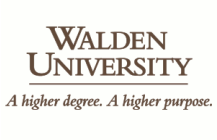

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Evaluation of a Remedial Educational Program at a Southern Suburban Middle School

Mary K. Mills
Walden University

Walden University

COLLEGE OF EDUCATION

This is to certify that the doctoral study by

Mary Leatherbury Mills

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

Review Committee
Dr. Don Jones, Committee Chairperson, Education Faculty
Dr. Marie-Anne Mundy, Committee Member, Education Faculty
Dr. Robert Throop, University Reviewer, Education Faculty

Chief Academic Officer

Eric Riedel, Ph.D.

Walden University
2012

Abstract

Evaluation of a Remedial Educational Program at a

Middle School in the Southeast

by

Mary Leatherbury Mills

MA, University of South Florida

BA, University of South Florida

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Teacher Leadership

Walden University

February 2012

Abstract

No Child Left Behind (NCLB) mandates that students be measured yearly on standardized state tests, rather than on classwork, to show adequate academic growth. During the 2007-2008 school year, 38% of eighth graders in one state failed the math portion of the Criterion Referenced Competency Test (CRCT). The purpose of this quasi-experimental, pretest-posttest control-group study was to determine if there was a significant difference in CRCT scores between at-risk eighth-grade math students receiving instruction in (a) the Remedial Education Program (REP) and in (b) the regular program. The theoretical base for this study included Piaget's concrete operational theory, constructivist theory, and behaviorist theory. In this causal-comparative experimental design, analysis of covariance was used to assess differences in eighth grade CRCT scores, controlling for seventh-grade test scores. Of the 50 students in this study, 25 received instruction in the REP model and 25 in the traditional model. Results indicated that the group that received the REP program instruction had significantly higher eighth-grade CRCT scores than the regular instruction group. Implications for positive social change include better understanding the most effective type of math instruction for at-risk students that can result in increased math achievement

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ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

Dedication

With deepest affection and appreciation I dedicate this dissertation to my parents, Dick and Ann Leatherbury, and my siblings, Diane, Karen, John, and Leslie. If it were not for them I never would have thought I could go to college and achieve my dreams. My family's love, support, and encouragement mean everything to me, and I could not have done this without them. I am truly blessed to have such a wonderful family.

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Section 1: Introduction to Study

Introduction

Middle school began in the 1970s to help students deal with the academic and complex emotional issues of adolescence (Juvonen, Le, Kaganoff, Augustine, & Constant, 2004). However, as the 21st century progresses, it is clear that middle schools have failed to educate children for the Information Age (Akos, Queen, & Lineberry, 2005). Deficiencies in math, specifically, leave students lacking in critical problem-solving skills and unprepared for a wide range of careers, such as those in science and technology, of which math is the foundation.

During adolescence, students undergo a change from concrete to abstract thinking (Piaget, 1969). In Georgia, for example, the middle school math curriculum makes a considerable jump to more abstract thinking (Georgia Department of Education [GDOE], 2008a). For adolescent students who are just learning to think abstractly, this math curriculum could present challenges and lead to difficulties in middle school and beyond, including failure to graduate high school and inability to perform all tasks required in the workplace. Over 25% of all high school students drop out before graduating, although half of these students do receive a general education diploma (Boylan, Bonham, White, & George, 2000). A majority of these students are functionally illiterate and many do not possess enough mathematics skills to contribute to the modern American economy (Boylan et al., 2000). Industry and businesses often find themselves spending money on, and devoting resources to, remedial mathematics instruction for employees who cannot do the math needed to perform their jobs (Fowler, 2000).

In order to proceed to high school, students must now show not just mastery in their classes but mastery on state tests in reading, math, and language arts. This requirement has led to additional retention and a higher dropout rate. In 1989, a study done by the National Research Council asserted that relatively little had been accomplished by remediation programs and that research was needed to discover how to reverse a consistent pattern of low achievement or failure in mathematics. This study spurred educators to look at remedial education programs and to use data-based research to determine which programs worked and how the pattern could be reversed (Baker, Rieg, & Clendaniel, 2006; Bottage & Hasselbring, 1993; Burris, Heubert, & Levin, 2006; Cole, 2009).

Instead of correcting the deficiencies by researching and implementing effective remediation programs, the United States Department of Education (USDOE) has changed the criteria for passing or failing. Specifically, the No Child Left Behind Act mandated that students' learning be measured yearly on standardized state tests, rather than on classwork grades, to show adequate academic growth (No Child Left Behind [NCLB], 2002). These tests play an integral part in determining if students pass on to the next grade (GDOE, 2008). However, since no effective remediation methods have been discovered and implemented, these tests represent simply one more challenge middle school students must face.

Statistics show that U. S. middle schools students experience a drop in achievement between fourth and eighth grade compared to their peers in other first-world countries (Juvonen et al., 2004). U. S. fourth grade students scored at about the

international average, ranking ninth among the 17 countries in the study. By the eighth grade, however, students were scoring significantly below the international average and were ranked twelfth (Juvonen et al., 2004). Several factors may have contributed to this decline, including puberty, increased autonomy from parents, and additional influence from peers. Nonschool factors such as race, socioeconomic status, and family history could have affected performance as well (Carruthers, 2009).

One possible source of the decline, puberty, occurs around the time that middle school starts. According to Akos et al. (2005), because of the varying rates of development among students, problems sometimes occur and interfere with student learning. Some students need time to catch up to their bodies while they deal with constant peer pressure and the need to fit in. They are also trying to find a sense of identity.

Academic success in middle school is further complicated by students' increasing independence from parents. During the middle school years, children begin to think for themselves and question parental control (Akos et al., 2005). This newfound autonomy undermines parental authority and it allows peers to become more of an influence (Akos et al., 2005).

All of these issues can impair learning. The challenge is to meet both the academic and emotional needs of this age group. However, effective approaches have not been developed.

For most students, math is exceptionally challenging and requires them to use problem-solving skills and to build on previously learned concepts. This degree of

difficulty, coupled with the unique factors facing adolescents in the middle school setting, makes teaching math a challenge. However, successfully teaching math is a critically important area for both student development and school success. But compared with the traditional, nonremedial student at-risk students are even less prepared for higher-level mathematics (Juvonen et al., 2004; Vaughn, Bos, & Schumm, 2000). According to many studies, at-risk students have common characteristics that might be a factor in their academic success (Juvonen et al., 2004; Vaughn et al., 2000). Some of these characteristics include the following:

- Lack of academic skills: They achieve lower scores on SAT, ASSET, and ACT tests and exhibit inadequate prerequisites for successful college study.
- Poor attitude: They do not demonstrate effort and motivation andfail to see learning as a lifetime experience.
- Lack of counseling—They have never spoken to a career counselor, lack direction, and have parents who have never been to college.
- Lack of school survival skills—They had poor elementary schooling and have difficulty taking notes, outlining, listening, taking tests, and using the library. They have poor memory and concentration skills.
- Low aspirations—have a fear of failure because of negative self-image and a lack of self-confidence.
- Cognitive style—They are more interested in nonacademics and are unable to use their own learning styles to their best advantage.

- Limited vision—They do not realize the need for mathematics skills that would be used later. They have tunnel vision and are unable to perceive long-range outcomes.
- Lack of maturity—They lack educational objectives, which results in a high course repeat rate and a high attrition rate. (Juvonen et al., 2004; Vaughn et al., 2000)

While schools have limited control over many of these characteristics, as well as additional factors like puberty, family situation, and peer influence, schools can influence students through instructional methods, class size, and flexible scheduling. NCLB (2002) has pushed administrators to delve into the research to help students in their schools reach their full potential and to pass increasingly higher standards.

Students who do not pass these standardized tests might fail their grade and face summer school or retention. Their school—which might not meet adequate yearly progress (AYP)—could face sanctions, a measure stipulated by NCLB (2002). Each school district is responsible for (a) identifying students who might be at risk for failing and (b) providing programs and implementing strategies to help them pass the state tests and be promoted. Identifying at-risk students early improves the odds that they will meet the standards and be successful over the long term, including developing good learning habits to carry them through high school, higher education, and into their careers (Loran, 1998; Juvonen et al., 2004).

This study looked at the effectiveness of instructional methods in eighth-grade math for two types of classes: Group 1 students received remedial, small-group classes as

their daily math instruction, known as the Remedial Education Program, or REP. Group 2 students were identified as at-risk due to low scores on the Criterion Referenced Competency Tests (CRCTs), but received their math instruction in a traditional classroom setting.

Statement of the Problem

In the 2007–2008 school year, 38% of eighth-grade math students in Georgia failed the math portion of the CRCT (GDOE, 2008a). Remediation classes, after-school tutoring, and curriculum changes were implemented to alleviate this problem. However, by the year 2014, schools will be required to have 100% of their students, including all subgroups, pass the state tests.

Many possible factors contribute to this problem, among which are (a) the transition to middle school, regardless of grade at which middle school starts (Alspaugh, 1998); (b) problems in finding their way around a new school(Elias, 2001); (c) new peer groups; and (d) diminished parental involvement because parents think they are no longer needed, but, in fact, it is often where they are needed the most (Anderson, 2000; Juvonen et al., 2004).

This study is anticipated to contribute to the body of knowledge needed to address math failure on the CRCTs by evaluating a remedial math education program that targets students at risk for failure. The goal is to overcome some of the complex academic and social problems faced by these students. The independent variable is the type of math instruction method, traditional or REP classes; the dependent variable is the CRCT test results.

Nature of the Study

Research in remedial education and program evaluation, particularly with respect to students at risk of dropping out, varies greatly in terms of research design and analysis. Quantitative techniques provide a systematic, analytical approach to data collection and analysis, which is often lacking in qualitative techniques. I used a quasi-experimental, pretest-posttest control-group design to evaluate the effectiveness of two delivery methods of math instruction. I selected this design because random assignment was not possible: students were placed by the school's principal and the data clerk. This design allowed me to evaluate the study's research question: What effect does math instruction given in a small group setting with a highly certified teacher have on CRCT scores compared with students in a regular classroom setting when both groups are taken from the at-risk list? This study analyzed the effectiveness of the REP math program on students who were considered at risk due to low achievement over the 2007–2008 school year. State-standardized math test scores for the 2008–2009 school year were used as a covariate.

