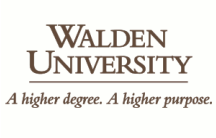

2016

NovaNET's Effect on the Reading Achievement of At-Risk Middle School Students

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This is to certify that the doctoral study by

Alice Harris Jackson

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2015

Abstract

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MA, University of West Alabama, 2007

BS, Concordia College Selma, 2006

Doctoral Study Submitted in Partial Fulfillment

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Abstract

At-risk and special education students in the 7th and 8th grades in a rural middle school in western Alabama, in the years following the introduction of the No Child Left Behind federal legislation in 2002, failed to achieve adequate yearly progress in reading. School districts are increasingly implementing flexible computer-based intervention programs to improve their students' reading achievement. Using a between-group design, the purpose of this study was to determine whether NovaNET, a newly adopted reading intervention program, enhanced the reading attainment of at-risk and special education students. Guided by constructivist theory, archived reading achievement data from the 2009–2013 Alabama Reading and Mathematics Test were analyzed for 3 consecutive cohorts of special education and at-risk students who did (n = 76) or did not (n = 73) participate in the NovaNET program. With dependent variables of reading achievement at the end of 7th and 8th grade, with independent variables of experimental-control group, gender, and general-special education status, and a covariate of reading achievement at the end of 6th grade, a multivariate analysis of covariance indicated a significant main effect associated with participation in the program (F = 4.13, df = 2, p < .02), whereas significant higher-order interaction effects pointed to differential program benefits for specific subgroups of students. Although overall effect sizes were small to modest, the results indicated that NovaNET can increase educational attainment for at-risk and special education students who are struggling with reading. This study may contribute to positive social change by providing educators with scientific data about a flexible, technology-enhanced program to promote reading instruction and achievement for at-risk general education and special-education students entering middle school.

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Dedication

"But those who wait on the Lord shall renew their strength; they shall mount up with wings like eagles, they shall run and not be weary, they shall walk and not faint" (Isaiah 40:31, NKJV).

This dissertation is dedicated to my loving and caring family; my husband, Frank; my adorable daughters, Jasmine and Ja'Kyra; and my loving sisters, Cherlanne, Cassandra, Rhonda, La'Tauja, and Valerie; my brother, Bennie Harris Jr.; my brothers-in-law, Lonzy and Ulysses; my nephew, Martavious; and my intelligent nieces, KaDreika, Quiwanda, and Aaliyah. I am forever thankful for each of you, your prayers, encouragement, babysitting, financial contributions, and abundance of love that made it possible for me to complete this milestone and become the first in our family to receive a doctoral degree. Along this journey, I faced many obstacles from my husband's near fatal automobile accident to my sister's life-changing illness but God allowed these stumbling blocks to become my stepping stones.

I would also like to dedicate this dissertation to my deceased parents, the late Mr. and Mrs. Bennie and Alice Waller Harris. Even though God only gave us a few years together, the foundation you both provided for me was enough for me to build an empire. I know that you both would be proud of your baby girl "Nika" and I Love You to eternity! You may be gone, but you'll never be forgotten.

Acknowledgments

First and foremost, I would like to thank God and give Him all the praises! To my mentor and dissertation chair, Dr. Mogens Jensen, I can't thank you enough for your affirmative leadership. I've never worked with an individual more concerned and compassionate about his student. There was a time that I wanted to give up, but it was with Dr. Jensen's optimism that I could see the light at the end of the tunnel. He believed in me when I lost sight and didn't believe in myself. Dr. Jensen, I am forever grateful for you taking me under your wings and providing excellent leadership. I would also like to thank Dr. Catherine Sullivan. Your encouragement and words of wisdom allowed me to press my way to continue this challenging journey. Thank you Dr. Boyd Dressler for stepping in as my second committee member as I completed the final stages of my dissertation process; your recommendations were greatly appreciated. To my University Research Reviewer (URR), Dr. Wendy Edson, and my Form and Style Editor, Mr. Michael Miller, thank you both for your constructive feedback and input that was beneficial in making sure my dissertation was top notch.

I would also like to thank my cousin-in-law, Dr. Duana Bassham Shears, for her continuous support and words of encouragement. Thank you Dr. Daniel Boyd, Dr. Kirit Chapatwalla, Dr. Doreen Moyo, Shamarick Paradise, and Dr. Elijah Swift for your assistance and contributions when I needed them. To my friends and co-workers, Kristy Bettis, Jennifer Black, Arthur Capers, Tamera Rucker-Carter, Christy Pickens-Crittenden, Tina Turner-Crittenden, Gladys Hood-Davis, Keith Davis Sr., Nettie King Flennory, Zella Haywood-Ford, Carolyn Franklin, Dejon Freeman, Monique Gordon, Deneen Hale, Clifford Hunter, Lesia James, Jacqueline King, Betty Lewis, Jacqueline Lucy, Clifford

Matthews, Dr. Shayla Crenshaw-McCray, Keonta Williams-Melton, Freda Milton, JoAnn Owden, Monica Rayford-Perkins, Cheryl Randolph, Stephanie Smith, Courtney Stewart, Joshua Stewart, Alicia Ward-Thomas, Katara Robinson Thornton, and Latonia Hunter-Tisdale, thank you all for being the final pieces to complete the puzzle. Thank you Pastor John Lumpkin, Deacon Herbert Blackmon, Deacon Tyrone Lumpkin, Mayor Louvenia Powell Lumpkin, Lula Powell Watters, and the Siloam Baptist Church family for believing in me and thinking I can do anything. You all provided me with the best support system that a person could have; it was the love and inspiration that you all contributed that allowed me to persevere.

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Section 1: Introduction to the Study

Reading is an indispensable gateway for individuals to attain a successful education and become well-rounded citizens in society. One of the major problems that administrators and educators are facing today is providing individualized instructions to students with reading disabilities to ensure they meet and, wherever possible, exceed the testing requirements set forth by the state and federal governments (International Reading Association, 2011). The No Child Left Behind (NCLB) federal legislation (NCLB, 2002) required all states to create and implement initiatives demonstrating how all students in schools statewide will attain proficiency in reading and mathematics by the 2013–2014 school year. This accountability-focused legislation shifted the emphasis from a global focus on all children to a narrow focus on each child: According to NCLB, schools must ensure that all pupils, regardless of classroom setting, master state standards. Schools, in short, are now accountable for achievement in not only the aggregate, but also for identified subgroups and in particular those that often were underserved by schools in the past (NCLB, 2002). Moreover, any school that does not meet the subgroup goal of 100% proficiency faces a series of increasingly onerous sanctions. Yet current knowledge indicates that these requirements create a considerable challenge with regard to at-risk students who display an extremely low reading level, especially those who are identified as students with special needs or disabilities. This may be especially true with regard to struggling middle school students (Lenski & Lewis, 2008).

Many programs and interventions focus on struggling readers in the elementary grades, but when students reach the middle grades, reading support often decreases

(Lenski & Lewis, 2008). Due to limited reading support after elementary school, many students often battle with reading during their years in middle school and beyond. Research has shown that 66% of middle school students in the United States are not reading proficiently at grade-level (Hernandez, 2011). Moreover, the available experts suggest that the frequent lack of fundamental reading foundations makes it unlikely that reading interventions currently in use will enable struggling middle school students to achieve the required standards on state mandated assessments (Biancarosa & Snow, 2004). Lenski and Lewis (2008) wrote, "Clearly, one of the most complex problems in education today is how to address the needs of struggling adolescent readers" (p. 52).

A new intervention program, NovaNET (Pearson Digital Learning, 2011), an online comprehensive courseware system that specifically targets low performing students in the area of reading, was adopted by the local system in western Alabama in January of 2009 for implementation at the middle and high school levels because of the lack of achieving adequate yearly progress in previous years. With NovaNET, students receive individualized learning even when they are not in school, and they can work at their own pace (Bursuck & Blanks, 2010). For the middle school, the focus is to identify students failing in reading/language arts and enable them to achieve passing grades or better on the standardized state tests. The present study is coextensive with this effort: focusing on at-risk and/or special education middle school students performing below grade level in reading. This study examines whether participation in NovaNET is associated with increases in reading achievement as measured by the Alabama Reading and Mathematics Test (ARMT).

Problem Statement

Seventh- and eighth-grade at-risk and special education students at a middle school in rural western Alabama were not making adequate yearly progress in reading according to state mandated requirements under NCLB. The purpose of this controlled quantitative archival study was to determine whether participation in NovaNET, a technology-based program promoting differentiated instruction within a general constructivist perspective, would enable students to improve their reading achievement compared with that of students in the regular (i.e., nonNovaNET) classroom setting. The targeted school in rural western Alabama uses instructional strategies to accommodate all students' various learning styles and abilities. Several years following the passage of NCLB (2002), a large number of at-risk and special education students at this school were not meeting expectations set forth in the standards developed by the State of Alabama (Alabama Department of Education, 2013). A preponderance of the at-risk and special education students in the seventh and eighth grades was performing on a reading level far below their grade level. Moreover, the school's then-existing programs and techniques were seen to be incapable by administrators and educators of providing the intervention these students needed to attain the goal set forth by the NCLB mandate (Hock el at., 2009). Table 1 provides ARMT data for 2007–2009 for all students at the targeted rural middle school in western Alabama (Alabama Department of Education, 2008–2009).

Table 1

Percentage of Student ARMT Reading Achievement by Level, Year, and Grade for General and Special Education

Year	Grade	Classification	Level I	Level II	Level III	Level IV
2007	7	Gen Ed	0.74	31.62	37.50	30.15
2007	7	Spe Ed	8.00	68.00	20.00	4.00
2007	8	Gen Ed	1.48	30.37	50.74	17.41
2007	8	Spe Ed	6.67	80.00	13.33	0.00
2008	7	Gen Ed	0.80	30.52	44.58	24.10
2008	7	Spe Ed	5.26	63.16	26.32	5.26
2008	8	Gen Ed	0.85	32.77	47.66	18.72
2008	8	Spe Ed	9.68	80.65	6.45	3.23
2009	7	Gen Ed	0.77	29.89	45.98	23.37
2009	7	Spe Ed	5.56	72.22	16.67	5.56
2009	8	Gen Ed	0.90	39.46	43.95	15.70
2009	8	Spe Ed	6.25	81.25	6.25	6.25

Reading is a uniquely human skill and one of the most complex of all cognitive activities. From a functional standpoint, reading is also considered virtually indispensable for individuals to fit in and maintain an effective adjustment within the rapidly evolving communities of the globalized knowledge economy. Education's central aim is to supply children with the mental tools, knowledge, and skills that are required to process and act on the information they need to achieve successful lives in the community (National Institute of Child Health and Development, 2011). Students' motivation to achieve these

objectives in school depend on the school's ability to ensure students feel they belong in the school and will benefit from being present in the learning setting (Steele, 1997).

Reading is one of the essential foundations that allow individuals to attain the necessary proficiency for academic success and daily living (Hopewell, McLaughlin, & Derby, 2011). Children who fail to learn to read are certain to perform well below their full potential. In comparison with recent practices, current legislation has dramatically affected students with disabilities and reframed the roles of general and special education teachers, administrators, other professionals, and families (Diehl & Reese, 2010). The practice of including students with disabilities into the general education setting stands out in this regard. Wright and Wright (2005) stated, "The practice has evolved due to numerous modifications in state and federal regulations that call for these students to meet the same challenging expectations that have been established for all children and improve their academic achievement and performance to the maximum extent possible" (p. 3, see also Alabama Department of Education, 2004a, and U.S. Department of Education, 2004).

Technology has become an increasingly powerful resource for teachers and students to address diverse learning needs hitherto considered intransigent (Behrman & Jerome, 2002). As technology becomes more common in the classroom, teachers are looking beyond traditionally accepted educational practices to find new and innovative ways to integrate and infuse that technology into the curriculum (Belland, 2009). Technology enables educators to customize interventions to meet the specific needs of individual learners to an unprecedented degree (Clarebout, Horz, & Schnotz, 2010). In a

self-paced format, technology enables educators to regulate the nature, type, amount, and intensity of intervention much more than do traditional classroom teaching methods.

Nature of the Study

A controlled quantitative archival study used inferential statistics to examine whether participation in the NovaNET intervention is associated with increased reading achievement of at-risk and special education middle school students as measured by the ARMT. Qualifying participants consisted of rising seventh graders scoring at Levels 1 or 2 on the ARMT, which indicates that they were not meeting academic content standards. Among qualifying students, those who actually completed the NovaNET program constituted the treatment group, whereas those who did not take part in this opt-in program constituted the comparison group.

