educational committees overseen by the superintendent in conjunction with the administration team responsibilities.
- District Homeless Liaison; Activities and Facilities Coordinator
- Operate the extended year program (summer school).
- Organize and MC large school events; assemblies, award recognitions, graduation

Assistant Principal, Grades 9-12 2007 - 2013
Central Regional High School, Bayville, NJ
Willing and eager to complete all tasks set forth by the Principal/Superintendent. Supervise student body, staff observations, activities coordinator and oversee computer lab instruction. Complete daily discipline referrals and truancy issues, in a timely manner.

- Co-supervised the High School Science Department (2007-2010)
- Computer Lab Administrator in the High School, designing individualized curriculum to educate students in their areas of weakness.
- Member of the CAPA team, presented accomplishments at State level and helped write grant that awarded the school $100.000.00.
- Professional Development Committee; wrote and revised yearly plan; help manage Professional Learning Communities.
- Annually revise emergency manual and assist in conducting monthly drills.
- Students' activities facilitator, helping organize events, receiving board approval, monitoring activity production on a monthly basis.

Classroom Teacher, Grades 9-12 1997-2007
Central Regional High School, Bayville, NJ
I employed an integrated approach towards teaching by utilizing a variety of teaching methodologies to facilitate student learning including critical thinking, open-ended questions, manipulative, computers, books, and peer teaching.

- Chosen by NJ DOE to set CCCS Science Standards on the HSPA.

- Mentor students/new teachers; provide guidance on classroom management.
- Developed district corrective action plan - rewrote over 100 procedures to ensure 100% compliance in special education programs by NJDOE (2002).
- Wrote/revised science curriculum (Earth Science, Biology, and Physical Science).

Athletic Coach 1997-2005

Provided one-on-one and team instruction to high school students to promote self-confidence, achieve and sustain target levels in the fields of ***soccer, softball***, and ***track***.

Key Club Advisor and Class Advisor 1996-2007

Key Advisor to the world's largest community service organization. Annually receive state recognition for yearly achievements of donating over 10k to charitable organizations. I received two International Honors and Advisor of the Year by NJ State Key Club. As Class Advisor I implanted proms, fundraising events and ran graduation for over 300 students.

Honors

New Jersey State Key Club Advisor of the Year, 2006
CRHS Golden Apple Recipient, 2007
Panelist on NJ Core Curriculum Content Standards, HSPA Science
$100,000. CAPA Grant recipient, 2009
Distinguished Staff Award for Voluntary Efforts, 2013
Central Regional Principals and Supervisors Association President, 2011 - present

Community Affiliations

Pine Beach Council Member 2007-2008
Active Member Pine Beach Alcohol and Drug Alliance
Honorary Member Toms River Day Break Kiwanis