In this study, I evaluated eighth-grade students who were placed on the schools at-risk roster based on one of the following criteria: having an IEP or 504 plan, failing a class, failing one of the CRCTs, or having a point plan, that is, a document developed by the at-risk student, parents, and administration to identify a problem, propose solutions, and document data to help the child succeed. The at-risk list included students who failed the seventh-grade math CRCT test, or barely passed it, as measured by a score of 815 or less. Eighth graders on the school at-risk list who scored lower than 815 on the seventh-

grade math CRCT were included also in the study. Students labeled special education or ESOL were excluded, since they receive modifications and tutoring that all students would not have access to.

I used a random number generator to choose three of the county's six middle schools. To further increase the random nature of this study, schools were additionally chosen at to participate in this study. The experimental group of 25 students received their instruction in the REP setting with a maximum of 18 students per class. The control group of 25 students received their instruction in the regular math class, heterogeneously grouped, with as many as 28 students per class. Students placed in the REP program required parental consent. The hypothesis behind REP classes is that eighth-grade CRCT scores would improve for the following reasons: (a) smaller class setting, (b) a highly trained math teacher (GDOE, 2008), (c) more hands-on methods, and (d) an emphasis on individualized instruction and problem-solving skills.

Instrumentation and Materials

I collected pretest and posttest data from the Georgia State Criterion Referenced Test, which has been in place as the main method of assessment in Georgia since spring of 2000 (GDOE, 2008a). The CRCT is designed to assess how well the students master the Georgia Performance Standards implemented by the state (GDOE, 2008a). The test diagnoses students' strengths, weaknesses, and mastery of skills needed to be successful in the next grade (GDOE, 2008a). The test includes multiple choice answers only and does not include any essay or long responses.

The CRCT has two major purposes: (a) to determine the quality of the state's education, and (b) to determine student strengths and weaknesses as measured by the Georgia Performance Standards (GPS) and the Quality Core Curriculum (QCC), which determine instructional programs in the state (GDOE, 2008a). It differs from a norm-referenced test in that it is designed to measure how well students have gained knowledge and demonstrated skills outlined in the curriculum (GDOE, 2008a), rather than how one student does compared to another student.

The questions for the CRCT are designed and developed by qualified, professional assessment specialists (GDOE, 2008a) Questions have been field tested by other students, and, to increase validity, a chosen committee analyzes all correct and incorrect responses given by students. Test quality has been established through the state of Georgia and is considered valid. Validity is the most important factor to consider when using a test (Creswell, 2003). Content validity is the most important component of validity (Creswell, 2003). In order to establish and maintain validity the GDOE follows strict protocols (GDOE, 2008b, p. 10):

1. All items written are done so by qualified content specialists.
2. After the items are written they are reviewed by curriculum specialists, and committees of Georgia educators review the items. Items are evaluated for overall quality and clarity, content coverage and appropriateness, alignment to the curriculum, and grade-appropriate stimuli with an emphasis on higher order thinking skills.
3. Each question has one clear answer choice.

4. Items should be free from bias toward or against any particular group.
5. The Testing Division meets with an independent panel of experts—Georgia's Technical Advisory Committee (TAC)—on a quarterly basis.
6. Specifications as to instructional material measured on the test and used by teachers is posted on the GDOE website. These descriptions make sure that the stakeholders are aware of the test's content and assessment methods.
7. Teachers receive training to ensure that tests are given to all students in a consistent manner.

Table 1

CRCT Performance Scores

	DNM	ME	EE
GPS Scaled Score	Below 800	800-849	850 or higher
Performance level	1	2	3

Tests with validity must also have reliability (GDOE, 2008b). The CRCT includes two reported reliability formulas. The Cronbach's reliability coefficient, which expresses the consistency of test scores in the form of a ratio, expresses as the true score variance to the observed score variance. The second statistical index is the standard error of measurement (SEM). The Cronbach's alpha reliability coefficient score for seventh-grade math was .92 and eighth-grade math .91 (GDOE, 2008b). These reliability scores are consistent from previous administrations of the test.

The following tables show the reliability indices in terms of Cronbach's alpha for all grades and subjects of the 2008 CRCT. (GDOE, 2008b). The NA scores are indicated where there were no data for the given area.

Table 2

Reliability Coefficients (Cronbach's Alpha) for Subject Area Tests by Grade

Grade	Reading	English Language Arts	Mathematics	Science	Social Studies
1	.88	.90	.91	NA	NA
2	.86	.90	.91	NA	NA
3	.89	.90	.93	.91	.92
4	.89	.90	.91	.92	.91
5	.86	.89	.92	.90	.92
6	.88	.90	.91	.90	NA
7	.87	.88	.92	.93	NA
8	.87	.89	.91	.90	.88

The overall SEM in Table 3 are shown in raw core units and reflect a test level statistic. The reliability and validity of the CRCT have been closely followed and the test has been found to have validity and reliability.

Table 3

SEMs Associated with the CRCT Mathematics Scale Cut Scores

Grade	Meets	Exceeds
1	7	10
2	7	10
3	11	13
4	9	12
5	9	11
6	8	10
7	8	10
8	9	11

Results from the CRCT are valid and reliable measures of the math knowledge learned throughout a school year (GDOE, 2008b). Results are easily interpreted by the stakeholders through a numerical scale and are assigned a value of meets expectations (ME), does not meet (DNM), or exceeds expectations (EE).

Research Question and Hypothesis

The following research question was designed to determine the success of the school-wide REP program that was instituted to assist middle school students who failed or scored poorly on the math portions of the CRCT test.

Is there a significant difference in CRCT scores between at-risk eighth-grade students receiving instruction in the REP program and at-risk risk eighth-grade students receiving instruction in the traditional program, while controlling for their seventh-grade CRCT scores?

H_1: There is a significant difference between the at-risk eighth-grade students receiving instruction in the REP program and the at-risk risk eighth-grade students receiving instruction in the regular program on the CRCT scores while controlling for their seventh-grade CRCT scores.

H_0: There is no significant difference between the at-risk eighth-grade students receiving instruction in the REP program and the at-risk risk eighth-grade students receiving instruction in the regular program on the CRCT scores while controlling for their seventh-grade CRCT scores.

Purpose of the Study

The purpose of this quantitative study was to analyze two different types of math instruction for at-risk students, regular and REP. The type of instruction may have an effect on the CRCT math scores while maintaining the same curriculum. The dependent variable is defined as the variable that is dependent on the independent variable. The control variables were consistent in both groups and were statistically controlled in this study. The independent variables in this study were the two different instructional methods used in the eighth-grade setting—regular and REP.

Theoretical Framework

The fact that middle school students are more prone to failure than their elementary school counterparts is a well-studied phenomenon (Alspaugh, 1998; Augustine et al., 2004; Juvonen et al., 2004; Beilke & Peoples, 1997). Students who were successful in elementary school often have difficulties in middle school (Juvonen et al., 2004). Additionally, students from the same backgrounds and aptitudes often differ in achievement in academic subjects from elementary to middle schools (Beilke & Peoples, 1997).

Constructivist theory suggests beginning instruction at the students' current level and then introducing them to increasingly difficult processes based on their preknowledge. The REP program uses smaller classes and highly qualified teachers to develop cognitive processes to allow students to improve their test scores. This is done by introducing new lessons with less complex tasks, then progressing to more

sophisticated problem-solving skills by building on skills and knowledge that students already possess and of which they have shown mastery.

According to constructivist theory, learning is done by relating to our experiences and that our environment influences us to make our own rules when learning and making decisions (Lambert et al., 2002). Students learn best by figuring things out on their own and applying meaning from their own lives to lessons (Lambert et al., 2002). Focus should be placed on the student's learning and not necessarily on the curriculum. Knowledge must be based on the meaning and relevance of the material taught and not just on segregated skills taught in isolation. Learning should be active, not passive (Lambert et al., 2002). Using all modalities, such as both hands on and theoretical, is the best way to get knowledge to internalize.

Additionally, constructivist theory states that learning is a social activity and should not be taught strictly in isolation. Similarly, learning concepts as isolated facts is not as effective as making connections with previously taught concepts. Additionally, learning is not instantaneous. Constant reinforcement and practice of skills are needed to gain mastery of the newly taught skills (Lambert et al., 2002).

Constructivist theory also states that motivation is key to learning (Lambert et al., 2002). In order for students to take the steps needed to learn material, they need to be motivated to do so. This is more likely to happen if the students can see how the material is relevant to their lives and by constant exposure through activities. In the REP program, the teacher connects the lessons to situations in the students' lives and relates

concepts to things they understand. The teacher also uses repetition to reinforce these skills.

The educator should be encouraged to allow students to discover key principles and important facts on their own, but guided by the instructor. By designing lessons and activities that allow students to build on previously learned concepts and relating them to things that are relevant and useful to the students, they will learn more. The teacher should also be actively involved with pupils through dialogue and feedback. In summary, constructivist theory states that instruction must be related to things the students find meaningful and relevant, should be set up so it can be easily learned by the students by building on previous skills, and it should be tailored to encourage students to make discoveries about learning on their own.

In addition to constructivism, motivation is important to academic success. The REP program focused on allowing children to meet with success. When students are met with constant failure it becomes a learned response. However, when students meet with success they are encouraged to perform better in class. The positive environment will encourage students to make their own positive study habits and continue to be motivated to learn.

Operational Definition of Terms

At-Risk. Students with risk factors, such as low test scores or poor math performance, that might put them in danger of failing a grade (GDOE, 2008a).

AYP. Adequate Yearly Progress is a measure of a school's or school system's ability to meet required federal benchmarks with specific performance standards from year to year (USDOE, 2008)

Core Class. Reading, Language Arts, Science, and Social Studies (GDOE, 2008a).