The study examined the central hypothesis in two ways. The first focuses on each subject's progress, whereas the second focuses on the variation between the experimental (NovaNET participants) and control (nonparticipants) groups. Adopting a longitudinal perspective, within-subject variation was used to examine ARMT scores before, immediately after, and 1 year after participation in the NovaNET program. This perspective was used to determine whether NovaNET is associated with improved reading scores and, if so, whether such improvements subsequently continue to grow (divergent effects), are maintained (stable gains), or decrease/disappear (short-lived effects). Adopting a cross-sectional perspective, between-group variation was used to contrast ARMT scores for treatment and comparison groups to ascertain whether students that participate in the NovaNET program outperform comparable students who do not.

The ARMT score immediately prior to the intervention period served as a control for the influence of pre-existing differences (analysis of covariance). I used archival data from the years 2009–2013 for the purposes of collecting all baseline, outcome, and follow-up data as illustrated and described further under Data Collection in Section 3.

Research Purpose

The main purpose of this research was to investigate whether learning intervention programs such as NovaNET have a significant positive effect on the academic performance of students. Students who are at-risk and/or have special education needs were the main targets for the examination of the program's effectiveness to determine the role of differentiated learning on their academic progress. With this study, I aimed to find alternative solutions to address the important issue of at-risk and special education students being able to meet state-wide and national academic standards. In doing so, the proper integration of these students into a general learning setting as opposed to learning in relatively higher isolation may also follow as a result of findings from this study.

Research Question

What is the difference in the reading attainment of seventh- and eighth-grade at-risk and special education students who participated in the NovaNET Intervention Program versus those who did not, as measured by their ARMT scores?

Hypothesis

H_0: There is no significant difference between the reading attainment of seventh and eighth grade at-risk and special education students who participated in the NovaNET Intervention Program versus those who did not, as measured by their ARMT scores.

H_1: There is a significant difference between the reading attainment of seventh and eighth grade at-risk and special education students who participated in the NovaNET Intervention Program versus those who did not, as measured by their ARMT scores.

Theoretical Framework: Individualized Adaptive Instruction and Differentiation

Drawing on the concept of instructional design and relying on advances in Internet-accessed, server-based technology, individualized adaptive instruction and differentiation have evolved rapidly from constructivist theories of learning (Kim, 2012; Timmers & Veldkamp, 2011; Vandewaetere, Desmet, & Clarebout, 2011; Woolfolk, 2010). Unlike prior models, constructivism holds that knowledge is not something that is transmitted, but something that is constructed in the mind of the learner. In this view, students are seen to achieve superior outcomes when they actively engage learning materials through a search for meaning and conceptual understanding. Constructivist theory and the ability, via technology, to tailor the learning environment to suit the needs of each individual student provided the theoretical rationale in this research study on the benefits of the NovaNET program. The specific characteristics of the NovaNET program, and their support in the literature, are discussed below.

The general framework for the lessons offered by NovaNET is introduction, presentation, and practice. The students are first introduced to the lesson. Next, through

demonstrations and models, the students are presented the new skill or concept. During this time the students answer questions and receive feedback to guide the learning process. NovaNET offers an array of structured, guided, and independent practices. These practices are tailored to fit the individual's need and provide him or her with the best tutorials that will allow them to increase their academic achievement and reading skills.

NovaNET also offers feedback with an interactive design. There are many models of feedback and their effects are varied (Mory, 2003). However, the model used most widely in NovaNET is broadly consistent with guidelines (Narciss & Huth, 2004) for effective teaching of declarative and well-structured procedural knowledge such as that found most commonly in academic curricula. The NovaNET feedback model consists of three levels. In the first level, when the student answers a question incorrectly, the system informs the student that his or her answer is incorrect and prompts the student to try again. During the second level, if the student answers incorrectly, the system provides the student with an informative hint and allows the learner to try again. The third level provides the student with the correct answer and presents the question to the student again, so that he or she can answer it correctly before moving ahead.

As a theoretical construct, differentiated instruction is believed by administrators and educators, to help students maximize their academic capabilities and attainment through teachers catering to particular needs of each student to ensure that they are constantly motivated and evaluated (Rock, Gregg, Ellis, & Gable, 2008; Roe, 2010). Educators can do this through modifications in their curriculum, such as the amount of

work, content, and difficulty to help adjust their students with learning obstacles or special needs. Differentiated instruction and learning have a positive influence on the educational outcomes and accomplishments of students (Stravula, Leonidas, & Koutselini, 2011) particularly their proficiency in reading and mathematics (Bender, 2012). It is important for teachers to plan innovative and meaningful lessons that engage students with a variety of learning abilities to enhance their reading achievement (Firmender, Reis, & Sweeny, 2013). Moreover, Bender (2012) also stated that students' overall attitude towards their education improved as a result of their motivation to further improve and move past their initial setbacks.

Adaptive individual learning, which is the main feature of the NovaNET intervention program, is a form of differentiated instruction. Adaptive instruction considers the individual differences in abilities, contexts, goals, interests, knowledge, self-efficacy, and learning styles (Foshay & Damyanovich, 2005). Using various adaptive instruction methods ensures students are provided the additional time and instruction they need. Pacing, prescription, feedback, and dynamic questioning are among the adaptive techniques that NovaNET lessons use.

Pacing permits each student the freedom to work at his/her own speed and receive the additional help tutorials in the needed area(s). NovaNET begins each lesson with a pretest. If the student scores 85% or better on the pretest, he or she will go on to the next lesson. However, if the student scores below this criterion, he or she will be assigned the necessary prescription(s) to enhance achievement in the specified area. NovaNET provides immediate feedback to students. For example, within each lesson, the students

are given ample opportunities to answer the questions correctly. The feedback becomes more detailed and explicit each time the student fails, leading the individual to the correct answer. NovaNET also helps students eliminate misconceptions by engaging them in dynamic questioning. Dynamic questioning is the process of creating questions during the lesson rather than presenting them all at once (Pearson, 2009).

NovaNET, a product of Pearson Digital Learning, was developed, authenticated, and refined by Pearson's User Centered Design (UCD) Committee, which includes the company's product development team in cooperation with administrators and secondary educators (Pearson School, n.d.). It is aligned with the courses of study of several states in various subject areas. On the assumption that NovaNET delivers standards-based individualized learning through the use of an effective adaptive instruction model, all students are in theory expected to achieve the required skills that will prepare them for graduation and/or college. In practice, the NovaNET system has been found to assist middle and high school students achieve academic objectives, specifically through improvements in their test scores, dropout rates, and self-esteem (Pearson Digital Learning, 2011). Due to new legislation and the requirements for scientific research-based interventions to improve student success in middle school and high school, NovaNET stands out as a program that may be able to meet these requirements. From the perspective of the present research, and as an effort to address learning needs that hitherto have proven largely recalcitrant in the school where the proposed research will be conducted, NovaNET is viewed as a program that integrates constructivist theory and practice.

Operational Definitions

Academic achievement – students' academic performance and official grades on their report card (Hardman & Dawson, 2008).

Accommodations - modifications made to increase the likelihood of students performing at their required level and the level of their peers (Rock et al., 2008).

Adequate Yearly Progress (*AYP*) - the ability of schools and school districts to obtain the required achievement goals in reading and math, high school graduation rates, and overall student attendance and test participation (Alabama Department of Education, 2013).

Alabama Reading and Mathematics Test (*ARMT*) - a criterion-referenced test, which contains select SAT-10 entries that correspond with the Alabama subject matter, benchmarks in reading and mathematics (Alabama Department of Education, 2013).

Alabama State Department of Education (*ALSDE*) – a group presided over by the Alabama State Board of Education, which manages the education policy for the state of Alabama (Alabama Department of Education, 2013).

At-risk student – a student that is not meeting the requirements of his current grade level and is at-risk of failing (Lenski & Lewis, 2008).

Comprehension – the process of perceiving and understanding information (Ahmadi, Ismail, & Abdullah, 2013).

Intervention – a process of being actively involved in a situation to influence the result or prevent an unfavorable event from occurring (Hawkins, Hale, Sheeley, & Ling, 2011).

Learning disability – a condition that creates difficulty in perceiving or understanding information, knowledge, or abilities, especially as compared to individuals in the same age group (Bender, 2012).

Learning style – the way by which an individual acquires and understands information, which is influenced by inherent or routine behavior (Rock et al., 2008).

No Child Left Behind Act of 2001 (*NCLB*) – law that required all states to create educational benchmarks that meet federal requirements (NCLB, 2002).

NovaNET – a self-paced, wide-ranging, distance learning system that enables schools to offer individualized instruction to middle and high school students (Pearson Digital Learning, 2011).

Pearson or Pearson PLC – a British publishing and education company who developed NovaNET, through its Pearson Digital Learning branch (Pearson Digital Learning, 2011).

Assumptions

It is assumed that the archival database contains an accurate record of the students' reading achievement as measured by the NovaNET intervention program. It is also assumed that eligible students who received the NovaNET intervention program (the treatment group) are comparable with similarly eligible students who did not receive this program (the comparison group).

Scope and Delimitations

Drawing on a quasi-experimental sample of convenience drawn from a rural middle school in western Alabama, the scope of the study was to examine the test results of students who entered middle school performing either *far below* (Level I) or *below* (Level II) grade level expectations in reading on the ARMT. Students meeting these criteria were all eligible to participate in the optional NovaNET-enhanced curriculum, but two groups of comparable students formed naturally, as some parents elected to enroll their learner in this program, whereas others did not. Thus, although drawing on a convenience sample available in the school's archived test results, the design was quasi-experimental with all the concomitant needs to protect the integrity of such a design by examining background variables to rule out or control for group differences other than the NovaNET/nonNovaNET assignment as far as possible. Reading achievement at the end of the seventh and eighth grades was recorded to analyze the significance of students' participation in the identified intervention program. The results of three complete cohorts of students were examined in the study with control also for special education or general education status. Within the limitations of the variables examined or controlled in the

research, the results of the study may be applicable to similar at-risk and special education students in the district and beyond.

Limitations

As the study took place at only a single research site and with only seventh and eighth grade at-risk and special education students, the results of the study may not be generalized to other student populations and to locations with socio-economic characteristics that vary from the ones associated with a middle school located in a rural community in western Alabama. In particular, these demographic characteristics included the racial composition and household income levels of the population. All students in the study resided in poverty stricken areas. A further limitation comes from the investigation of only one computerized reading recovery program in this study and no general conclusions about the efficacy of this type of program can be reached from this investigation. Student accountability or effort is another factor that may contribute to the limitations of this study. All of the students in the study had low (Level II) or very low (Level I) reading achievement levels.

Significance of the Study

The intent of this quantitative study was to determine if NovaNET enhanced the reading abilities of seventh and eighth grade at-risk and special education students in terms of increased achievement on state mandated standardized achievement tests. The findings presented here can assist educators in determining the best ways to address problems related to reading. NovaNET is designed to provide students with the individualized instruction they need to become successful in school, ensuring they are

able to graduate from high school and serve as productive citizens in their community. Hargreaves (2003) stated that in a society that depends on information and knowledge, it is essential for adults to be skilled in both reading and writing.

The outcome of this research is particularly meaningful if it can be shown that NovaNET predictably and reliably enables large numbers of at-risk and special education students with a history of reading difficulties to increase their level of proficiency in reading. The program claims to be able to provide effective learning paths that are tailored to each student's individual learning needs and disabilities to prepare them for their remaining years in school and their careers in the future (Pearson Digital Learning, 2011). The increased reading abilities of at-risk and special education students may allow them to score proficient on the ARMT test and increase the school's possibility of meeting the requirements for AYP. The results may also inform administrators and stakeholders of the benefits of making the NovaNET intervention class available to all special education students, in support of increased reading scores on the ARMT assessment.

Organization of the Remainder of the Study

Section 1 consisted of the introduction to the study, the problem statement, the nature of the study, the purpose of the study, and the theoretical framework. In addition, this section provided important definitions, scope and delimitations, assumptions and limitations, and a word about the significance of the study. Section 2 reviews the literature associated with special education students with reading disabilities, students' attitudes and motivation toward reading, and an analysis of different methodologies used

in the field. Section 3 explains the methodology of this study, including the research design, population and sample, instrumentation and data collection, ethical considerations, and the role of the researcher. Section 4 presents the scientific analyses and findings. Section 5 discusses the findings of the study and assesses their implications for social change.

Section 2: Literature Review

Introduction

An ultimate goal of reading in education is comprehension (Woolhether, 2012). Middle school students should have teachers that value student individuality and provide explicit instruction to meet the academic needs of each learner (International Reading Association, 2010). Greenberg and Walsh (2008) recommended that teachers should provide students with explicit instruction and research-based instructional strategies to increase their reading abilities and motivation to read. They also noted that students should be given assessments that show their strengths and their needs to guide educators in designing lessons that will promote optimal growth and improvement. Through the modeling of various scientific research-based instructional strategies, educators have been able to increase reading achievement among all students (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009).