CRCT: Criterion Referenced Competency Test used by Georgia to evaluate students (GDOE, 2008a).

NCLB: No Child Left Behind is a law passed by congress in 2002 that requires students to become proficient in reading and math. By the year 2014, 100% of the students must be proficient in order for schools to make adequate yearly progress (USDOE, 2008).

REP: Remedial education program. Smaller math classes where at-risk students receive instruction (GDOE, 2008a).

Assumptions

It was assumed that the data was unbiased and free of errors. It was assumed that my data on the CRCT scores was accurate and complete. This study assumed that the teachers in the REP and regular programs were following the county guidelines and teaching the same curriculum.

Limitations

The subjects being tested were all middle school students in the same county. One limitation was that I could only generalize to the county, and results might differ in counties with other demographics. Another limitation was that the

at-risk students were not placed in the two programs randomly, because they needed parental consent. However, the students in each group were chosen randomly. An additional limitation was that the teaching styles of the teachers in question might differ.

Scope and Delimitations

The scope of this study was to determine the effectiveness of two different math programs and the effect they have on students who had not met with success on previous state math tests. The variables involved placing these students into two groups; one group receiving math instruction in a REP setting and one group receiving math instruction in a traditional setting. The math block for both groups was 55 minutes a day. Both groups were taught the same concepts using different pacing and different methods. The REP students received slower pacing and different workloads.

This research was delimited to a single student population at one suburban middle school in the southeastern United States. Furthermore, identical curriculum was used in both programs including same basic textbooks and a list of required skills to be taught. REPs had access to additional remediation materials not available to teachers in the regular class. The instructor in each class was different but was highly qualified and certified as a math teacher by the State of Georgia. Variables that might have affected the outcome of student test scores included teachers' unique experiences, opinions about the best methods to teach math, classroom organization and structure, and perceptions about the students.

Significance of the Study

The remedial program gives students extra instructional and practice time. The students volunteer to spend 1 hour a day for 2 additional weeks, outside of regular school hours, studying mathematics they had difficulty understanding. New concepts are not learned; rather, existing knowledge comes together and the student forms new connections.

In the short term, remedial educational programs give students an opportunity to pass the course in single year and advance to high school. In the long term, students gain an improved understanding of mathematics, an improved attitude toward taking other math courses, and they graduate from high school.

Teaching students the importance of learning mathematics is often overlooked as teachers strive to cover all of the standards in the course. Middle school students often do not understand that mathematics is required in a wide variety of other fields, such as sociology, business, economics, psychology, and home economics (McGlone, 1985). R. Moses (2001) refers to mathematics as the new civil right and relates success in Algebra to productive careers. The Department of Labor reports that the highest paying, fastest growing job sectors all require significant technical skills, of which math is a foundation. Mathematics is an essential part of science, which itself is the language of the information age.

Middle schools need a variety of ways to ensure students pass mathematics, and an remedial educational program is one possible way. Positive social change is a deliberate process of creating and applying ideas, strategies, and actions to promote the

worth, dignity, and development of individuals, communities, organizations, institutions, cultures, and societies (Harper, 1998). The REP program uses strategies and activities that help students develop (a) positive self-esteem and (b) the feeling that they can be successful in math. Meeting with success in math could lead to additional success in school and future careers.

Although this study pertains to middle school, its findings have implications in high school and beyond. Failure at the middle school level can lead to increased chances of failure at the high school level (Carrutheres, 2009). Only 68% of students in the United States graduate on time (Losen, Orfield, & Balfanz, 2006). As of 2008, graduation rates in the state of Georgia were at 70% (GDOE , 2008a). High-stakes testing can lead to more students being retained, which can increase the chances that a student might drop out (Losen et al., 2006). Increasing standards has put pressure on school systems to have students meet these high expectations. Schools are graded on how well their students perform, as measured by passing the annual CRCTs, which measure students' knowledge on the Georgia Performance Standards, including math, reading, language arts, science, and social studies.

Determining the factors that influence middle school students' ability to succeed as they start middle school and how to implement effective strategies is critical to the success of both student and school. Success in middle school is critical to success in high school and college. A key component of middle school success is a successful transition from elementary school (Lorain, 1997). Additionally, study and learning habits gained in middle school will carry over into higher levels of learning.

Summary

NCLB mandates standardized testing as a measure of academic progress. For many reasons, including puberty, increased autonomy from parents, peer influence, self-efficacy, class size, and grouping style, as well as familial and socioeconomic factors, middle school students might not perform well on these standardized tests. In fact, 38% failed the math portion of the Georgia CRCT in the 2007–2008 school year (GDOE, 2008a). This is a problem for schools, which can face sanctions, and it is a problem for students, who might view themselves as a failure and continue a pattern of failure throughout middle school and beyond (Juvonen et al., 2004; Walker et al., 2006). Using Piaget's concrete operational theory, constructivist theory, and behaviorist theory as a theoretical base, this study set out to determine the effectiveness of remedial math instruction as measured by students' performance on the CRCT tests.

Fifty students were involved in this quasi-experimental, pretest-posttest control-group study; 25 received instruction in the REP model and 25 in the traditional model. This study was done by conducting an analysis of covariance (ANCOVA) using the seventh- and eighth-grade CRCT math scores as well as a pretest-posttest control group. The seventh-grade scores were the covariate. Participants in this study took the CRCT at the end of seventh-grade and again at the end of eighth grade, at the conclusion of this study.

Section 2: Literature Review

Introduction

The topic of students meeting with academic success in middle school has been a central focus of discussion in the education field for the last 30 years (Akos et al., 2005). Maturity levels, peer pressure, adolescent difficulties, physical development, reduced parental involvement, and lack of basic skills all appear to be hindrances to students trying to jump from elementary to middle school (Akos et al.; Mullins & Irvin, 2000). Trends in middle schools have also shown an increase in discipline problems and a decrease in achievement (Beilke & Peoples, 1997). The failure rate in middle school has long-ranging effects for the students, parents, and community. Compared to students who score in the top half of scores, students who fall in the bottom fifth are almost nine times as likely to drop out of high school and not earn a diploma (Beilke & Peoples, 1997).

Middle school has not always been the norm for educating the adolescents in America. The concept of middle school was first proposed in the early 1970s as a means to help students deal with the complex academic and emotional issues that adolescents face (Juvonen et al., 2004). The prevailing thought was that by placing these adolescents in the same school with a support system, they would be more likely to meet with academic success that would follow them to high school.

The complexities of putting all these students facing these issues in one place need to be examined to determine what can be done to help them meet with academic success. The research concerning middle school students and achievement is diverse and

widespread. But one common thread is that students need to succeed in middle school in order to prosper in high school and the world beyond (Akos et al., 2005; Beilke & Peoples, 1997; Juvonen et al., 2004; Mullins & Irvin, 2000). When students succeed in middle school, success often follows them into high school. Conversely, when students do not meet with academic success in middle school they often struggle into high school (Akos et al., 2005; Beilke & Peoples, 1997; Mullins & Irvin, 2000).

Math especially has been a troublesome area when it comes to success for the middle school student. In the state of Georgia, students take the CRCT in April of each year to assess their skills learned during the academic year. For the 2007 testing year, 26% of seventh graders and 19% of eighth graders did not pass the math portion of the test. For the 2008 school year, 20% of the seventh graders did not pass and 38% of the eighth graders did not pass the math portion of the CRCT (GDOE, 2008b). These numbers can be compared to the 15% of seventh graders who failed to master reading and 9% of eighth graders who failed to master reading (GDOE, 2008b). The dramatic increase of eighth graders who failed the math portion, which jumped from 19% to 38%, significantly impacted the number of students who were retained, since passing the math portion is required to be promoted. One potential cause of the increase in failure was that the math curriculum was revised in 2007 to include more reasoning and application, which was reflected in the CRCT (GDOE, 2008b). In addition, more emphasis was placed on math achievement to keep American school children competitive in the world market. The NCLB Act of 2002 requires school districts to have a way to measure success in their students. Most states have started using CRCTs as a way to measure

student success in academic subjects. These tests are often additionally used as criteria for passing to the next grade.

By the year 2014, schools will be required to have 100% of their students, including all subgroups, meet expectations (USDOE, 2007). The law was originally put in place to make sure that all children were learning and making strides in their academic growth. Met with the demands of NCLB and the complex issues facing adolescents as they enter middle school, schools need to look at programs that will help middle school students effectively learn the math skills needed to pass the state tests, to retain those math skills, and to apply them in the world beyond school. This literature review focuses on the following areas: emotional issues facing middle school students, math and other academic issues, motivation, self-efficacy, classroom environments, class size, NCLB, and middle school pedagogy.

The literature review used the following databases: ERIC, ProQuest Dissertation and Theses. The following search terms were used: *remediation methods, programs, education, middle school, homogeneous, heterogeneous, class size, achievement, math, adolescent issues,* and *adolescent problems.*

Literature Establishing the Problem: Emotional Issues for Middle School Students

Recent studies have shown that even though emotional health is vitally important to a child's success in school, as many as one in 10 middle school students have emotional, behavioral, mental, or learning problems that prohibit them from learning and succeeding in school (Bearman, Jones, & Urdry, 2003; Vander Stoep, Weiss, Kuo, Cheney, & Cohen, 2000). Adolescents are at increased risk for depression, self-esteem

issues, and myriad other emotional issues (Bearman et al., 2003; Mullins & Irwin, 2000). When it comes to math achievement, students who are troubled will often not perform well in the classroom or on state achievement tests. Emotional wellbeing and a positive sense of self are essential to performing well in school (Bearman et al., 2003). When state tests and classroom grades are not passed, retention is often the end result. Students who have been retained in middle school are more likely to drop out of school and have emotional and physical problems including emotional issues, increased drug and alcohol use, and more behavior problems (Bearman et al., 2003; Mullins & Irwin). Eighth-grade students who fail the CRCT in Georgia have a high possibility of being retained. Passing both the math CRCT and math classes are needed to be promoted to the ninth grade. Failing either one results in intense instruction and then one more chance to pass the CRCT. Failure to pass the second time leads to retention.

Middle school students are often faced with the onset of puberty and the awkwardness of adolescence. Puberty often brings awkwardness, uneasiness, and the unending pressure to fit in based on appearance (Alspaugh, 1998; Beilke & Peoples, 1997; Mullins & Irwin, 2000). These emotions, which the students experience during their transition to middle school, are often detrimental to learning (Mullins & Irwin, 2000).

Being with peers is important for students, but it is especially important for middle-school-age students. When students are retained, they are often placed with students who are younger than they are. Students who have better emotional connections to their peers are better able to interact socially (Vorbach & Foster, 2003). Being

retained with a younger set of students could hinder the ability of the students to form strong emotional and social friendships, which could continue the cycle of failing.

Adolescents experience unique problems when faced with stress, such as irritability, low self-esteem, feelings of panic, lack of control, and isolation (Akos et al., 2005; Beilke & Peoples, 1997; Mullins & Irvin, 2000). These problems are compounded by the physical and emotional changes experienced during adolescence. When students are faced with failing classes and are constantly worried about not passing the CRCT, stress is increased; this could induce a circular pattern that induces even more failure. School systems add to this stress by giving failing students additional homework, placing them in remedial classes, and tutoring after school. Although these steps are probably necessary to remediate deficits, they often make the student feel singled out and further isolated from peers.

Students begin to develop self-awareness in elementary school; in middle school, students start to develop their sense of identity (Akos et al., 2005). Thinking about their identity often causes additional stress, confusion, and pressure—not only to succeed but to figure out their place in the world (Akos et al., 2005). Students who fail classes and state-mandated tests might call their sense of identity into question, and they might start identifying themselves as a failure. Stress levels will increase, and social and emotional development could suffer.

Motivation

In addition to emotional issues, motivation seems to be a key factor in whether or not a student succeeds in school. Motivation includes energy, direction, and persistence

(Deci & Ryan, 2000). Linnenbrink (2002) defines motivation as involving a strong personal interest in a particular subject or activity (p. 312). The attribution theory suggests that motivation is not a fixed cause and focuses on why things occur. Motivation, self-perception, and perception of school are major factors that contribute to students' academic achievement drop when they enter middle school (Mullins & Irvin, 2000).

When a student passes or fails something in school, the attribution theory states that the student will look for why they did or did not meet with success. How the student perceives the causes of his or her failure is a better determination of motivation than a learned failure response (Marzano, 2003). Students often attribute effort, luck, ability and task difficulty as the main reasons they are successful or not (Marzano, 2003). Emotions also play an important role in motivation (Linnenbrink, 2002; Marzano, 2003). Middle school students particularly experience a roller coaster of emotions as they go through adolescence. Hawley (2002) stated that "motivational or affective factors, such as intrinsic motivation, personal goals, attributions for learning, and self-efficacy, along with the motivational characteristics of learning, play a significant role in the learning process" (p. 16). Motivation clearly plays an important role in students successfully making the transition to middle school and succeeding in school. There is often a discrepancy between a teacher's perception of what motivates students and the actual motivators. Teachers often feel that motivation is internal and that the harder a student tries, the better he or she will do (Marzano, 2003; Hawley, 2002). There can be a drop in motivation when students enter middle school, which corresponds to a decrease in

academic success in school (Mullins & Irwin, 2000). This motivational decrease is also accompanied by a drop in achievement in the areas of English, math, science, and social studies.

Getting students to be motivated to do well on the state tests is a particular challenge teachers face. Adolescents are often motivated by their own set of beliefs, and getting them to see that paying attention and studying more are necessary to do well on the test can be difficult (Marzano, 2003). Increasing motivation among students is an important component of classroom success. Students who are interested and engaged in their learning will be more motivated to do well in their classes (Linnenbrink, 2002).

Intrinsic and extrinsic motivation also play roles in learning. Pintrich & Schunk (2002) define intrinsic motivation as students doing some activity for its own sake, and extrinsic motivation as students engaging in an activity when some external force compels them to complete that activity. When students are intrinsically motivated they will work for the sake of self-motivation and self-fulfillment (Pintrich & Schunk, 2002). Humans have an innate tendency to be intrinsically motivated to do well on tasks (Deci & Ryan, 2000). In order for students to rely on intrinsic motivation, learning needs to be relevant, and the skill being taught needs to be one that the student is capable of performing (Deci & Ryan, 2000). Earning good grades and passing tests can be self-fulfilling for some students, where others need outside motivation and incentives such as rewards in order to be driven to perform their best. Intrinsic motivation along with the ability to understand the need for academic knowledge leads to increased academic performance, where extrinsic motivation leads to poor cognitive learning (Walker,

Greene, & Mansell, 2006). According to Deci and Ryan (2002), "Extrinsic Motivation refers to the performance of an activity in order to attain some separable outcome." Extrinsic factors such as short term rewards would appear to the observer to have a positive effect, but rewards actually do not increase motivation long term (Benabou & Tirole, 2003). While extrinsic rewards and peer-influenced pressure do affect classroom performance in the short term, intrinsic motivation is a better indicator of student academic success (Benabou & Tirole, 2003; Deci & Ryan, 2000; Walker et al., 2006).

Motivation is clearly important to students succeeding in class. School districts continue to work for ways to motivate their students both intrinsically and extrinsically to make sure students learn required materials and pass benchmarks and tests. Providing education in a setting where students can be intrinsically motivated will result in improved academic success and students reaching their full potential.

Self-Efficacy

Hand in hand with motivation is self-efficacy. Self-efficacy can be defined as belief in one's ability to succeed in situations that arise. A student's sense of self-efficacy can greatly influence school success. Self-efficacy beliefs are positively related to students being engaged in their learning, as well as general academic achievement (Pintrich, 2000). Specifically, some studies have found that students do better in school, put their best effort into their work, and can perform better at higher levels when they have self-efficacy (Pintrich, 2000).

Self-esteem can have an impact on student's self-efficacy (Dodgson & Wood, 1998; Mullins & Irwin, 2000). Feeling empowered and in control of learning reinforces

students' self-efficacy beliefs (Dodgson & Wood, 1998; Mullins & Irwin, 2000). Students with higher self-esteem believe they can succeed in school, which has a positive effect on academic achievement. Conversely, poor self-esteem it is often reflected in poor academic performance.

According to the social cognitive theory, people with high self-efficacy believe they can perform well and therefore seek out harder tasks. They view these tasks as positive challenges rather than impossible undertakings to be avoided (Bandara, 1977, 1997). Programs for the middle school student should include components that increase students' self-esteem, self-efficacy, and motivation in order to maximize student academic success.

Classroom Environments

In addition to motivation, the uniqueness of the classroom setting in middle school affects the student's ability to pass classes. The fact that students are also graded more on performance-based standards than task-based assignments in middle school certainly affects the achievement of the middle school student (Alspaugh, 1998). Additional research needs to be done on the best way to facilitate communication between elementary school and middle school teachers so that work at elementary school level is graded on a consistent basis with middle school teachers. This is sometimes problematic since the teachers are housed in different buildings and different sets of standards are often used at different grade levels. Implementation of a uniform set of standards and expectations across all grade levels in a district setting would make the learning environment more consistent.

Communication between teachers is necessary for students to maximize achievement (Chory & McCroskey, 1999; Manke, 1997). Most middle school models consist of the team approach, for example four or five teachers responsible for teaching the same team of children. Communication between the teachers about curriculum, students, and achievement will help optimize learning potential (Durrant, 2000). Unfamiliar surroundings, the complexity of dealing with several different teachers, and not having a clear homeroom are sometimes detrimental to school success for new middle school students. Akos et al. (2005) wrote that "Students have voiced concerns about navigating the larger building and getting lost, being late to class, being victimized by students, meeting higher academic expectations, making new friends, and following new rules" (p. 46) Teachers in the team can reinforce each other's curriculum and can notify each other if a student is having difficulties.

The ideal middle school features the following elements: learning teams or communities, a focus on integrated content and critical thinking, flexible grouping for successful learning, empowerment of faculty, improved training for teachers, emphasis on health and safety for learners, and connections between schools and communities (Elmore, 2000). Part of the teacher's job is to facilitate communication between all members of the child's educational team to improve learning. Effective communication can be done through technology, regular team meetings, common planning, and staff development days.

Math Issues for Middle School Students

High-stakes testing, increased homework in math, and a harder curriculum that relies on abstract thought, together with the emotional issues that adolescents face, can lead to increased failure rates in math, and thus, more retention. Math in middle school is measured at three levels: nationally norm-referenced standardized tests, local or state tests, and other local instruments (USDOE, 2007). Adolescence marks the start of a change from concrete to abstract thinking (Piaget, 1969). Middle school math curriculum in Georgia makes a considerable jump to more abstract thinking (GDOE, 2008). For adolescent students who are just learning to think abstractly, this math curriculum could be more challenging than the math curriculum they were accustomed to in elementary school. Some middle school students believe math is difficult or impossible to learn, and attitudes of the student and teacher affect math performance (Ketterlin-Geller, Chard, & Fien, 2008; Rafael, 2008). The GDOE (2008) suggested that "Instruction and assessment should include the appropriate use of manipulatives and technology." Topics in math should be represented in multiple ways, such as concrete/pictorial, verbal/written, numeric/data-based, graphical, and symbolic in order to make sure the abstract mathematical concepts and problem-solving tasks will be able to be mastered by the student. Concepts should be introduced and used, where appropriate, in the context of realistic phenomena" (GDOE, 2008). Thompson, Simonson, & Hargrave (1996) firmly believe that the best time to learn mathematics is when it is first taught, provided it is taught correctly the first time.