Strategies for Literature Review

A variety of scholarly publications were used for the literature review. The Walden University library was used to research peer-reviewed journals from the following databases: Academic Search Complete, Educational Resources Information Center, ProQuest Dissertations and Theses, and Educational Research Complete. The following keywords were used to search for current literature: *academic achievement, adaptive instruction, collaboration and coteaching, inclusion, individualized adaptive instruction, learning disabilities, middle school reading, online courseware, NovaNET, reading achievement, reading difficulties,* and *special education.*

The literature review below outlines current research on (a) the history of Individuals with Disabilities Education Act (IDEA), (b) the current state of reading achievement in Alabama, (c) today's middle school, (d) the need for differentiated teaching, (e) characteristics and needs of students at-risk, (f) interventions for students at-risk, (g) motivating middle school students to read, (h) technology in the classroom, and (i) computer-based recovery. As a whole, the literature review provides an overview of (1) current knowledge of reading difficulties among at-risk and middle school special education students, and (2) attempts to overcome these difficulties using technology-based approaches.

Brief History of IDEA

The IDEA has challenged all providers of service to young children with disabilities to provide services in natural community settings where young children without disabilities participate (Freiberg, 2013). IDEA is a federal law binding on all states. U.S. Department of Education (2008) stated, "IDEA was initially endorsed by Congress in 1975 to guarantee that children with disabilities have the opportunity to receive a free appropriate public education, just like other children" (p. 39). The law has been amended several times, most recently in 2004.

IDEA defines *children with disabilities* as individuals between the ages of 3 and 22 years who have one or more of the following conditions (20 U.S.C. § 1401(3)):

- Autism.
- Visual impairment (including blindness).
- Hearing impairment (including deafness).

- Serious emotional disturbance.
- Mental retardation.
- Multiple disabilities.
- Orthopedic impairment.
- Other health impairment (including Attention Deficit Disorder [ADD] and Attention Deficit Hyperactivity Disorder [ADHD]).
- Specific learning disability.
- Speech or language impairment.
- Traumatic brain injury.

The 1997 Amendments to IDEA required "that all states include students with disabilities in their measures of accountability" (Freiberg, 2013, p. 228). Kleinert and Kearns (1999) stated, "Such measures may be part of the statewide and district wide general education assessment programs through appropriate accommodations or through alternate assessments for those who cannot complete the general education assessment" (p. 105). The 2004 reauthorization of IDEA emphasized that educating disabled children can be enhanced by setting higher expectations pertaining to developmental goals (Public Law 108-446; Wright & Wright, 2005).

Brief History of NCLB

President Bush signed the NCLB act on January 8, 2002. The main objective of the act is to ensure that each public school student attains essential learning objectives while considering their safety in their classrooms under the guidance of competent teachers (Johnson & Smith, 2011). To increase students' learning attainment, the NCLB

act mandates that school districts must be accountable for their students reaching proficiency levels of 100%. This target must be achieved within 12 years on evaluations that assess academic content. In addition, the act also obliges schools to lessen the inequality experienced by students who come from different economic, racial, or ethnic backgrounds as well as those with disabilities, compared with their more advantaged counterparts. The NCLB act also necessitates testing all public school students as a way to measure their learning progress. States must also monitor students' progress through adequate yearly progress or standards in academic proficiency. They must work toward gradually raising the percentages of students that fulfill this standard in each district. In the event that a school district fails to meet this minimum, the act also has provisions for penalties or corrective measures to be employed (Johnson & Smith, 2011).

Through explicit instruction and collaboration, the general education and special education teachers (coteaching) can capitalize on learning in the inclusive classroom (Conderman & Hedin 2014). Bowen and Rude (2006) stated, "The NCLB act significantly challenged the status quo of public schools and established the U.S. Department of Education as a responsible party for increasing student achievement in public schools" (p. 24). The NCLB has become increasingly controversial because of the accountability placed on educators. Aside from raising the academic proficiency of all students, educators must also address the gap between various groups as well as maintaining the desired level of competency of teachers (Anthes, 2002). They are the ones accountable for the implementation of these amendments:

> Today, expectations for [school leaders] run well beyond managing budgets and making sure the buses run on time. They are counted on to be the instructional leaders of their schools and districts: to understand effective instructional strategies, regularly coach and observe classroom teachers, and be able to analyze student achievement data to make more effective instructional decisions. The NCLB puts more pressure on the public education system to increase student achievement for all students (p. 1).

The key objectives of the NCLB act are as follows:

- All students shall be taught by teachers who are highly qualified and proficient by school year 2005–2006.
- All students shall meet or surpass the desired level of academic proficiency, particularly in reading and mathematics by school year 2013–2014.
- All students shall receive their education in environments that are safe, secure, free from drugs, and beneficial to obtaining a quality education.
- All students who are lacking in English proficiency shall become proficient in the language.
- All students shall finish high school, college and career ready.

The aforementioned goals may be a challenge not only for schools, but also for school districts and states. The requirements of NCLB mandates that students should be tested to ensure that goals are met, adding the accountability measure that schools, school districts, and states are responsible for implementing changes and improvements where necessary to achieve these goals (Bellinger & Di Perna, 2011). In support of these goals,

Congress made significant increases to the federal spending earmarked for education (NCLB, 2002). Congress also allowed states greater flexibility in using federal funds to the maximum advantage to individual school districts. All students must demonstrate progress in academic attainment for ubiquitous school improvement (Hardman & Dawson, 2008).

The Current State of Reading Achievement in Alabama

Reading requires the ability to obtain, understand, and implement knowledge (Ellery & Rosenboom, 2011; Reyes, 2011; White, 2011). The National Assessment of Educational Progress (NAEP) is one of the most reliable wide-scale studies of reading achievement in the United States (NAEP, 2004). This federally sponsored test is periodically given in reading (and other subjects) to a nationwide sample of students in 4th, 8th, and 12th grades. According to the July 2011 NAEP report, Alabama met the 95% inclusion goal in reading for both grades 4 and 8. "NAEP reading results for grades 4 and 8 are reported as average scores on a 0–500 scale (NAEP, 2011)." The average scale score for Alabama's students with disabilities was 217; where 80% of them scored below the *Basic* level, 20% scored at or above the *Basic* level, and 2% scored at or above the *Proficient* level (NAEP, 2011). The average scale score for Alabama's students without disabilities was 262; where 26% of them scored below the *Basic* level, 74% scored at or above the *Basic* level, 28% scored at or above the *Proficient* level, and 2% scored at the *Advanced* level (NAEP, 2011). Alabama's eighth grade reading results from 2011 showed 69% of students scoring at or above the *Basic* level and only 26% of students scoring at or above the *Proficient* level (NAEP, 2011). According to these

scores, there has been no dramatic improvement in middle school reading achievement during the past decade. Although various studies on reading achievement have been completed, the results show few implications for improvement (Fernald & Weisleder, 2011). Dilemmas associated with differentiation in state standards have impelled the development of the Common Core State Standards Initiative (2012) to encourage fairness and extraordinary outcomes across various states.

Today's Middle School

Middle school should address the emotional, intellectual, physical, and social needs of adolescents while educating them to become productive citizens (Carpenter, 2010). Reading intervention classes in middle and high schools are frequently neglected, with only few remedial classes available to students (Goldman, 2012). Middle school students must adjust to ever increasing demands on their reading abilities. Padgham (2011) stated that when middle school students lack interest and engagement in reading material, they will also struggle with comprehension. Denton (2011) stated that developing prior knowledge, vocabulary, and intellectual capacity are reading barriers encountered in elementary grades that tend to progress into further reading deficiencies by young adolescents in middle school grades. Middle school students must deal with increasingly difficult reading materials, a greater emphasis on expository text, and an increasing expectation that they "read to learn" (Bender, 2012). Despite these increased reading demands, however, many middle schools still offer little or no systematic reading instruction. Of those middle schools that do offer such instruction, fewer still offer content-based reading instruction (Goldman, 2012). Also, the use of various research-

based reading initiative strategies has increased the reading and comprehension skills of at-risk and special education middle school students (Resnick & Hampton, 2009).

One aim of middle school is to establish habits that will enable students to be independent, self-directed learners long after their formal education has been completed). Many middle school students show evidence of intensive deficiencies in reading and endure more educational challenges than their peers (National Joint Committee on Learning Disabilities [NJCLD], 2008). In order for students to thrive in content rich reading environments, teachers must prepare them by providing a solid foundation for reading skills (McKeown, Beck, & Blake, 2009). There are several factors that play a part in the lives of middle school students that may cause them to achieve below average. Attitude, socioeconomic status, interest, and motivation are the factors that the researcher targeted.

Students' attitudes towards reading in the middle school have been shown to influence their reading achievement (Logan & Johnston, 2009). Due to the significance of reading in today's society, students should acquire a positive attitude towards reading at an early age (Lee, Bartolic, & Vandewater, 2009). A positive reading attitude also fulfills an essential role in the expansion and utilization of lifelong reading abilities (Solis, Ciullo, Vaughn, Pyle, Hassaram, & Leroux, 2012).

The rising rate of illiteracy in the low socioeconomic population tends to exist more in the minority population (Goldman, 2012). The ability to read, comprehend, and evaluate information is more crucial in current day society than ever before. Research has repeatedly shown that the majority of lower socioeconomic status population consists of

African-American families (Hardaway & McLoyd, 2009). A student's demographic location sometimes influences his or her ability to meet performance standards (Rouse & Fantuzzo, 2009). This statement sustains the assertion that at-risk students, including those with learning disabilities and special needs, function under lower expectations centered on issues other than their academic capability (Bender, 2012). According to Sullivan and Long (2010), at least 70% or more of at-risk middle school students require some method of reading remediation. Despite the advent of inclusion, students with learning disabilities and special needs still tend to be taught in more restrictive settings (Hosp & Reschly, 2002). This tradition pessimistically influences the academic achievement of these students (Hardman & Dawson, 2008). Nevertheless, students with learning disabilities and special needs farther withdraw themselves during inclusion in the general education setting because they are not able to compete with their peers (Spring, 2010).

Currently, one of the biggest concerns among educators is that the lack of student interest inhibits their effectiveness in the classroom (McTighe & O'Connor, 2009). Students that are bored do not find the material relevant to their lives. As a result, they either daydream in class or seek excitement and diversion by distracting the teacher or causing classroom disturbances (Guthrie, 2008). Such student behavior directly affects achievement because attention is required in order for learning to occur (Hulleman & Harackiewicz, 2009). Therefore, because the absence of interest results in a lack of student attention, interest is a prerequisite to effective learning of the content. The inability to comprehend inhibits the student's ability to do the thinking required by the

teacher (Zvoch & Stevens, 2011). Paris (2011) emphasized the importance of students reading age-appropriate materials that are suitable to their reading level.

Motivation to read can be characterized as the probability of engaging in reading or desiring to read (McCaleb, 2013). Increased literacy rates in at-risk and special education students has been shown in individuals that are motivated by the general and special education teachers (Morgan & Sideridis, 2006; Sideridis & Scanlon, 2006; Strommen & Mates, 2004). In recent years, teachers and researchers have placed great emphasis on increasing the reading motivation of special needs students and students with learning disabilities (Biancarosa & Snow, 2004). Self-motivation and improved reading abilities in at-risk and special education middle school students has been associated with the implementation of successful reading intervention programs (Melekoglu, 2011).

Why Must Teachers Differentiate?

Differentiated instruction is implemented to aid students in maximizing their reading capability and attainment (Roe, 2010). Differentiated learning has an optimistic influence on the educational outcomes and accomplishments of the students (Stravula, Leonidas, & Koutselini, 2011). According to Bender (2012), teachers must differentiate in order to cater to particular needs of each student, while also ensuring that they are constantly motivated and monitored. Through the implementation of individualized learning plans, teachers provide differentiated instruction to accommodate the learner (Ryan, 2009). Recognizing learning styles allows teachers to benefit from a student's

strengths while familiarizing themselves with instructional strategies that will accommodate his or her weaknesses.

Coor (2011) indicated that differentiated instruction has been used to assist in closing the achievement gap in reading among at-risk and special education students. Fine (2003) reported that differentiated instruction resulted in a drastic increase in test scores of special education students. Fine also stated that these students' attitude improved as a result of the differentiated instruction they received to meet their targeted goal. Fine's study sample consisted of 422 students (214 regular education students and 208 special education students).

> "The special education sample consisted of males and females in grades 9–11 who were classified as emotionally disturbed or learning disabled according to their individualized education program. The special education students' achievement gains were highest during the implementation of sound (through the use of headphones) and student-created materials during instruction. Their total mean posttest scores were significantly better when taught through learning style approaches than with traditional instructional methods" (p. 56).

Differentiated instruction maintains the classroom as a community, meeting the similarities and differences of the individual child (Tomlinson & Imbeau, 2010). It permits an environment in which all students can thrive and receive the benefits of differentiated instruction (Tomlinson & Imbeau, 2010). Through differentiated instruction, the teacher is able to concentrate on the various degrees of intelligence in the heterogeneous class (Beach, 2010).