Instruction methods further influence students' ability to do math. In most middle school classrooms, students are grouped heterogeneously with the exception of a few gifted and special education classes. This often puts teachers in a position where they have to stay on a concept long enough to make sure everyone understands it. Through this method, some students who have mastered the concept get additional practice, or they can move forward and leave the lacking students behind. Whole group instruction tends to have a consistent type of instruction for all students, with the teacher performing modifications as needed. The concepts, the order in which they are taught, and the pace used are often dictated by state standards (GDOE, 2008). Many educational theorists state that whole group instruction is an effective way to impart instruction to students (Ebeling, 2000). Ebeling feels that it is important for teachers to be aware of instructional differences and the needs of their students but that whole group heterogeneous instruction is still the most effective way to instruct students within the current setup of instruction in the United States education system (Ebeling, 2000). However, research suggests that individualized math instruction certainly benefits struggling students (Cole, 2010; Daly, Hintze, & Hamler, 2000). Further research reveals the benefits of utilizing more paraprofessionals in the classroom to enhance performance of struggling math students (Moorer, 2010). Remedial education programs (REP) in Cherokee county are taught by one certified math teacher. If the class size exceeds 18, a paraprofessional is brought in to enhance the one-on-one time the students receive.

Teacher certification and experience also affect students' math achievement. Certified math teachers who consider themselves to be very competent in math

instruction and math knowledge have students who perform higher than those with uncertified instructors who do not (Rafael, 2008). Teachers with a secondary math certification level have students who perform better on assessment tests (Costello, 2010; Rafael, 2008). Montrose (2009) studied the link between special education students and economically disadvantaged students and the certification levels of their teachers. Students in these groups whose teachers were certified in the area in which they taught outperformed their peers who were taught by noncertified teachers. Having a certified teacher teaching students is definitely an asset to increasing student performance.

At-Risk Students

The term *at risk* was coined in *A Nation at Risk* written by the National Commission on Excellence in Education (Garner, 1983). This was the first report scrutinizing American schools and indicating that many students were not mastering the necessary skills to graduate and succeed in life.

Many factors are considered when determining if a student is at risk, including ethnic background, economic status, disabilities, classroom grades, and test scores. All these factors play a part in determining the correct placement and instructional delivery models for students on school's at-risk list. Characteristics of at-risk students include poor academic performance, poor attitudes toward work, and absenteeism (Vaughn et al., 2000). Students who are labeled at-risk often face the complex emotional and social issues that plague all adolescents, but at an amplified level. Although the at-risk label is not always known to the child, the ramifications of being labeled are apparent in the form of remedial classes, counseling, and extra tutoring opportunities.

Remediation often follows for students who are identified as at risk. Remediation refers to the additional instruction and alternative strategies for students who are not performing well (Vaughn et al., 2000). Some remediation programs are considered add-ons, like tutoring, or totally new strategies, like remedial instructional programs. Based on extensive studies, six instructional strategies appear to help at-risk students: "(a) visual and graphic depictions, (b) systematic and explicit instruction, (c) student think-alouds, (d) peer-assisted learning, (e) formative assessment data provided to teachers, (f) formative assessment data provided directly to students" (Ketterlin-Geller et al., 2008).

Effective math programs need to take these factors into account when designing curriculum and delivering instruction. In addition, hands on concrete instruction will help students make the leap to harder, more abstract concepts and gain a better understating of those concepts (Ketterlin-Geller et al., 2008). Extending time in the math core curriculum areas also appears to have a positive effect on student achievement in math (Ketterlin-Geller et al., 2008). These findings have implications as to the best instructional models for delivering math instruction in the middle school setting.

In addition to what is best for the students, there are funding issues to consider. In The United States due to NCLB, schools are increasing their standards and the rigors of academic programs in the curriculum (Robinson, 2009). Schools need to be sure when they are funding a program, like the REP math program, that their money is being well spent and the program yields significant gains for their students enrolled in such programs.

Remedial Education Programs for Math

By the time they reach secondary school, students who are behind in math skills are not able to solve the more complex problem solving situations needed in secondary math classes (Bottage & Hasselbring, 1993). Students who fail the state tests are sometimes placed in remedial education programs. These classes are taught by highly qualified teachers certified in mathematics and a variety of teaching methods aimed to improve their students' success in math based on state standards. Remedial math classes take the place of traditional math classes in the middle school setting. Students go to their REP classes instead of a traditional class. These classes have lower student to teacher ratios, more hands on instruction, additional tutoring, peer-led teaching situations, and a gradual progression from concrete to abstract concepts. With a maximum of 18 students per class, remedial math classes enable students to receive more individualized teacher interaction and additional tutoring when needed. The REP provides differentiation and instruction that helps students build on concrete concepts to understand more difficult and abstract concepts.

Making math relevant to the student increases the student's success in learning concepts (Stone, 2007). Additionally, when lessons are taught using certain proven guidelines, more learning occurs. Stone outlined these basic guidelines (2007):

1. Introduce the lesson.
2. Assess the students' math awareness and level.
3. Work through contextual related examples.
4. Work through traditional math examples.

5. Make sure students have demonstrated mastery.
6. Assess.

These steps show students the connections between harder concepts and previously learned lessons (Stone, 2007). Due to the smaller class size, REP teachers are able to follow these guidelines to provide individualized instruction and make learning math relevant to the students by relating concepts to everyday things.

Similar programs have been implemented across the country, mainly in response to NCLB legislation. One such program, the Pennsylvania System of School Assessment Prep Program, was instituted in Western Pennsylvania to help struggling students meet with academic success as measured by the state Pennsylvania System of School Assessment tests (Wyllie, 2010). This program consisted of four main components

> (1) additional time during the normal school day dedicated to skill building, (2) small group settings, (3) targeted instruction in specific skill areas identified by assessment as in need of remediation, and (4) the addition of computer-aided instruction as a component of the overall instructional approach. (Wyllie, 2010, p. 4)

Students received their instruction in homologous small-group settings. Specifically targeted skill areas included both reading and math. At the conclusion of this study, participating students made significant gains on the Pennsylvania System of School Assessment test (Wyllie, 2010).

Additional factors that contribute to remedial program success include a personal plan for each student and targeting specific skills. Students in remedial math classes

receive a personal plan that is used to try to remediate difficulties the students face. Students who have such plans as well as mentors to make sure the plans are followed often perform better in school (Blankenship, 2009; Foley, 2009). Remedial programs in math appear to work best when they target specific skills that the student lacks, as opposed to just treating everyone in the class the same (Bahr, 2008). In addition to placing students in remedial classes based solely on performance, other factors such as class size, ability grouping, and teacher certification need to be addressed.

Smaller Classes

Class size and its relationship to student achievement is a hot issue among educators and the public. Teachers feel that smaller classes are indeed beneficial to students' emotional and academic success (Leahry, 2006). Many studies have been done regarding the benefits of small group instruction and reduced class size, including one by Springer, Stanne, & Donovan (1997). After reviewing hundreds of studies, Springer et al. determined that small group instruction has positive effects on student outcome measures (1997). In the study done by Wyllie (2010), instructional classes were held in smaller settings with students who were labeled at-risk due to academic and socioeconomic reasons. These students showed significant gains in their test scores (Wyllie, 2010).

With at-risk populations, small group instruction increases student achievement and decreases behavioral problems (Foley & Pang, 2006). Foley & Pang found that at-risk students experience increased success when placed in a nurturing environment with smaller classes, more individualized learning, and opportunities to apply their knowledge

practically. Significant academic gains are evident in situations where students receive more individualized instruction (Foley & Pang, 2006). Students who are already labeled at-risk can benefit from receiving instruction in a smaller setting that will enable them to understand the material and internalize the concepts more effectively (Foley & Pang, 2006; Springer et al., 1997).

Class size alone does not appear to be the sole determining factor of success in the classroom, however. Quality of teaching is also important and, when used in conjunction with smaller class sizes, does appear to increase student performance (Graue, Rauscher, & Sherfinski, 2009; Jepsen & Rivkin, 2009). Noncertified teachers realized no significant gains (Jepsen & Rivkin, 2009). In order to see the benefits of smaller class sizes, certified teachers must be highly qualified in the area in which they are teaching (Graue et al., 2009; Jepsen & Rivkin, 2009). In addition to teacher certification, teachers' attitudes towards their classes have an impact on student performance (Cakmak, 2009). When teachers believe that smaller class size has a positive impact on student performance, and they are happy with their class, positive student performance results (Cakmak, 2009).

Research on classroom size and its impact on students reaches various conclusions. Although some studies indicate that smaller class sizes have a positive impact on learning (Springer, 1997; Foley & Pang, 2006), others indicate that smaller class sizes do not have a positive impact (Cravens, 2006). Cravens found no significant difference in academic achievement between small group and large class instruction. Studies can be conflicting and often biased by educators who feel that smaller class sizes

are beneficial (Graue et al., 2009). Additional studies need to be done with an emphasis on teacher quality, not just class size (Graue et al., 2009). Additionally, studies on class size and its effects on classroom and testing performance need to be conducted in order to determine if students who need remediation will benefit from receiving their instruction in smaller class sizes.

The class size debate is important because of both financial and teacher resources (Coombs, 2009; Januska & Dixon Crauss, 2008). Most studies found that changing class size had to be done in conjunction with improved teaching methods and other proven methods of raising scores; class size alone did not make a significant difference (Achilles, 2004; Coombs, 2009; Jacobson, 2008). Before precious resources are used to make smaller class sizes, research needs to be done to warrant the investment.

Homogeneous or Heterogeneous Grouping

Since the term *ability grouping* was first coined in the 1970s, deciding whether heterogeneous or homogeneous grouping for at-risk students, regular students, and gifted students has been a hot topic among educators. Although ability grouping and academic tracking are similar in definition, ability grouping can be defined as the creation of homogeneous classrooms within schools, while academic tracking is the process used in secondary schools to place students in homogeneous settings for entire school days (Loveless, 1998). Smaller class instruction tends to signify homogeneous grouping. The research on homogenous and heterogeneous grouping has mixed results. Some studies show that there are advantages and disadvantages to both homogeneous and heterogeneous groups (Schullery, 2006). Specifically, when looking at average gains

across both groups, gains appeared to be consistent, but among some individuals the gains were higher and more apparent (Schullery, 2006). Therefore, while homogeneous small groups might not be the answer for all, they can be very significant for some (Tiesco, 2003).