Characteristics and Needs of Students at Risk

Students who are at risk are those who have been exposed to some condition that negatively affects their learning. Most teachers include in this list students who have been prenatally exposed to drugs, including alcohol; students who are homeless; and students who have been neglected (Reglin, King, Losike-Sedimo, & Ketterer, 2003). Others include students who are bullies and those who are victims and those who have experienced negative peer pressure (Spring, 2010). Students who are school phobic are at risk, as are those considering suicide, those who are considered physically unattractive, and those who are socially underdeveloped (Epstein, 2008). Students that repeated a grade or dropped out of school as a result of their relatively slower learning are also a group of particular concern for professionals (Spring, 2010).

In terms of cognitive, social and emotional, behavioral, and physical attributes, at-risk students are similarly diverse to students in the general school population (National Literacy Trust, 2011). What differentiates at-risk students from other students is the high probability of them dropping out of school before graduating; which will likely cause difficulties in adulthood (Epstein, 2008). Some also share other characteristics and needs, including a propensity to be disobedient, issues in observing their learning and behavior, language impediments, problems with social relationships and issues in comprehending that their actions have consequences (Spring, 2010). In most cases, children of poverty have little, if any, literature and limited technology within their homes. They are often malnourished and receive limited (if any) health care. Research has shown that children of poverty attend school with inadequate vocabulary and minimum readiness skills

(Worthy, 2002). In recent years, researchers have provided numerous factors identifying specific barriers that contribute to the failure of at-risk and special education students (Marinak, 2010). When children lack the basic phonemic awareness foundation such as letter and sound recognition, the ability to break words into syllables, and vocabulary use, they will also have difficulty with reading comprehension (Ahmadi, Ismail, & Abdullah, 2013).

Interventions for Students at Risk

Fang (2012) stated that implementing reading intervention programs is the ultimate response to the high demand of at-risk and special education individuals' literacy deficiency. Educators are sometimes faced with the frustrating situation of not being able to take away the stresses of students that often prevent them from learning to their potential (Lipson, 2011). Administrators and educators work collaboratively to detect barriers that prevent at-risk and special education students with reading difficulties from achieving at their required academic level and strive to offer successful interventions that will enhance their academic achievement (Benner, Nelson, Stage, & Ralston, 2011; Fletcher & Vaughn, 2010; Speece et al., 2010). Educators can offer these students a safe learning environment, with clear expectations and instructional support, which might become an important place in their lives (Kamil, Borman, Dole, Kral, Salinger, & Torgesen, 2008). Intervention instructional methods should be intense, omnipresent, and of significant duration (Bauman, 2009). Miller and Veatch (2010) persuaded teachers to select and utilize the most suitable approach of instruction to assist students in becoming

skillful in understanding content. Appropriate grade level materials should be utilized to challenge students to read at their required level (Firmender & Sweeney, 2013).

Trotter (2008) found that an increasing number of middle and high schools are using online credit recovery and intervention classes to increase student graduation rates. With the widespread use of computer-based classes, it is essential to understand how computer-based learning environments influence student perceptions toward learning (Rance-Rooney, 2010). The implementation of computer-based credit-recovery programs has been beneficial to many middle and high school students (Pearson Education, 2009). Combier (2009) stated that struggling students thrive when computer-based credit recovery is used appropriately. Intervention must transpire at various levels for literacy to be satisfactorily authenticated throughout the duration of a child's education (Reynolds & Shaywitz, 2009).

Previous researchers suggested that peers should learn from each other to assist in educating culturally and linguistically diverse students (Morehouse, 2009). Several types of peer tutoring arrangements have been used successfully with students with learning disabilities (Patterson, 2010). At-risk and special education students academic achievement has been enhanced through the use of classwide peer tutoring (CWPT) during their middle school years (Kourea, Cartledge, & Musti-Rao, 2007; Maheady, Harper, & Mallette, 2001). Classwide peer tutoring consists of "students who are taught by peers who are trained and supervised by classroom teachers" (Maheady et al., p. 1). Peer-assisted learning strategies (PALS) are based on best practices in reading (Fuchs & Fuchs, 2005; Fuchs, Fuchs, & Burish, 2000). PALS involve grouping students with

various academic abilities to facilitate shared knowledge among the group. The students rotate being the "coach" and the "reader."

Researchers view collaboration between special and general educators as essential to the success of students with disabilities who are being served in general education classes (Garderen et al., 2009). It is important that general and special educators increase their collaborative efforts in planning and designing weekly lessons to increase the reading achievement of at-risk and special education students in an inclusion setting (Garderen et al., 2009; Bender, 2012). Due to the tremendous increase of inclusion students, the question is no longer what to teach, but where to teach (O'Banion, 2010). Bender (2012) recommended that teachers in general and special education should emphasize the inclusion of disabled students in general education classrooms to prevent feelings of seclusion and inadequacy among these particular students, while also allowing both their educators and peers to actively share in the responsibility of their learning. In addition, to be able to provide a suitable learning environment for students with learning disabilities, teachers need to become more involved in collaborative planning and problem solving (Garderen et al., 2009).

Special education students, their parents, and teachers are perplexed with the notion that students with learning disabilities are required to be 100% proficient in reading (White, Polly, & Audette, 2012). If that's the case, the thinking goes, there would not be a need for special education services. McCaleb (2013) explained that in order to build a community of proficient learners, there must be a working relationship between educators and parents. Communication with parents and family members can be

strengthened by improving parent and family teacher conferences (Lounsbury, 2009). Effective communication skills should be used during conferences with family members (David, 2010). Students' grades and school attendance can be improved by parental involvement; this will also reduce the probability of students dropping out of school (Balfanz et al., 2010).

Motivating Middle School Students to Read

The more children read the more proficient they become and the more their desire to read intensifies (Fingon, 2012). "Research shows that as children progress through school, their interest in reading for pleasure, and their motivation to learn, diminishes (Reutzel, 2009)." Motivation is enhanced when learning is personally relevant (Ladson-Billings, 2002). Motivating students to read for enjoyment can be an unbearable task for teachers (Becker & Schneider, 2009). Li (2011) stated that through the implementation of intervention programs, research has shown an increased trend in reading achievement among at-risk and special education students. Teachers who truly understand motivation embrace the richness that children from all cultures and backgrounds bring, rather than emphasizing their deficits (Ladson-Billings, 2004). Duke and Carlisle (2011) and Adlof et al. (2011) indicated that the reading deficiencies of seventh and eighth grade at-risk and special education students do not arise as a result of the inability to read, but instead as an absence of metacognition.

Participation in a structured intervention program can alter student motivation and academic abilities (Allington, 2011a; Snow & Moje, 2010). Duncan (2010) acknowledged that the consideration of students' personal interests in the selection of

materials motivates students and encourages them to "invest in their own reading" (p. 91). According to Schunk and Zimmerman (1997), "students' belief in their ability to learn to read proficiently, and to set specific, short-term goals for an assignment, motivates them to work hard, become involved in an assignment, and successfully complete it." Edwards (2009) stated that "middle school students are social beings; they enjoy spending time with friends talking, playing games, and discussing issues typical of those facing today's teens instead of spending time reading" (p. 56).

Through the implementation of more computer-based credit recovery programs, students are becoming motivated to remain in school and complete their high school education (VanDerHeyden, 2011). There are some educators that do not agree with this process because they feel the students are granted full credit for completing very few assignments (Hodge & Collins, 2010).

Technology in the Classroom

A new challenge has been established for instructors as the advancement of technology has placed an increased demand on online learning or e-learning (Bialek, 2011). The use of technology is widespread in all didactic levels; as an educational aid for developing, monitoring, and instructing students, as well as a means by which learners can gain access and become engaged in learning (Katz & Carlisle, 2009). Technology plays a vital role in the instruction of all students. With technology, disabled students have access to new ways of displaying their abilities, whereas instructors can use technology to improve their teaching and increase student learning (Lee & Templeton, 2008). Technology can enhance the abilities of disabled individuals greatly (Lee &

Templeton, 2008). Technology can assist in assignment completions, learning new information, and following the general curriculum more easily, so that all at-risk and learning disabled students can enjoy full inclusion and benefit from technology (Kennedy & Deshler, 2010).

Through the integration of technology within their current reading instruction, teachers have increased student achievement (Basham et al., 2010). According to Franklin (2001), "our classrooms have been permanently altered by the proliferation of technology in the 1990s." Technology has become an ever-present tool for teachers and students (Behrmann & Jerome, 2002). The NCLB Act (2002), which revised the Elementary and Secondary Education Act of 1965, provides incentives to use technology in the education of students and their teachers. Technology plays a vital role in enhancing the academic achievement of at-risk and special education students so that they may perform at the level of their peers. Since technology engages pupils in a deeper way, and encourages critical thinking, it can make learning much more desirable and attainable to students, including those with special needs (Cole, 2009).

Computer-based Credit Recovery

According to Dessoff (2009), many school districts have begun using computer-based credit recovery programs to reach their at-risk and/or failing students. These programs have been put in place to prevent student failure and decrease dropout rates (Meyer et al., 2011). There are various online credit recovery programs available that allow students the opportunity to receive individualized instruction that will increase his or her academic achievement (Blomeyer, 2002; Roblyer, 2006; Watson & Gemin, 2008).

A+nyWhere Learning System, *GradeResults*, and *NovaNET* are a few of the top online computer-based programs that districts nationwide use to enhance their students' educational skills.

Research on A+nyWhere Learning System

A+nyWhere Learning System is a courseware program that is designed to enhance the academic level of all students, from Grades K–12. *A+nyWhere* offers rationalized lessons that are designed to meet the individual learner's weaknesses and assign study guides, practice tests or quizzes, and mastery tests to increase their academic achievement (A+nywhere Learning System, 2012). During the 2003–2004 school year, the Harris County Department of Education in Houston, Texas implemented the Zenith Project. The Zenith Project was an opportunity for adolescents that had been suspended from within the school system for persistent behavior problems to acquire credit in four content areas of English, Mathematics, Science, and Social Studies using the *A+nyWhere* software. Analysis of the data from the 3 to 6 weeks program showed significant results in all four content areas for the students who participated in the study (Trautman, 2005).

Research on GradeResults

GradeResults is a tutoring center that provides online courses and a broad array of "credit acceleration, remediation, alternative and special education services" to schools, colleges, and universities (GradeResults, 2011, p. 2). The GradeResults program proposes solutions that concentrate on an array of requirements for Grades 3 through 12. GradeResults school-wide instruction is designed to strengthen at-risk and special education students' classroom performance by expanding the students understanding of

regular classroom instruction (GradeResults, 2011). To make sure students are prepared and objectives are achieved, GradeResults includes progress monitoring aligned to state standards, so educators can target skills students are expected to come across on state tests. Differentiating from other computer-based programs, GradeResults automatically generates an optimistic educational pathway for each student on the basis of his or her assessment outcomes, which permits educators to present various instructional interventions and differentiate instruction. Once students have been assigned their unique learning pathway, they are allowed to work independently to conquer their assigned mastery objective. Another unique feature of GradeResults is the ability for students to communicate with a live instructor using an interactive whiteboard. The use of a live instructor is beneficial to the following components of the GradeResults program: Advanced/AP Learning Environment, Credit/Grade Recovery, Intervention, and Remediation/Special Education Support (GradeResults, 2011).

GradeResults is not only focused on those students currently enrolled in school but has also designed a program component to reach those individuals between the ages of 16–21 that have dropped out of school and wish to pursue a high school diploma, not a GED. This program is entitled the *Grade Results Drop Back In,* and it has four main focal points that are incorporated throughout the program: academic support, social and emotional development, behavioral modification, and job readiness. With the help of community groups and stakeholders, students are identified and recruited to enroll in the *Grade Results Drop Back In* program to obtain a high school diploma through an accelerated high school learning community (GradeResults, 2011).

In 2005, the catastrophe of Hurricane Katrina stimulated powerful action transformation within the New Orleans, Louisiana, educational system, resulting in the expansion of a wider definition of underachieving schools and the creation of more charter schools focused on closing the achievement gap. Due to the hurricane, many inhabitants resolved to leave New Orleans and not return, leaving the school district at a significant deficiency of qualified teachers. GradeResults worked strongly with the Louisiana Recovery School District (RSD), a special school district intended to transform underachieving schools into thriving institutions to facilitate students' learning (Louisiana Department of Education, 2008). To begin the study, the selected students were given a pretest and then a Graduation Advancement Plan was initiated based on the educational rank of each individual student. The results of the students that participated in the GradeResults Graduation Advancement Plan (2011) were significant. There was a success rate of more than 90% of students who graduated with a high school diploma from three RSD high schools that implemented the GradeResults Graduation Advancement Plan.

Research on NovaNET Applications

Bulgakov-Cooke (2010) published favorable results for the application of the NovaNET program in getting students help in achieving credits towards graduation at the Wake County Public School System in Raleigh, North Carolina. These were based on 1,920 student enrollments, with 22.6% having disabilities and 6.4% having limited English proficiency. Based on the results, 95% of students were able to complete their courses, and passing rates ranged from 83% (Algebra) to 100% (Chemistry). These

passing rates from the NovaNET program were 24% higher as compared to North Carolina Virtual Public School (NCVPS) courses. A large majority of surveyed participants (95%) said that the program was beneficial to their learning. Reasons for this included the relative ease of the instruction process, allowance for flexibility, and its individualized approach. The program was also viewed by administrators as comparatively cost-effective. The recommendations of this particular study included its expansion as a supplement for regular courses and making it available to students for additional learning during summer.

These results were echoed by Volkerding and Adviser-Mcneese (2012), who reported that NovaNET applications were successful and favored by students and faculty, based on interviews and surveys. For students, the fact that the medium of instruction was on a computer and that they could advance through the program at their own pace made the program effective, as evidenced by improvements in many content areas, particularly in mathematics and reading. On the other hand, teachers, administrators, and parents also viewed NovaNET as a cost-effective and efficient alternative to other possible outcomes. This included providing remedial programs for the students who were struggling academically and for those that dropped out of school that had a desire to complete their education.

Foshay and Damyanovich (2005) reported that studies at the secondary and post-secondary levels have found that NovaNET applications are successful and welcomed by students. The intervention strategies included in the majority of NovaNET lessons have consistently confirmed the largest effect sizes of any instructional strategy, especially

when executed on the computer. The success has been demonstrated in a wide range of content areas, but the strongest evidence is in math and reading (Foshay & Damyanovich, 2005). In 1999, Wake County Public School System (WCPSS) in Raleigh, NC was issued a three year federal grant that afforded financial support for the implementation of NovaNET in all WCPSS schools (Harlow & Baenen, 2002). The students that were to be chosen to participate in the NovaNET program were selected using the district computer files using criteria such as gender, grade, ethnicity, lunch eligibility (free/reduced), and GPA. Faircloth and O'Sullivan (2001) completed an independent study that consisted of interviews and surveys from NovaNET faculty and students, which concluded that the advantage of students' functioning at their own pace was one of the greatest contributions of NovaNET. In addition, NovaNET coordinators, administrators, guidance counselors, students, and teachers saw NovaNET as a great alternative to drop out prevention.

Palagi (1993) completed a study on 126 students in regards to a competency based reading and mathematics program at Dawson Technical Institute in Chicago, Illinois for newly admitted adult students. All students entering the institute are required to take the Test for Basic Adult Education (TABE). Students who do not pass the test or need additional basic skills are referred to the NovaNET lab to complete a beginner's course. Once the assigned individuals complete the NovaNET program, they are retested with the TABE. There were a total of 126 students enrolled in the program. The research from this study concluded that 44 students initially met the entry requirements and 82 students successfully completed the 4-week basic NovaNET skills course and showed grade level gains in their courses.

Coulter (2004) completed a study on 12 adjudicated youths from a juvenile detention facility in Southern Colorado using the NovaNET program for a 9-week period to improve their reading accuracy, comprehension, and rate as measured by the Gray Oral Reading Test (GORT-3). The students attended an average of 21 sessions in the course of a month. The instructional method included reading aloud, where the instructor recorded the student errors and stopped him or her to go back and correctly re-read and spell the missed word. In conclusion, Coulter (2004) reported the students' average grade level increased from 4.5 to 5.4 (an increase of 9 months in one month of instruction) in passage oral reading. He also reported (p. 31) that the "students who participated in 21 to 31 sessions increased about 1.5 grade levels in passage reading and reading comprehension." There was one student with an IQ less than 55 that participated in 48 sessions during the 9-week period but did not show any growth in the NovaNET pre/post-tests. However, he did make an increase in the number of correct words read in one minute by 20.

Summary

Technology can be essential to addressing all students' various needs, especially those that are at-risk and those that have learning disabilities in a general classroom setting. A variety of computer applications are available to assist students with different reading proficiencies. At-risk students and students with learning disabilities can overcome certain reading problems with the use of supportive technology. Multimedia and computers also provide motivational alternatives to traditional teaching and learning. To meet the challenges set forth by the NCLB Act of 2002, many school districts have begun to use computer-based programs such as *A+nyWhere Learning System*,

GradeResults, and *NovaNET* to improve student learning and meet required AYP standards. The next section will discuss the methodology that will be used to evaluate effects, an explanation of my approach, the research questions, ethical issues, and the role of the researcher.

Section 3: Methodology

Introduction

This quantitative, archival study examines whether participation in the NovaNET intervention program is associated with increased reading achievement for at-risk and special education middle school students as measured by their reading scores on the ARMT. This section addresses the methodology that was used to address this research question. It contains six subsections as follows: research design, population and sample, instrumentation and data collection, data analysis, ethical considerations, and role of the researcher.

Research Design

According to Creswell (2009; 2012), a quantitative researcher uses postpositivist claims for increasing knowledge, uses experiments and surveys, and collects data on predetermined instruments with the aim of yielding statistical data. A controlled research design using archival data for three cohorts of NovaNET eligible students either assigned or not assigned to this intervention program was employed in this study. Data analyzed for this study consisted of students' archived results on the reading test of the ARMT from 2009 to 2013. The scores of three cohorts were retrieved for a period covering 3 years, consisting of their 6th, 7th, and 8th grade scores. The first cohort completed middle school from 2009 to 2011, the second from 2010 to 2012, and the third from 2011 to 2013. The available sample was divided into two groups: a group of students who were enrolled and completed the NovaNET program, and a group of NovaNET eligible students who were not enrolled in the program, with students from both groups

comparable in terms of age and educational achievement. The study assessed the benefits of the NovaNET program based on ARMT scores immediately following the administration of the NovaNET program at the end of the 7th grade of each cohort and at follow up one year later at the end of their 8th grade. The scores at the end of their 6th grade, before the administration of the program, served as the control for pre-existing differences (covariate).

The archival longitudinal cross-sectional design was chosen as it provides a robust framework for evaluating the efficacy of an intervention program such as NovaNET. From the standpoints of human subjects, time, logistics, and the need for the researcher's role to be unconfounded from any other role, the design is feasible as its execution draws on data already collected. The longitudinal component was designed to enable the study to determine whether participation in the NovaNET program is associated with improved reading scores and whether such improvements are durable. The cross-sectional component of the design enables the study to ascertain whether students who take the NovaNET program (enrolled students) outperform comparable students who do not (nonenrolled students). The ability to analyze data for cohorts enables the study to ascertain whether teachers' growing experience with the program results in stronger student gains in time. Using the ARMT score immediately prior to the intervention period serves as a control for the influence of pre-existing differences (analysis of covariance). All in all, the longitudinal cross sectional design was chosen because it enables a thorough scientific evaluation of the NovaNET program. A schematic illustration of the design is presented in Figure 1.

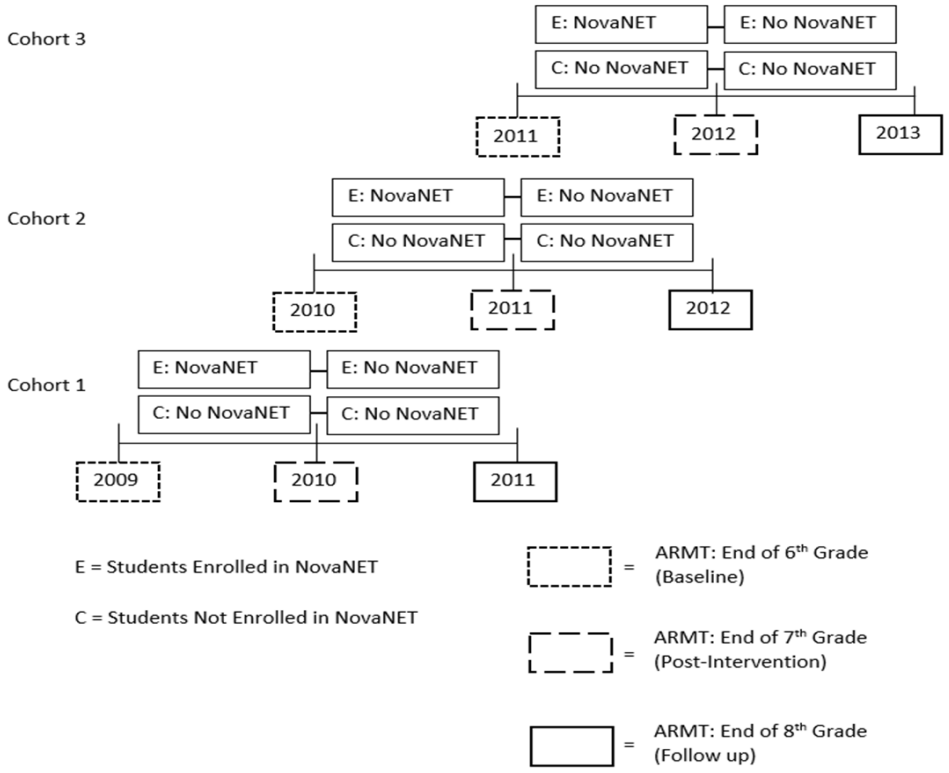

Figure 1. Longitudinal cross-sectional design. Three cohorts of NovaNET and nonNovaNET students with collection of ARMT data for baseline, post-intervention, and follow-up purposes at the end of 6th, 7th, and 8th grade (Alabama Department of Education, 2010–2013).

Population and Sample

The study was carried out in a small, rural middle school in western Alabama. The school's annual enrollment consists of an average of 550 seventh and eighth grade students. The racial or ethnicity makeup of the school is 99% African American and 1% Caucasian. The free- or reduced-lunch status for the students at this school is 100%. Students included in this study were considered at-risk due to the fact that they had either failed one or more grades, core courses, or were performing below grade level. Students that were identified as special education had been deemed so through special education

testing. Drawn from this population, the convenience sample included 7th grade students whose 6th grade ARMT scores placed them in Level I or Level II categories, which are the lowest achievement levels. These students were then recommended to participate in the NovaNET intervention program. Participation in NovaNET is not mandatory; therefore some parents opted not to enroll their child in the NovaNET program. This effectively enabled students to be divided into a control group and an experimental group for the study yielding a quasi-experimental study. Student background variables included in the archival data were closely examined to ensure that the quasi-experimental design of the study was carefully protected against threats to its integrity. Drawing exclusively on archival data, ARMT scores were retrieved for both groups at the end of 7th grade (after provision of NovaNET to roughly half the sample) and 8th grade (at the end of a one year follow-up period). G*Power encompasses statistical power analyses for an array of statistical tests. G*Power delivers effect size calculators and graphics options. Demidenko (2008) stated, "G*Power also supports both a distribution-based and a design-based input approach" (p. 37). Based on the results of a G*Power 3.0.1 analysis, which considered the type of statistical analysis planned for the study, the desired medium effect size and a desired power of 80%, the minimum sample size for this study was 120. Based on the results of the power analysis, it was determined that a sample of this size would provide sufficient and ample power to enable the data analysis to detect statistically significant effects of the NovaNET program, if such effects did indeed exist. Drawing on the archived records for the school, the actual sample size (see also Section IV) was 149 participants with 76 in NovaNET (51%) and 73 (49%) in the control group.

Exceeding the estimated requirement of 120 study participants, the available sample, thus, was considered more than sufficient for the study to be adequately powered to discover significant effects, if such effects exist.

Instrumentation and Data Collection

Data for this study consisted of student scores on the reading portion of the ARMT as retrieved from the school district's archival records. This data encompassed the 2009–2013 school terms. The ARMT is a criterion-referenced test that contains specific chosen material from the Stanford Achievement Test (Stanford 10) that corresponds with the State of Alabama content standards in the reading and mathematics areas. The ARMT scoring report reveals that construct validity is the main method of validity used with this assessment (ARMT, 2005). Construct validity of the ARMT was studied utilizing the intercorrelations of the identified areas, sub-areas, and total scores. The 7th grade reading portion of the ARMT addressed five standards which consisted of 51 multiple choice items with 51 possible points and 4 open-ended items with 12 possible points. The 8th grade reading portion of the ARMT addressed four standards which consisted of 54 multiple choice items with 54 possible points and 4 open-ended items with 12 possible points. Internal consistency and test-retest reliability are the forms of reliability that are cogitated for the ARMT (ARMT, 2005, p. 46). The ARMT is administered to students in grades 3–8. The students' performance is reported in terms of four achievement levels (Level I – IV) and the results are used for accountability purposes of the NCLB act. Among the four levels, Level IV is the highest level. Students that achieve at Level IV exceed academic content standards for their grade. Students who achieve at Level III

meet academic content standards for their grade. Students who achieve at Level II are only partially meeting academic content standards for their grade. Lastly, students who achieve at Level I, the lowest level, are not meeting the academic content standards for their grade. At-risk or special education students who performed at Level I or Level II comprised the sample for this study.