In regards to the remedial math student, the research on homogeneous versus heterogeneous grouping has mixed conclusions. Burris et al. (2006) found that homogeneous remedial instruction was detrimental to students. They discovered that heterogeneous grouping accelerated the lower ability students without hindering the advanced students. In fact, accelerating the curriculum instead of reteaching the basics appeared to accelerate learning further (Heubert & Hauser, 1999). Additional studies found that lower achieving students perform better in heterogeneous groups, average students perform better in homogeneous groups, and high achieving students perform equally well in both groups (Saleh, 2005). Conversely, other research has shown that when students are carefully placed in remedial homogeneous math groups based on accurate data-driven methods, progress improves (Sexton, 2010). After studying homogenous groups of students in elementary schools, significantly higher averages were found (Tiesa, 2003). The key to having homogenous groups for low ability students is having a teacher who sets high expectations for those students and not low ones. When teachers set low expectations for their students they get low results (Linchevski & Kutscher, 1998). With increased pressure for all students, including special education students, to pass state tests, schools now are often using homologous settings so specific skills can be taught. Students who are taught in collaborative or co-taught classrooms

fared better than their peers who were taught by a general education teacher (Warner, 2010).

Various criteria exist for determining appropriate placement for students. Often when students come into middle school from the elementary school setting, standardized test results, school evaluation methods, and teacher recommendations are used to place students in remedial, regular, or advanced classes (Bliven, 2010). When parents, administrators, previous and new teachers, as well as the student are involved in the placement process, better academic placement matches are made (Bliven, 2010). In the case of the math remedial education program evaluated in this study, a committee composed of the parents, teachers, counselors, and administrators makes the final decision to place the student in REP or regular classes.

To make matters more complicated when determining placement, Maresca (2004) found that most studies have failed to find any definitive answers on the positive and negative aspects of ability grouping. Instead, she found that the conclusions of studies are mixed as to which is the most beneficial way to teach students (Maresca, 2004). For example, when dealing with gifted and advanced students, ability grouping is clearly beneficial (Hendricks, 2009). Hendricks found that gifted students' test scores and academic achievement greatly improved when they were taught in a classroom that comprised other gifted students only. An additional study found that when at-risk students were placed into heterogenous or homogenous remedial groups, both demonstrated increased test scores, but the heterogeneously group students achieved slightly higher gains (Colamerino, 2008).

The opposite of homologous grouping is heterogeneous grouping. Heterogeneous grouping is defined as grouping students with different abilities and performing at different levels in the same class (Morris, 2008). Morris' study found that heterogeneous grouping helps lower-achieving students academically and all students socially, but meeting the needs of gifted students academically was not as clear cut. Detracking students, meaning to stop ability grouping, has been recognized as a way to decrease the gap between low and high performing students (Burris & Welner, 2005). By detracking students and placing them in mixed ability classrooms, students' social and academic success tend to increase (Vekatakrishan & William, 2003). In regards to math performance, Burris, Hubert, & Levin (2006) concluded that math performance actually increased among heterogeneous mixes.

After School Math Tutoring

Tutoring has been around for centuries as a means to educate or supplement the education of students, typically in a small-group setting or one-on-one. The first studies on tutoring done in the 60s and 70s indicated that tutoring was effective in increasing achievement (Gordon & Gordon, 1990). One-on-one tutoring has traditionally been recognized as more effective than small group instruction (Baker et al., 2006; Lauer, 2006; Wasik, 1998). Keeping the teacher-student ratio low is the most effective way to utilize tutoring programs (Wasik, 1998). Tutoring can be even more effective when both the tutor and the classroom teacher work together to make sure skills are taught and reinforced (Lauer, 2006). In this model, the classroom teacher teaches the initial skills and the tutor reinforces them. Certified teachers who hold degrees in the area of tutoring

in which they are working tend to be more effective and produce better academic results (Gordon, Morgan, Ponticell, & O'Malley, 2004).

Tutoring is an especially critical component of remediating math deficits. Small group instruction combined with tutoring appears to increase math problem-solving skills and increase learning in students (Fuchs, Fuchs, Craddock, Hollenbeck, & Hamlet, 2008). Individualized tutoring appears to have a more significant effect on math achievement than small group instruction (Fuchs et al., 2008). Schools, however, often do not have the resources or funds to offer all struggling students one-on-one tutoring. Small group after-school tutoring is often used in lieu of individualized tutoring for targeted students who either failed state tests or who are not performing well in school. After-school tutoring produces modest gains in students' performance when attended regularly (Baker et al., 2006). Math students specifically tended to benefit more from tutoring in math than in reading when done in small after-school classes (Cohen, 2006). Providing students with the additional benefits of tutoring in conjunction with small group classroom instruction might help at-risk students.

Parental Involvement

Parental involvement is often considered a key to academic success in school (Anderson, 2000). Increasing parental involvement in public schools can help improve schools both academically and environmentally. Additionally, parental involvement is highly important for pushing the public school systems to higher standards (Machen, Wilson, & Notar, 2005). Higher standards have been the norm in districts across the country as schools try to comply with new federal guidelines.

Parental involvement often declines when students go to middle school (Juvonen et al., 2004). Even parents who are very involved in their child's elementary school activities are seldom seen in the middle school environment. This decrease in involvement may be due to the unique structure of middle school versus elementary school. Getting parents involved at the middle school level is a challenge for the teacher. Teachers in elementary school only have 30-35 sets of parents to interact with. In a middle school setting, teachers often have to deal with 100 sets of parents or more (Juvonen et al., 2004). This affects the ability of the secondary school teacher to effectively interact with parents as closely as the elementary school teacher does. Parents are also dealing with five or more teachers for the first time and might be unsure which teacher to approach.

Effective teachers need to collaborate with colleagues and parents to help students make the transition from elementary to secondary school a smooth one and to ensure that students experience academic success. Parental involvement is an important factor in students' achievement. Parental attitudes toward math can affect the student's ability to perform. For example, parents' negative attitudes towards math can manifest in their children as well (Ketterlin-Geller, et al., 2008; Rafael, 2008). Children whose parents take an interest in their child's education perform better in school (Machen et al., 2005). According to Gonzalez-DeHass, Willems, & Holbein (2005), "Parental involvement is related to the following motivational constructs: school engagement, intrinsic/extrinsic motivation, autonomy, self-regulation, mastery goal orientation, and motivation to read" (p. 2). Children whose parents motivate them to do well often

perform better in academics (Gonzalez-DeHass et al., 2005). Specifically, when students feel that their parents value education and place a strong emphasis on the importance of getting good grades, there is an increase in both motivation and academic competence among those students (Marchant, Paulson, & Rothlisberg, 2001). The highest correlation between parent involvement and student achievement is seen when parents place a high value on education, resulting in the greatest impact on students' academic ability, effort, and grades (Marchant et al., 2001). When their children are involved and motivated to do well in school, parents tend to be more motivated to be more involved in the school (Marchant et al., 2001). This correlation effect tends to increase the importance of motivation and parental involvement in the academic success of students.

In addition to academics, middle school students face many unique social situations for the first time. They struggle to form an identity and find their place in the world. Parents can influence their children's personality formation dramatically when they participate in their children's education (Sarter & Yarniss, 2002). These challenges are faced by both parents and teachers in the transition from elementary to middle school.

Current Learning Theories and the Middle School Student

Leading learning theories for the middle school student include behaviorist theory, cognitive theory, and constructivism theory. Behaviorist theory emphasizes the importance of empirical, observable behaviors and the influence of external environment factors in determining behavior (Schlunk, 2004). Cognitive theory suggests cognitive processes influence learning. As children grow, they become capable of increasingly more sophisticated thought, and they organize things when they learn (Piaget, 1969;

Phillips, 1981). This organization is especially critical in the development of middle school students as learning becomes more abstract. Students must take previously learned skills and apply them to increasingly complex problem-solving situations. They must organize the information given to them by multiple teachers and retain that information for testing.

Constructivism theory states that learning is done by reflecting on experiences and understanding environment. Knowledge and environment influence students to make their own rules when learning and making sense of the world (Piaget, 1969; Phillips, 1981; Lambert et al., 2002). Previous background knowledge and experiences enable students to more easily acquire new knowledge and allow them to have more control over their own learning (Lambert et al., 2002). According to constructivism, learning is an active process of creating meaning from different experiences. In other words, students will learn best by trying to make sense of something on their own, with the teacher as a guide to help them along the way. For the middle school student, this theory coincides with developing a sense of identity and trying to make sense of the world. Hands-on activities and relating learning to real-life situations can enhance the learning experience.

A core premise of constructivism is that physical and social contexts influence and dictate cognitive processes (Lambert et al., 2002; Schunk, 2004). When learning new skills or vocabulary, attaching a picture of something with which the student is already familiar will facilitate learning (Marzano, Pickering, & Pollock, 2001). Students learn best by making connections to things they already know; however, middle school teachers face the difficult challenge of dealing with students in an environment that is

totally unfamiliar to them. It is then left to the teacher to determine the students' backgrounds and design lessons that take these things in to account. Teachers must make sure they build on concepts the students already know.

No Child Left Behind

No field in education can be discussed without mentioning the NCLB legislation and the effect it has had on teaching and the education process. NCLB is based on four main principles: stronger accountability leads to more success, more freedom for states and communities when making educational choices, utilizing proven educational methods, and allowing more choice for parents (NCLB, 2002). Upon implementation, these four principles dramatically affected the way instruction is delivered and assessed in the United States. The first principle led states to come up with ways to measure success, since the government mandated accountability (NCLB, 2002). Each state individually conducts tests and reports results annually. Failure of students to perform in the areas of math, reading, and writing result in sanctions by the government in the form of loss of funds and other serious implications. In addition to making sure students are learning worthwhile life skills, teachers must also ensure students can demonstrate these skills by passing a test given to students statewide. Failure to pass these tests leads to remediation classes, retention, extra tutoring, and other measures for the students.