The results of the ARMT, also known as Accountability Report, are posted on the Alabama State Department of Education (ALSDE) website. This report also includes a breakdown of the school population in terms of the students' gender, ethnicity, and various other demographic characteristics. This aggregate report is available to the public; therefore acquiring and using the data in this report does not require permission from any administrative body. However, because the data required in this study were based on the individual ARMT scores of each student, the researcher, following permission granted by the approval of the study by Walden University's Institutional Review Board (IRB), requested permission from the superintendent of the school district to access and acquire this information. Once the superintendent authorized the data collection, the researcher provided a letter to the principal of the project school detailing the purpose of the study and the nature of the data required, with a copy of the permission letter from the superintendent attached to it.

The researcher commenced data collection procedures by compiling the ARMT scores of at-risk and special education middle school students who met the research criteria for the school years between 2009 and 2013. In addition to the ARMT scores, data on the students' age, gender, and special education status was also collected for

analysis purposes. A list of seventh and eighth grade students enrolled in the NovaNET Intervention class was obtained for the cohorts covered by the research to identify which students were part of the experimental group and the control group.

Data Analysis

The data collected from the school database were analyzed and graphed using a combination of SPSS version 21.0 and Statistica version 7 statistical data analysis programs. A frequency analysis was conducted separately for male and female students in each cohort to identify the level of reading achievement (arrayed on an ordinal scale from Level I to Level IV) for at-risk NovaNET and nonNovaNET students in general and special education. Lying on an ordinal scale, the analysis of the number of NovaNET and nonNovaNET students at each level of reading proficiency starting with the end of 6th grade (ARMT1 - all study participants were reading either at Level I or Level II) going to the end of 7th grade (ARMT2) and, finally, the 8th grade (ARMT3). The frequency totals provided a gross overview of the school's ability to promote reading for all at-risk and special education students coming into the 7th grade with below-proficient reading achievement. Following the frequency analysis, a more discerning inferential statistical analysis was used to determine if observed differences between NovaNET and nonNovaNET students could be accounted for by statistically significant differences attributable to the variables examined in this study. Specifically, a multivariate analysis of covariance was used to determine whether participation in the NovaNET program results in significantly higher reading scores in the ARMT. The analysis compared the ARMT reading scores of the experimental and control groups after they finished the

NovaNET program and at 1-year follow-up, and this was the basis to determine the immediate and longer-term effects of participation in the program. The data included scores of the 7th grade students from all three cohorts during the school years 2010 to 2012 (ARMT2). The second set of data included in the multivariate analysis compared the reading scores of the eighth graders from all three cohorts during the school years 2011–2013 (ARMT3). Roughly half of these eighth graders had gone through the NovaNET intervention program when they were seventh graders, and the multivariate analysis was based on experimental vs. control groups. Inspection of the scores of the eighth graders was the basis by which the long-term effects of the NovaNET intervention program were measured. Lastly, an analysis of variance was conducted using the data from the experimental group, with cohort as the grouping variable, in order to determine whether there were significant variations in student outcomes based on the cohort they were in when they participated in the NovaNET program. In these analyses, all variables were categorical. Independent variables NovaNET (yes/no), Gender (male/female), Education (special education/regular education) conformed to a nominal scale whereas dependent variables (ARMT2 and ARMT3) and the covariate (ARMT1) conformed to an ordinal scale of measurement.

Ethical Considerations

The researcher obtained permission from the Walden University Institutional Review Board (IRB# 09-22-14-0079405) prior to starting this study. As mandated by Walden University's IRB, all participants' rights were protected. Subject to the approval of the IRB and in preparation for the planned data collection, the researcher also secured

the written permission of the superintendent to access the data needed to carry out the proposed study (see Appendix A). The researcher informed the superintendent of all aspects of the research that could influence his willingness to grant permission to access the data and answered all inquiries by the superintendent regarding the adequacy of safeguards against adverse effects or consequences. The researcher assured the superintendent of the stringent security measures that would be implemented to preserve the confidentiality of the data including the identity of the students whose data would be used in the study. These measures included de-identifying the data and replacing the names of the students with numbers. All the hard copies of the data, including drafts of the write-ups of the study, were kept in a locked filing cabinet in the researcher's office. The researcher was the only individual who was able to open this filing cabinet. Electronic copies of the files were also stored on the researcher's personal computer, secured by a password known only to the researcher. A back-up copy of the files was stored on a password-protected flash drive and was secured in the researcher's locked filing cabinet. The data will be stored for a period of five years after the completion of the study, after which all hard copies of the data will be shredded and all electronic files will be permanently deleted.

Role of the Researcher

The primary role of the researcher is to maintain responsibility for the ethical standards to which the study adheres. Doyle, Brady, and Byrne (2009) stated that in doing quantitative research, a researcher must be detached from the study to avoid bias. In this study, the decision to use archival data was undertaken with a view to meeting the

requirement to unconfound the role of the researcher from any other role. The researcher is a reading intervention teacher in the school where the archival data originated and is a voice for at-risk and special education students. All students whose data were analyzed in the study had all completed their tenure at the school by the time their data were retrieved from the archive. Therefore, no student currently enrolled in the school participated in the study.

Summary

The study investigated whether NovaNET, an online computer-based program, has a significant effect on middle school at-risk and special education students' educational performance in reading as measured by the ARMT scores. The study was designed to support a preliminary frequency count of group changes in reading achievement across three consecutive annual administrations of the ARMT with a more powerful parametric statistical analysis of students' reading levels before, immediately after, and 1 year after participation in the NovaNET program. The study was designed to determine whether participation in the NovaNET program in the 7th grade resulted in significant improvement in the reading scores of at-risk and special education middle school students immediately after the completion of the program (ARMT2) and at one-year follow-up (ARMT3). The study was designed to control for variation prior to entering the 7th grade using the ARMT score at the end of 6th grade as a covariate (ARMT1).

Section 4: Results

Introduction

The presentation of results covers the description of the sample, frequency summaries by level of reading achievement for each cohort for each year, a summary frequency table, and the results of an inferential statistical analysis subjecting the hypothesis of the study to a rigorous scientific test. This section contains the following subsections: introduction, sample and descriptive statistics, frequency summaries and inferential statistics. Archival NovaNET and ARMT data from 2009–2013 were collected and analyzed to determine whether NovaNET increased ARMT scores. All identifying student information was removed and student data for each cohort were entered into Excel spreadsheets, which were merged into one combined subjects *x* variables data set for analysis. Data cleaning focused on the removal of students who principally for reasons of mobility had not completed their middle school education from beginning to end at the project school. Overall, this resulted in the removal of 31 students from the dataset.

Sample and Descriptive Statistics

The sample available to test the hypotheses of the study consisted of 149 middle school children in rural western Alabama who had ARMT scores at the end of Grades 6 (ARMT1), 7 (ARMT2), and 8 (ARMT3) within three cohorts of students covering the academic years from 2009–2013. The sample consisted of 46 (31%) females and 103 (69%) males. The experimental-control group split was 76 (51%) experimental participants and 73 (49%) control participants. Of the 149 participants, 67 (45%) were in

general education and 82 (55%) were in special education. There were a total of three cohorts and the breakdown for each cohort was as follows: 52 participants (34.9%) in Cohort 1, 53 participants (35.6%) in Cohort 2, and 44 participants (29.5%) in Cohort 3. The Level (at ARMT1) of participants at Level I was 64 (53%) and 85 participants (57%) were at Level II.

Frequency Summaries and Inferential Statistics

The variables of gender, general/special education, and ARMT1 through ARMT3 scores within and across the three cohorts are presented in Tables 2 through 7 (Alabama Department of Education, 2009–2013).

Table 2

Cohort 1 Number of Male Participants by Level of ARMT Score

	Control		Exp		Level I		Level II		Level III		Level IV	
Year	GE	SPED	GE	SPED	Control	Exp	Control	Exp	Control	Exp	Control	Exp
2009	5	14	8	9	6	8	11	11	0	0	0	0
2010	5	14	8	9	2	0	8	12	7	7	0	0
2011	5	14	8	9	0	0	6	5	11	11	0	3

Table 3

Cohort 2 Number of Male Participants by Level of ARMT Score

	Control		Exp		Level I		Level II		Level III		Level IV	
Year	GE	SPED	GE	SPED	Control	Exp	Control	Exp	Control	Exp	Control	Exp
2010	12	11	13	8	13	5	8	18	0	0	0	0
2011	12	11	13	8	5	3	14	10	2	9	0	1
2012	12	11	13	8	2	0	9	9	9	10	1	4

Table 4

Cohort 3 Number of Male Participants by Level of ARMT Score

	Control		Exp		Level I		Level II		Level III		Level IV	
Year	GE	SPED	GE	SPED	Control	Exp	Control	Exp	Control	Exp	Control	Exp
2011	4	8	6	5	6	6	5	6	0	0	0	0
2012	4	8	6	5	1	2	6	3	3	7	1	0
2013	4	8	6	5	0	2	5	2	6	6	0	2

Table 5

Cohort 1 Number of Female Participants by Level of ARMT Score

	Control		Exp		Level I		Level II		Level III		Level IV	
Year	GE	SPED	GE	SPED	Control	Exp	Control	Exp	Control	Exp	Control	Exp
2009	2	5	3	6	6	2	3	5	0	0	0	0
2010	2	5	3	6	0	2	8	2	1	3	0	0
2011	2	5	3	6	0	0	3	2	5	4	1	1

Table 6

Cohort 2 Number of Female Participants by Level of ARMT Score

	Control		Exp		Level I		Level II		Level III		Level IV	
Year	GE	SPED	GE	SPED	Control	Exp	Control	Exp	Control	Exp	Control	Exp
2010	1	3	3	2	1	2	4	2	0	0	0	0
2011	1	3	3	2	0	1	1	3	4	0	0	0
2012	1	3	3	2	0	0	1	2	3	2	1	0

Table 7

Cohort 3 Number of Female Participants by Level of ARMT Score

	Control		Exp		Level I		Level II		Level III		Level IV	
Year	GE	SPED	GE	SPED	Control	Exp	Control	Exp	Control	Exp	Control	Exp
2011	4	7	6	4	4	5	6	6	0	0	0	0
2012	4	7	6	4	0	2	6	6	4	3	0	0
2013	4	7	6	4	0	0	4	3	5	6	1	2

Table 8

Summary of Comparison of the Level of ARMT Scores

ARMT Reading Level		Level I		Level II		Level III		Level IV	
Group	Test	*n*	%	*n*	%	*n*	%	*n*	%
NovaNET	ARMT2	10	13.2	36	47.4	29	38.2	1	1.3
	ARMT3	2	2.6	23	30.3	39	51.3	12	15.8
Control	ARMT2	8	11.0	43	58.9	21	28.8	1	1.4
	ARMT3	2	2.7	28	38.4	39	53.4	4	5.5

Table 8 shows the number and percentage of students at the four reading levels at ARMT2 and ARMT3. The ARMT3 scores show that 67.1% of students in NovaNET achieved the goal of reading at least at Level III by the time they completed middle school, whereas only 58.9% of students in the nonNovaNET group achieved this outcome. NovaNET was associated with a success rate 8.2% higher than the

nonNovaNET group. In addition, at the end of the study, three times as many NovaNET students (15.8%) performed at Level IV than did the number of students in the control group (5.5%). A more powerful inferential statistical analysis was required in order to determine the statistical significance of these global findings. The relatively large sample size made the use of a parametric variance analysis possible and preferable.

A multivariate test of significance (general linear model) was done with dependent variables of ARMT2 and ARMT3, independent variables of experimental-control (EX-CO), gender (GEN), general education – special education (GESP), and covariant of ARMT1. In addition to information for the independent variables and the covariate, the analysis yielded information for the following interactions between variables (an * is used to designate interaction): EX-CO*GEN, EX-CO*GESP, GEN*GESP, and EX-CO*GEN*GESP. Table 9 presents the results of this analysis. Levene's test for homogeneity of variances was not significant for either dependent variable (ARMT2: $F = .10$, $df = 1, 147$, $p < .76$; ARMT3: $F = 2.14$, $df = 1, 147$, $p < .15$). Assumptions for the integrity of a quasi-experimental design were consistent with the finding that ARMT1 scores revealed no significant difference between students receiving and not receiving the NovaNET program ($F = 2.37$, $df = 1,147$, $p < .13$). The results of the multivariate analysis of covariance are summarized in Table 9.