The second NCLB principle is why each state is able to come up with their own tests, instructional methods, and remediation methods for their students (NCLB, 2002). States develop their own tests based on standards they create, a practice which has resulted in nonuniform testing methods across the states. Regardless of the testing

methods used, students must pass these tests. By 2014, 100% of all subgroups will be required to pass these standards or sanctions will be imposed. As a result, schools are implementing more remedial classes to correct the deficits that students have as measured by the state tests.

The third NCLB principle concerns using proven teaching methods to make sure all students are meeting with success. NCLB emphasizes implementing programs proven effective through research (NCLB, 2002). Programs such as Reading First and other federally mandated programs receive increased funding. Additional funding can be obtained for other programs proven sound in the future.

The fourth and most controversial NCLB principle involves more choices for parents. Under NCLB, schools that do not meet state standards for 2 years must provide parents with the opportunity to seek educational alternatives for their children (NCLB, 2002). The district must allow these students to transfer to better performing schools. In addition, students from low-income families in schools that fail for two years are eligible to receive further educational services that may include private tutoring, after school services, summer school options, and extra remediation programs (NCLB, 2002).

These four principles can have far-reaching effects on school systems. Meeting state standards and making AYP as outlined by NCLB means students are held accountable for passing high-stakes tests given once a year. A resurgence of remedial homologous-grouped classes is appearing across the United States as schools struggle to make sure all students are passing (Reed, 2005). Often school districts allow for students to retake the test in an attempt to obtain a higher score. Reed conducted a longitudinal

study on the reorganizational practices of low performing schools as measured by testing required by NCLB. Her study suggested that even though more students were being taught by ability grouping, achievement scores did not necessarily increase (Reed, 2005). The study suggested moral and ethical issues exist when grouping students according to abilities simply for the purpose of raising test scores (Reed, 2005).

High-Stakes Testing

As mentioned in the previous section, testing is an integral component of today's educational climate. NCLB mandates state tests to make sure that learning is evident in all students, and this mandate has various effects on the teaching environment and learning strategies in classrooms. Most teachers report using at least some questions from item banks found on the CRCTs in their daily assessments (Jackson, 2009). Surprisingly, at least half indicated that they use teacher-made assessments that are exclusive of the state tests (Jackson, 2009). Remedial education program classrooms do incorporate items similar to the CRCTs format to allow students practice taking the test.

High-stakes testing can have an effect on the pedagogy used in the school setting. Some assessment in the classrooms is geared toward students passing the test and drives instructional practices (Evan, 2005). High-stakes testing does affect the way some teachers design lesson plans, implement instruction, and perform assessment (Gonzer, 2009). This does not always lead to ineffective teaching if the high-stakes testing, county standards, and state standards work together to ensure that students are learning and engaged in meaningful academic situations. High-stakes testing appears to have a greater

influence on school curriculum implementation, development, and planning than low-stakes testing (Brady, 2009).

Pedagogy

Pedagogy is defined as teaching instruction methods. Middle school teaching methods have been diverse and wide reaching since the concept of middle schools was established. Class size, teacher certification, homo or heterogeneous groupings, and other newer methods have influenced pedagogy in middle schools for years. Several studies indicate that a teacher with a strong knowledge of the content he or she is teaching and an understanding of the most effective pedagogy for the subject matter will increase student learning (Brown & Borko, 1992; Ball & Bass, 2000).

Additionally, research in teacher development suggests that teachers should possess knowledge that integrates content and pedagogy, called pedagogical content knowledge (Ball & Bass, 2000). In mathematics, this kind of knowledge may include offering useful representations, presenting concepts in a way that makes them related to other concepts, using examples and non examples, including helpful analogies, and establishing relationships that helps math make sense. These practices will help students understand math better and improve their math performance (Grouws & Shultz, 1996). Teachers should receive training to increase their mathematical pedagogy if they are to be effective teachers of mathematics at all levels (Brown & Borko, 1992; Ball & Bass, 2000; Grouws & Shultz, 1996). This is especially important at the middle school level where concrete learning is essential for the adolescent to meet with success.

Some modern research has shed light on mathematical pedagogy (Klosterman & Gainey, 1993). In the past, math was usually taught with the main emphasis on rote memorization and learning math skills. Newer models of math instruction focus more on conceptual math knowledge and meaningful problem-solving skills (Hiebert et al., 1996; Lampert, 1991; Owens, 1993). This correlates to the newer state tests that tend to have more of a problem-solving and application format with very little skill work. This move from abstract to concrete reasoning has often been a difficult transition for students. Teacher-centered methods of instruction have been replaced with more cooperative learning, student-driven instruction, and smaller heterogeneous groupings, which increase student achievement in math (Hiebert et al., 1996; Lampert, 1991). The research on math pedagogy indicates a switch towards smaller student-driven classes focused on problem-solving and application as a means to understand math and internalize math skills.

Knowledge of the content area is as important as the willingness to learn new instructional methods that might increase students' math knowledge and increase test scores (Fortune, 2009). Teachers must be willing to embrace cutting-edge teaching techniques and styles for their students to succeed (Fortune, 2009). Teachers selected for the REP have strong content-based knowledge as well as a willingness to try new strategies to help their students learn. There is no doubt that high-stakes testing continues to influence pedagogy and classroom instruction across the United States (Goble, 2009). The REP modifies the curriculum to ensure student success in the math classroom, and it uses innovative teaching methods and approaches to help students meet the criteria for promotion to the next grade level. The teacher's personality, uniqueness, and strengths

should be used in conjunction with sound teaching practices (Feger, 2009). Teachers that emphasize creativity and capitalize on the needs of their students have students who attain a higher quantity of achievement (Houge, 2009).

Researchers employ quantitative methodology to examine cause and effect, determine how a variable affects an outcome, and investigate a theory using numerical data. (Creswell, 2003). Quantitative methodology utilizes closed-ended questions with predetermined approaches and numerical data based on statistical analysis (Creswell, 2003). Benefits of quantitative methodology include the use of numerical data. The theory uses tests, identifies a variable to study, forms a hypothesis, and then analyzes the data using statistical methods to prove or disprove the hypothesis (Creswell, 2003).

Researchers use qualitative methodology on the other hand to make claims based on knowledge or truth statements most likely based on constructivist theory (Creswell, 2003). For this type of methodology surveys, experiments and open-ended questions are the basis of the research (Creswell, 2003). Data is often more personal than numerical. In most instances the researcher focuses on a single concept or issue and utilizes various means of collecting data from the participants.

Mixed Methods methodology combines elements from both quantitative and qualitative methodology. Both closed- and open-ended questions could be used in addition to integrating data from both numerical and empirical collections (Cresswell, 2003).

Conclusion

Helping students to succeed in school, especially in middle school, is vital to helping children achieve both in school and in life. Finding ways to reach students, determining the best methods to teach them, and helping remediate deficits will be an on-going challenge for educators for years to come. NCLB has brought to light the question of what to do with students who do not appear to meet with academic success. Underlying causes such as academic settings, internal factors like motivation, and teaching methods all have an impact on the learning of students.

Self-efficacy plays a large role in whether a student succeeds. Finding programs and methods that help students feel that they are able to succeed is imperative if schools are to help students pass the state-mandated tests and make sure students meet performance standards.

In addition to the typical emotional issues that all people face, adolescents face additional unique pressures. The complex emotional and physical changes that students experience in middle school can influence learning (Bearman et al., 2003; Mullins & Irwin, 2000). Trying to fit in, dealing with stress, and finding the way to motivate themselves all play a factor in the students' ability to succeed (Bearman et al., 2003; Mullins & Irwin, 2000). Schools need to address these issues and see them as critical to academic success.

Of all the academic areas of school curriculum, math appears to be a particular source of difficulty for students (Ketterlin-Geller et al., 2008; Rafael, 2008). Finding the most effective delivery system, best teaching models, and properly certified teachers is

critical to ensure that students reach their full potential. Instructional delivery systems also impact learning. Heterogeneous versus homogeneous, small and large group instruction, and teacher- or student-led instructions are all factors that have been researched and can influence the outcome of student learning. Teacher, parent, and student attitudes and perceptions about math also tend to have dramatic effects on the student's success in school (Ketterlin-Geller et al., 2008; Rafael, 2008).

Middle school math focuses on more abstract concepts, and effective programs help students make the jump from concrete to abstract reasoning in math. These skills allow students to increase their problem-solving skills, which helps them solve word problems and apply their math skills to real-life math situations. The REP utilizes small classes, hands on instruction, activities that make learning concrete, and increased parental involvement. It also works with the emotional and behavioral issues that sometimes face at-risk students. By allowing students who are deemed at-risk for possibly failing eighth-grade math assessments to receive their math instruction in such a supportive environment like the REP, students will be more likely to be promoted.

I selected a quantitative methodology for this study. According to Creswell (2003) this methodology is appropriate when using ANCOVA to compare the performance of two groups of students. ANCOVA equates two convenience groups on pretest scores and compares them using post test scores. A quantitative methodology was selected as opposed to qualitative since I was concerned with test result scores. I used ANCOVA to compare two groups of students while controlling for the pretest scores so the two groups can be equated. In the case of this study, GA CRCT scores will be used

as a pre and post test scores. Students must perform well on this standardized test required by the state of Georgia to be promoted to the ninth grade.

Section 3: Design Study

Introduction

The purpose of this research study was to determine the effectiveness of remedial math classes on math achievement as measured by the state CRCT tests for eighth graders in a rural Southern middle school. Quantitative data was collected to answer the study's research question: What effect does participation in the REP remedial math program have on students' CRCT scores?

This quantitative study focused on analyzing the math instruction types in place at a suburban middle school, regular and REP, to increase the math achievement of at-risk eighth-grade students. This section describes the quantitative methods and sample selection procedures used to complete the study. First, this section will discuss the study's research design and approach. Next, it will explain the setting in which the study took place and the sample used, including how participants were selected. A detailed description of all remediation programs put in place will follow, along with a description of the data collected and the statistics used in the analysis of the effectiveness of the remediation programs. The last part of this section will discuss the procedures used to safeguard participants' rights.