Table 9

Multivariate Analysis of Covariance

Effect	Test	Value	*F*	Effect *df*	Error *df*	*p* <
Intercept	Wilks	0.56	54.604	2	139	0.001*
ARMT1	Wilks	0.65	37.835	2	139	0.001*
NovaNET (EX-CO)	Wilks	0.94	4.129	2	139	0.02*
Gender (GEN)	Wilks	0.96	2.957	2	139	0.06
GenEd-SpEd (GESP)	Wilks	0.99	1.031	2	139	0.46
EX-CO*GEN	Wilks	0.95	4.300	2	139	0.02*
EX-CO*GESP	Wilks	0.98	1.208	2	139	0.30
GEN*GESP	Wilks	0.99	0.351	2	139	0.70
EX-CO*GEN*GESP	Wilks	0.96	3.121	2	139	0.05*

Note. * = Statistically significant at $p \leq .05$.

The covariate of ARMT1 is expected to be a significant predictor of subsequent ARMT scores, so this finding is not a surprise. The utility of this variable in the model is to ensure that variation existing between students prior to entering the experimental or control group would not be interpreted as resulting from being in these groups. Thus ARMT1 is a quality control variable.

The most precise understanding of the results of the multivariate analyses relies on the interpretation of the highest-order interaction effect, as it most comprehensively encapsulates the significant interrelationships between the variables in the model. Nonetheless, the statistical significance of the main effect of participating vs. not participating in the NovaNET program, EX-CO most directly addresses the hypothesis

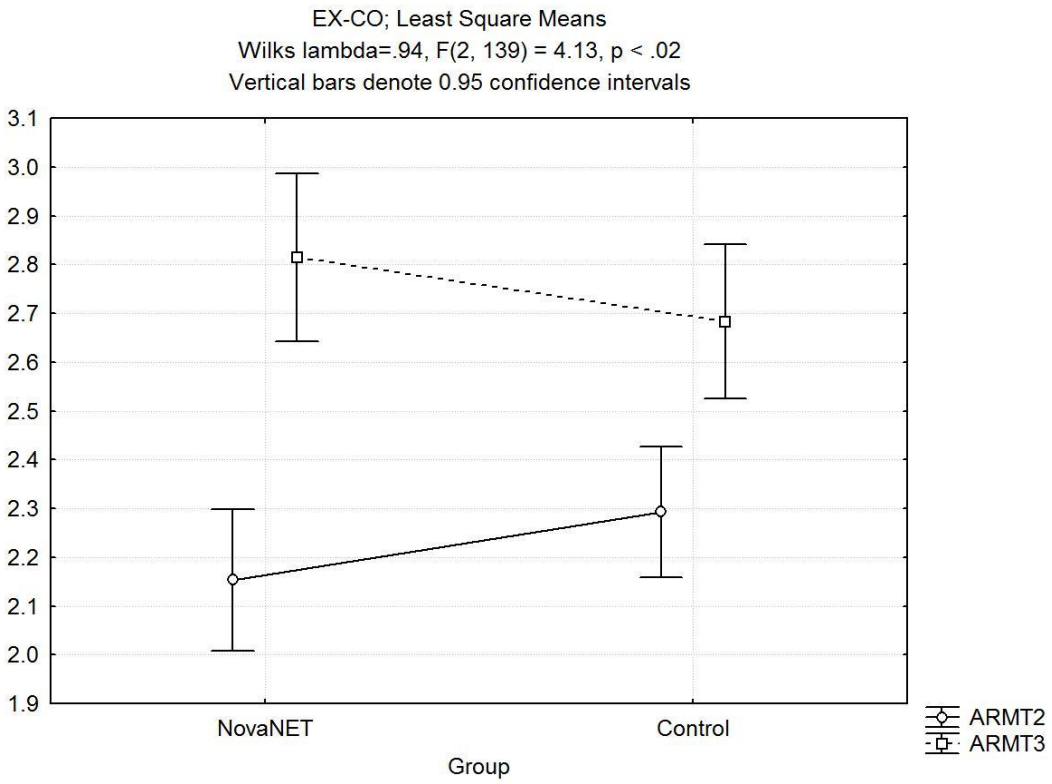

Figure 2. ARMT scores of NovaNET and control students immediately after participation in the experimental program (ARMT2) and at 1-year follow-up (ARMT3).

of the study. Figure 2 presents the statistical data for this significant main effect ($F(2,139) = 4.13$, $p < .02$). As can be seen from inspection of the graph, the data indicated that while students in the control group had higher ARMT scores at the end of 7th grade (ARMT2), this relationship was reversed by the time students were tested at the end of 8th grade (ARMT3). Thus, as measured by the ARMT, a principal finding of this study is that while participation in NovaNET was not associated with a comparative benefit immediately after completion of the program at the end of 7th grade, it was associated with a statistically significant comparative benefit at follow-up at the end of 8th grade. Therefore, in this investigation the null hypothesis (H_0) is rejected and the alternative

hypothesis (H_1) is accepted. In other words, the study concludes that participation in the NovaNET experimental program is associated with statistically significant improvement in the reading performance of middle school at-risk and special education students. Notably, the evidence indicated that the effects of the experimental program may not right away be apparent in a controlled, comparative study, but that these effects nonetheless continue to grow and become more prominent, and statistically significant, in the year following students' participation in the NovaNET program.

The finding of significant interaction effects indicates that a fuller or more detailed understanding of the benefits of the NovaNET program is both possible and warranted. Specifically, the three-way interaction between EX-CO*GEN*GESP ($F(2,139) = 3.12$, $p < .05$) indicated that variables of both gender and general education-special education status were associated with differential benefits of participation in the NovaNET program. Inspection of the data (see Figures 3 and 4) revealed that while at-risk general education girls who participated in NovaNET achieved below their nonNovaNET counterparts at the end of the experimental program (ARMT2), these girls nonetheless succeeded in closing the gap and even surpassing their counterparts at the end of the follow-up period (ARMT3). On the other hand, at-risk general education boys in NovaNET scored just slightly higher than their nonNovaNET counterparts at both ARMT2 and ARMT3 (see Figure 3). Conversely, for special education students, boys who had completed NovaNET scored slightly higher than their controls at the end of 7th grade (ARMT2) and relatively even higher still at follow-up at the end of 8th grade. For special education girls, on the other hand, the results indicated that those in the control

group maintained a slight difference compared with those in the NovaNET group, although the difference grew smaller over time. In sum, although the overall result pointed to the benefit of participation in the NovaNET program, a closer inspection of the highest order interaction effect suggested that NovaNET may be particularly beneficial for at-risk general education girls and special education boys.

As indicated above, the study uncovered associations between variables that were sufficiently stable to yield statistically significant results. Yet the importance of such findings is a function not merely of the stability of such relationships, but also their size. For multi-variate analyses of variance inspection of the Lambda statistic provides a readily accessible estimate of effect size where larger effects are associated with values of Lambda progressively smaller than 1.00. Inspection of the Lambda values in Table 8 indicate that, beyond the Intercept and the covariate of ARMT1, all variables in the model were associated with only small effects on the dependent variables of ARMT2 and ARMT3. Yet, taken as a whole, the combined set of variables and interaction effects achieved an educationally relevant impact on the dependent variables as indicated by the computation of the Adjusted R^2 which, respectively, were 0.36 for ARMT2 and 0.14 for ARMT3. Taken together, the findings of this study indicated that while other variables not included in the current study appear to play a greater role in outcomes, the variables examined in this study nonetheless indicate that NovaNET can make a stable and educationally significant contribution to the achievement of improved reading outcomes among special education and at-risk middle school students. Finally, it should be noted that the variable of cohort was not statistically significant ($F(4, 142) = 0.57$, $p < 0.69$). In

other words, there was no evidence that increased experience with NovaNET at the school site resulted in higher scores for students enrolled in the two years following the initial implementation of the program.

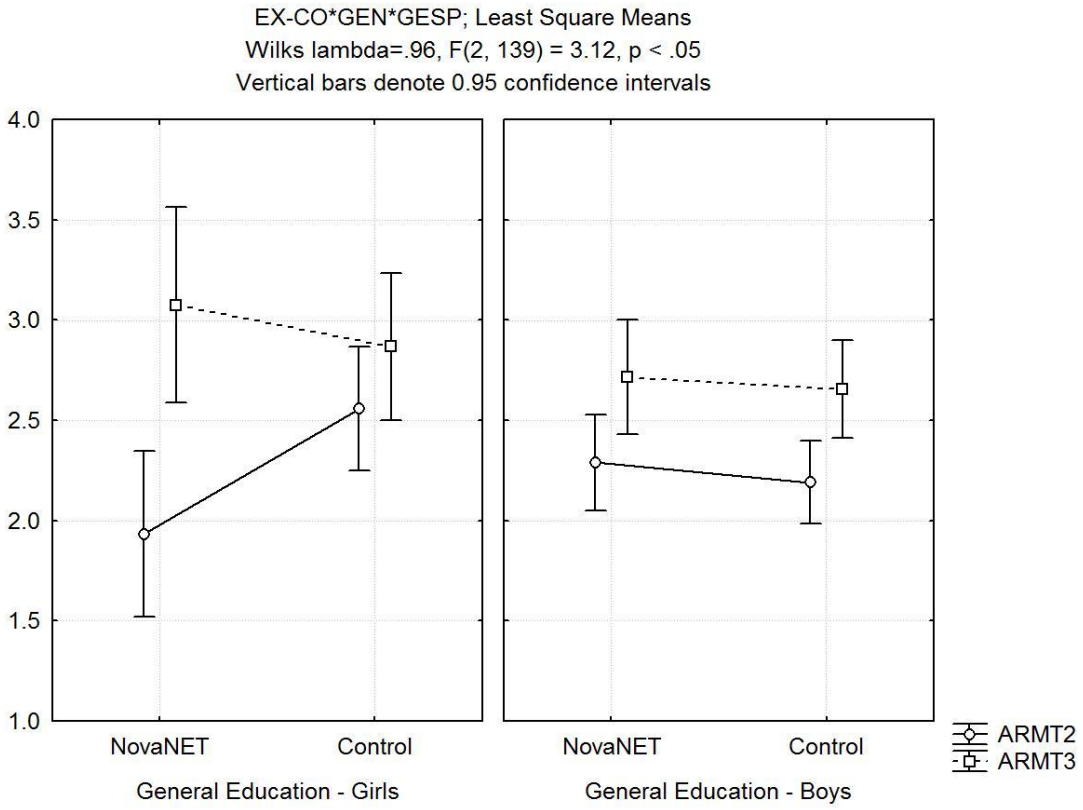

Figure 3. General education students by gender: ARMT scores of NovaNET and control at-risk students immediately after participation in the experimental program (ARMT2) and at 1-year follow-up (ARMT3).

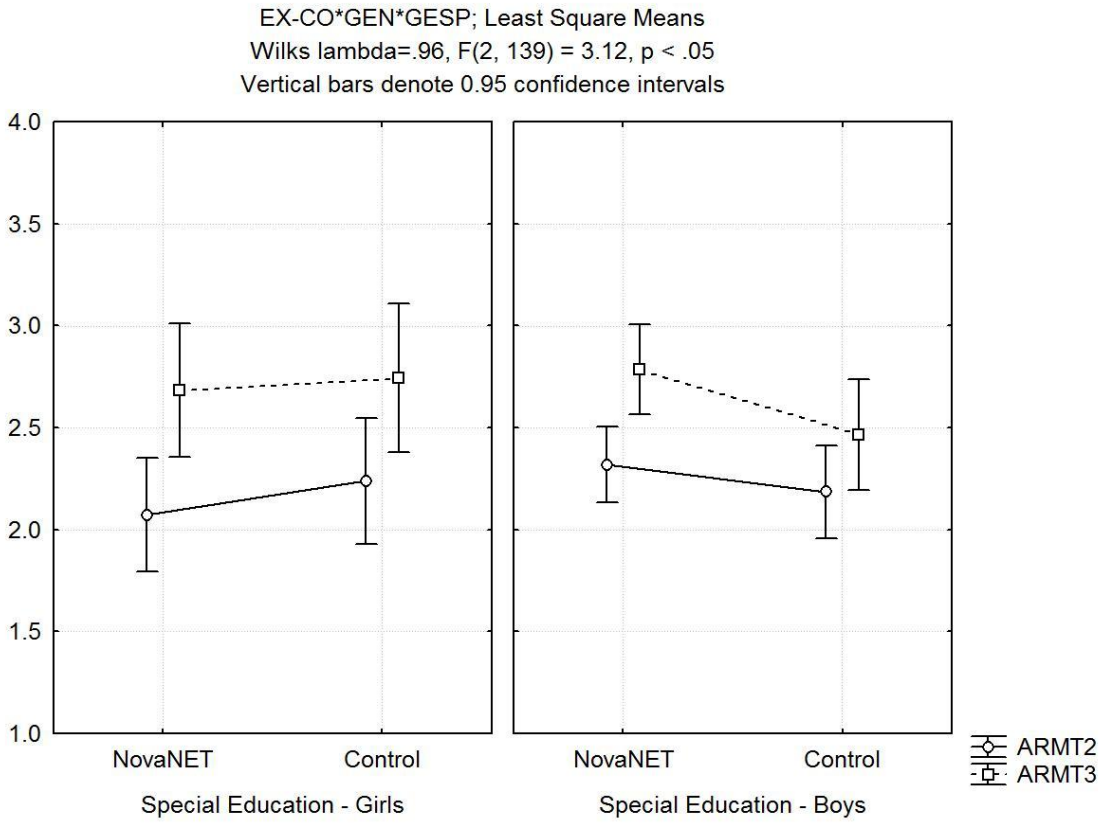

Figure 4. Special education students by gender: ARMT scores of NovaNET and control students immediately after participation in the experimental program (ARMT2) and at 1-year follow-up (ARMT3).

Section 5: Discussion, Conclusions, and Recommendations

This section provides an overview of why and how the study was done and the research question that was addressed. In addition, this section covers the interpretation of findings, the implications for social change, recommendations for action, and recommendations for further study.

Overview

Seventh- and eighth-grade at-risk and special education students at a middle school in rural western Alabama were not making adequate yearly progress in reading according to state mandated requirements under NCLB. The purpose of this controlled quantitative archival study was to determine whether NovaNET, a technology-based program promoting differentiated instruction within a general constructivist perspective would enable students to improve their reading achievement compared with that of students in the regular (i.e., nonNovaNET) classroom setting. Participants included students who completed ARMT testing three times covering the end of sixth grade, leading in to middle school, as well as the end of Grades 7 and 8. Drawing on a sample of 149 students, with 76 (51%) in the NovaNET group and 73 (49%) in the control group, the study examined the single hypothesis of whether NovaNET students performed comparatively better than their nonNovaNET counterparts. Findings indicated that, by the end of the study, 8.2% more NovaNET students than controls achieved a reading score on at least Level III (meeting grade level standards) whereas three times as many NovaNET students than controls (15.5% vs. 5.5%) demonstrated reading proficiency at Level IV (exceeding grade level standards). A multivariate analysis of covariance indicated

statistically significant findings associated with participation in the NovaNET program. The main effect emerged during the follow-up period, whereas significant interaction effects indicated that the program, in comparison with controls, was more beneficial for at-risk girls in general education and boys in special education. Yet, although educationally significant as indicated also by the results of the frequency analysis, statistical effect sizes were generally small. Overall, more variance was accounted for by variables not known or included in the study than the variance accounted for by variables included in the study. There was no effect of the variable of cohort in this study.

Interpretations of Findings

Regardless of whether students participated in NovaNET or not, the results of the study indicated that well over half of the students (63.1%) who started middle school only partially (Level II) or not meeting grade level standards (Level I) did meet grade level standards by the end of 8th grade. Moreover, 67.1% students who had completed the NovaNET program did so as compared to only 58.9% of nonNovaNET students. While these results indicate that many students in both groups continued to fall short of state-mandated goals, fewer students in the NovaNET group (32.9%) did so as compared to those who had not participated in this program (41.1%). As indicated above, these differences corresponded with statistically significant differences in a parametric multivariate analysis of covariance.

While effect sizes were largely small and more variance was unaccounted for than accounted for, the best interpretation of the available evidence suggests there is a scientifically supported case for the inclusion in middle schools like the research site for

computer-assisted programs that enable students with a history of reading difficulties to benefit from differential instruction. Moreover, based on the results of this study, it is possible that the benefits of such a program will vary somewhat across different subgroups of students. In the current study it appeared that at-risk girls in general education benefited more than girls in special education with a tendency for the opposite result to be the case for boys. The identification of plausible reasons and perhaps explanations for the various aspects of this interaction effect must await a replication of the current study within a mixed-model design that would include also the collection and analysis of qualitative data from both students and teachers (see also Recommendations for Further Study). This type of data would likely be helpful to explain more precisely a finding such as, for instance, the one in the current study that at-risk general education boys scored just slightly higher than their nonNovaNET counterparts while this difference was somewhat more pronounced among special education boys. Other important limitations of the current study are reviewed below.

While the controlled archival quantitative research design afforded a good ability to examine the hypothesis of the study, that NovaNET is associated with comparatively better reading outcomes than nonNovaNET classrooms, the adopted research design also had a number of key limitations. Key among them was the inability to control for a number of variables that could have impacted the obtained results. Thus, for example, no specific measure of daily attendance was available to control the statistical analysis for this factor. Thus, it is at least in theory possible that more nonNovaNET students might have achieved poorer reading scores simply because of poorer school attendance. While

there is no evidence that this is so, this study is not able to rule out the possibility that it might be so. Similarly, while the benefits of NovaNET appeared to become stronger over time (divergent effects), it is at least in theory possible that salutary life events ('history') in eight grade could have benefitted more NovaNET than nonNovaNET students. If so, the association identified here pointing to the benefits of the NovaNET program could be attenuated or eliminated altogether. Again, while there is no evidence that such factors played a role, neither can this study definitely rule out such a possibility. A further limitation of the current study concerns the possibility that one or more factors could have been at play, when parents chose to enable or not enable their NovaNET-eligible child to participate in this program. While students in both groups all met the admission criteria for inclusion in the study (ARMT reading level of I or II at the end of sixth grade), the parental choice could have introduced an extraneous variable whose existence and possible influence on the results of this study cannot be known or ascertained.

Overall, and within the context of the limitations of the variables included in the study, the available evidence lends support to other research in the literature that have pointed to the benefits of differential instruction via computer-assisted learning formats. Thus, the findings are consistent with Walkington's (2013) observations that the evolution of interventions that rely on adaptive instruction was associated with increases in academic achievement among at-risk and special education students in middle-school settings. Likewise, the findings of the study are compatible with the position that an adaptive format helps at-risk and special education students by allowing them to use technology to govern their own learning (Kanar & Bell, 2013). Lee and Templeton

(2008) observed that software and technology can provide differentiated instruction to at-risk and special education individuals to increase their academic achievement. The findings of the present study are in keeping with this assessment. Likewise, the findings of this study support Kennedy and Deshler's view that technology can assist in assignment completions and acquiring new information, so that all at-risk and special education students can enjoy full inclusion and benefit from computer-assisted instruction (Kennedy & Deshler, 2010).

The results of this investigation supported the view – and the working hypothesis of the study – that NovaNET, a technology-based approach to differentiated instruction, is associated with educationally worthwhile benefits on the achievement of reading proficiency. ARMT scores of students who participated in the NovaNET program pointed to a significant albeit modest benefit over the ARMT scores of NovaNET-eligible students whose had not participated in this voluntary program.

Implications for Social Change

The findings of this study support the positive impact of the intervention program and reinforce positive social change aimed at providing at-risk and special education students differentiated instruction via computer-assisted instruction. Therefore, the effectiveness of the NovaNET intervention program in increasing reading achievement on the ARMT can be supported. By implementing the strategies of the NovaNET intervention program, educators can increase student reading achievement in the general classroom setting.

The outcome of this study is significant because it demonstrates that the use of the NovaNET intervention program can contribute to enhanced reading achievement among at-risk and special education middle school students. Learning to read in today's society is essential. Schools provide the foundation for students to learn to read and contribute to their future success. Using a reading intervention program such as NovaNET, can assist at-risk and special education students with learning necessary reading skills and increase academic achievement.

Recommendations for Action

This study is an important addition to the literature on the efficacy on NovaNET. It can provide a valuable platform on which administrators and educators especially with student populations similar to the ones studied here can arrive at decisions about the implementation of NovaNET in their settings. The use of the NovaNET intervention program should be considered in districts where at-risk and special education students are struggling with reading achievement. Upon implementation, the school district should decide how they will offer the program to at-risk and special education students. The program can be used in at least three different ways: Offered as an elective where students can enroll voluntarily; offered as a mandatory course for students who need to attend summer school, or offered as an enrichment program during the summer for at-risk and special education students who have been promoted to the next grade but would like to enhance their reading abilities. Due to prevailing limitations in educational funding, some districts may struggle with the cost of acquiring and implementing the NovaNET program which, among others, include the cost of the program, the cost of the requisite

technology, and the cost of teacher training and on-going support. An effective school-based action plan will come with a program evaluation component – such as tracking students by their achievement on accepted standardized measures – to ascertain the plan's ability for educators and students to accomplish identified learning objectives. A research component will enable educators in schools to continue to add to the evolving body of knowledge on NovaNET and, more generally, learning and computer-assisted instruction.

Recommendations for Further Study

The findings of the current study can be placed in a broader context of relevance by further study that would replicate and extend the current research design. For example, it may be possible to control for additional variables such as attendance, intervening events (history), or have a better understanding of the considerations that differentiate between parents who indicate they want this program for their children, and those who do not. Likewise, research can be undertaken to examine the benefits of NovaNET as an option for students in general education with no identified reading deficit and also for students in high school with a variety of learning needs associated with reading.

Perhaps most importantly, a qualitative study can focus on the views of teachers, students, and parents regarding the NovaNET program and its efficacy. Student narratives of their own sense of reading efficacy over time would provide access to valuable contextual information. Likewise, teacher reports about the plusses and minuses of using NovaNET over alternative (nontechnology-based) programs would be useful. While the current study did not find evidence that later cohorts outperformed earlier ones, it would be valuable to know whether there may be supports that could enable new

NovaNET teachers to transition more effectively from a novice to a proficient or even expert user of this program, perhaps enabling improved student outcomes over time. In addition, collateral information from parents about changes in children's reading habits at home, including their motivation to read, would serve to broaden our understanding of the impact of the use of NovaNET.

Conclusion

Guided by constructivism and utilizing technology, educators are forging innovative solutions to students' learning problems. The methods of scientific research are available to examine the ability of such solutions to secure improved student outcomes while promoting continuous improvement in schools. The examination of the benefits of the NovaNET program in the current study contributes to the effort to use the techniques of controlled scientific research to study the benefits of compelling advances in theory with equally captivating advances in technology-based delivery-systems to determine whether their combination indeed can solve practical problems of real students.

The current study suggests that NovaNET can be a useful option for educators concerned about students entering middle school with below-proficient reading levels. Specifically, within its limitations, this study found that the effects of NovaNET were not significant immediately following the delivery of the program (end of 7th grade), but grew and became statistically significant by the end of 8th grade. Moreover, the examination of statistically significant interaction effects indicated that NovaNET at-risk girls in general education out-performed their nonNovaNET counterparts, whereas an opposite trend was found for boys. Overall, at the end of middle school and in

comparison to nonNovaNET controls, the number of NovaNET students reading at Level III or above exceeded by 8.2% the number of nonNovaNET students achieving such outcomes – 67.1% vs. 58.9%. In addition, three times as many NovaNET students as controls (15.7% vs. 5.5%) exceeded academic content standards (Level IV) by the time they reached the end of 8th grade and completed their middle school education.

While new media and methods of communication evolve at a dizzying pace, the ability to read, comprehend, and evaluate information remains as basic and critically important as ever. As educators and administrators, we tend to assign the goal of mastering the reading curriculum to the primary grades, but the need to continue to acquire new reading skills, or adapt existing ones, points to the advantage of a broader view of reading; one that extends beyond the primary years of schooling. The implementation of such a view is facilitated by increasingly versatile technological advances that enable educators to identify and address the unique challenges each learner faces, including, importantly, learners with special needs or risks for school failure. Technology-supported reading intervention programs must be evaluated scientifically for their effectiveness in increasing the academic achievement of all those who use them. The results of the current study suggest that students with a history of reading difficulties at the end of the primary grades can go on to improve their reading skills in technology-supported learning formats.

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Appendix A

Letter to Superintendent

Alice Harris Jackson
[redacted]

August 19, 2014

[redacted]

Dear [redacted]:

As a doctoral candidate at Walden University, I am working on my dissertation. This letter is to request permission to conduct research related to my dissertation at [redacted] School.

The purpose of my research is to use archival data to determine the strengths and weaknesses of NovaNET's Impact on the Reading Achievement of At-Risk Middle School Students. I will gather 2009-2012 ARMT data from the Alabama Department of Education website and the 2009-2012 NovaNET data from the schools' database. I will analyze the ARMT scores and NovaNET data for each of the those years.

All students, schools, district, and city names will remain anonymous. For example, [redacted] may be referred to as a suburban middle school in Southern Alabama. My advisors, Dr. Mogens Jensen and Dr. Catherine Sullivan, will assure that my dissertation adheres to both university standards and the Ethical Standards in Human Subjects Research of the American Psychological Association.

For your convenience, I have enclosed a signature block below. Please feel free to sign, scan, and email this letter back to me. Thank you for your assistance.

Sincerely,

Alice Harris Jackson

Alice Harris Jackson

Enclosure

Check one. Approved ✓ Disapproved _____

Signature [redacted]

Date 8-19-14