The main problem addressed in this dissertation was the large percent of eighth graders who failed or barely passed their seventh-grade math CRCT; failing the seventh-grade test was considered a predictor of failing the eighth-grade test. This study also looked at the interventions put in place to ensure that they did not fail the 2008–2009 math CRCT.

Many factors might account for middle school students struggling with math. One reason is that math is more abstract in middle school than in elementary school (Grouws & Shultz, 1996; Juvonen et al., 2004). This jump to more abstract concepts often conflicts with middle school students' emotional and intellectual development (Mullins & Irvin, 2002). The REP math classes help students who are experiencing difficulty. While students in both REP and regular math classes receive their regular math instruction in a separate class taught by a highly qualified teacher of mathematics, the teachers in the REP program have smaller classes and more flexibility with pacing and curriculum so they can provide more hands-on and repetitive lessons to help students bridge the gap between concrete and abstract mathematical concepts (Owens, 1993).

To supplement the classroom procedures, each middle school in the district has a graduation coach who monitors class attendance issues, grades, and state-mandated tests and is responsible for making sure at-risk students have the needed skills to pass their classes and the state tests. Students in both groups of this study had access to the graduation coach.

Research Design

I conducted this experimental, pretest-posttest control-group study using state standardized math test scores to compare two groups of students. The 2008-2009 CRCT scores served as a covariate for choosing the students in the two groups. I analyzed the math CRCT 2009-2010 test scores to determine which group, those receiving math instruction in REP or those receiving math instruction in a regular setting, performed better as measured by the CRCT scores. Based on this research, I determined the

effectiveness of remedial education programs on the progress of eighth-grade at-risk middle school students as measured by state CRCT results. Using this study, I examined two different types of math instruction delivery methods (independent variables) as measured by the CRCT test scores (dependent variable). I chose this design due to the quantitative nature of collecting statistical data on the results of CRCT testing. In order to determine if improvement was made in mathematics, I tested the use of standardized methods of monitoring progress. The CRCT is a criterion referenced test with items designed and field tested by qualified educational professionals. This study will answer the research question as to which instructional delivery method works best to remediate math in at-risk students by analyzing CRCT results.

By using both a treatment group (those receiving math instruction through remedial education programs) and a control group (those receiving instruction through a traditional math class) unbiased information could be gathered to determine the best placement for similar students in future school years. Using a state CRCT also increased validity, since the questions have been field tested and are used uniformly throughout the state. The CRCT is a valid and reliable criterion referenced test.

Setting and Sample

For this quantitative study I used a simple causal comparative research experimental design. A random computer generator chose three of the county's six middle schools and I randomly selected students from these schools to participate in this study. I used the results of the math CRCT scores from students in both the traditional and remedial instruction programs. The population for this sample is eighth-grade

students in a rural school district in Georgia. The county is comprised of students who are 3% Asian, 7% Black, 11% Hispanic, 77% White, 3% multiracial, 4% English for Speakers of Other Languages (ESOL), and 24% eligible for free reduced lunch. I took the sample for this study from the rosters of eighth graders at this school who were considered at-risk because of low seventh-grade CRCT math scores and low classroom performance in math.

One group of students, the experimental group, was composed of 25 students who received their instruction in the REP setting with a maximum of 18 students per class. The control group was composed of 25 students who received their instruction in the regular math class heterogeneously grouped with as many as 28 students per class. The population of students enrolled in the REP program in the county is approximately two hundred students. The 25 students used in the sample represent approximately 10% of the overall population and should increase validity and reliability versus a smaller sample.

I used the school's at-risk list to get students enrolled in this study. Each school in the district is required to generate an at-risk roster at the beginning of each school year. Students are placed on this list for factors that could lead to failing a class, such as failing a prior class, failing or barely passing the CRCT with a score of 800-815 in the areas of reading and math, having an IEP or POINT plan, being served in the ESOL program, or facing behavioral challenges. To determine which programs were effective, I used this at-risk list to enroll participants in this study.

I eliminated any student on the list who had an IEP, 504 plan, SST folders only, and participated in the ESOL program. I also excluded students who failed the reading, but not the math. The factors for being included in this study were failing or barely passing the seventh-grade CRCT, but any of the above mentioned criteria eliminated them from the study.

Instrumentation and Materials

I used CRCT test scores as a pre- and post-measurement tool. During April 2009, schools in Georgia took the CRCT tests. This criterion referenced test has been in place as the main method of assessment in Georgia since the spring of 2000 (GDOE, 2008a). The CRCT test is designed to assess how well the students master the Georgia Performance Standards that are implemented by the state (GDOE, 2008a). This test diagnosed students' strengths and weaknesses and the degree to which students mastered the skills necessary to be successful in the next grade (GDOE, 2008a). The test included multiple choice answers only and did not include any essay or long responses.

The school's average score for the seventh-grade math CRCT's was 838. In order to pass the CRCT a score of 800 or higher must be obtained, and a score of 850 or higher exceeds expectation for the test. This study includes only students who failed or scored low on the seventh-grade 2009 CRCT math test.

At this middle school, seventh-grade math teachers and the administration recommend which students are placed in the REP program. Placement criteria are generated by the county and include students who failed or barely passed the CRCT with a score of 800-815, students struggling in their math classes with a 70 or lower math

average, or students who would benefit from smaller group instruction based on low scores in a regular-sized sixth- and/or seventh-grade math class (GDOE, 2008a). The sample students used in this study were randomly selected from a randomly generated list of middle schools in the county. The students were not randomly placed in the classes, but I randomly choose the students in the study using a random computer generator. The test has been evaluated to have both reliability and validity (GDOE, 2008b, p. 10).

REP Math Program

The state of Georgia implemented remedial education programs to meet the needs of students who show low achievement in math. Criteria for placement in the REP program are as follows:

1. A formal student support team process containing documented evidence that supports remedial placement.
2. The student has been retained in the grade in which he or she is enrolled.
3. The student is eligible to receive services under Part A of Chapter 1 of Title 1.
4. The student has been recommended by a teacher who has documented low math performance.
5. Current standardized test information indicates the student has scored at or below the twenty-fifth percentile in reading, writing, or mathematics. For participation in middle school remediation programs, the most recent Criterion Referenced Competency Test (CRCT) scores indicate the student has a score in the 'Does Not Meet' category in reading, or English/language arts, or mathematics. (GDOE, 2008)

Students in the REP are not segregated from their peers and study other subjects in traditional class settings.

Table 4

Classroom Elements in REP Classroom vs. Traditional Classroom

Classroom Element	REP Classroom	Traditional Classroom
Class Size	Maximum 18 students	Maximum 28 students
Length of math class	55 minutes	55 minutes
Teacher qualifications	High	High
Adherence to pacing outlined on county standards calendar	Flexible	Rigid
Texts	Countywide textbooks, access to additional and unique remediation texts, workbook, and programs	Countywide textbooks and materials
Instructional method	Frequent one-on-one instruction, additional morning tutoring, lessons designed to help students understand abstract concepts	Traditional, infrequent one-on-one instruction, additional morning tutoring
Access to Successmaker math program	Frequent	Limited

Some students in traditional math class scored low on the CRCT or performed low in class but are placed in a regular class setting regardless. This placement could be due to parent preference, conflicts among students in the class, REP program being at capacity, or the discretion of school administration. The schools where these studies took place were not Title 1 schools, and socioeconomic factors were not addressed when determining placement in math classes.

Data Collection and Analysis

I used a pretest-posttest control group design for this study. Participants in this study took the CRCT at the end of seventh grade and again at the end of eighth grade at the conclusion of this study. Although the test was not the same, the test covered the material that was taught in class according to the Georgia Performance Standards (GPS). Each teacher in the state is responsible for teaching the same material in the same order, following a series of performance standards, to make sure all students receive a uniform curriculum. I confidentially recorded test scores for each student in both the control and experimental group in a spreadsheet, using an identification number in place of names to keep the student identities confidential and to track them from year to year. I did not name the schools used in any research data or publication. I used ANCOVA to determine whether students receiving math instruction in an REP math setting performed better than their peers who received math instruction in a traditional classroom as measured by CRCT scores while controlling for the previous year's CRCT scores.

In this study the level of statistical significance between the experimental and control group was predetermined to be 0.05. If the samples provide a result that is at or below the 0.05 level, I should then fail to reject the null hypotheses. If the results provide a result that is above the level of .05, then the null hypothesis will be rejected.

During the spring of 2010, the students were given the CRCT test again. Twenty-five students from each group were chosen randomly using a computer program and matched up based on similar test scores. The final statistical analysis was done using

ANCOVA to determine if there were differences in the test scores of both groups of students.

Researcher's Role

My role in this study was to identify students whose CRCT scores would be utilized in this study. In addition, I used identification numbers, which had been assigned by the schools' principals, to record data for each student,. I analyzed the at-risk list and determined which students would be in the control and experimental groups respectively, but I had no role in the placement of those students on the list or in the classes. In addition, I had no contact with the subjects in the sample. All students involved in the study were kept in confidence with recorded data being held in a password-protected file.

Rights of Participants in the Study

Measures were put in place to protect the rights of all participants. I obtained IRB approval (Walden IRB approval No. 10-28-10-0339027). Individual consent forms were not required since students were placed in this class as a normal method of math instruction at the middle school. Whether this study took place had no effect on the placement of students or the tests they took. School committees placed students in the math instructional classes, not me. I formed a control and experimental group using generated class lists. All eighth graders in the state of Georgia take the same test, so the samples used in this study were not subjected to additional assessment data. The REP teacher and I did not know the names of the students involved in the study. I used student number codes to collect data and keep personal information confidential. All data was kept in a secure location.

Section 4: Statistical Results

Introduction

The purpose of this study was to see if one method of teaching math was more effective than another in an eighth-grade population that had received low math CRCT scores in their seventh-grade year. One group received math instruction in a traditional math setting; the other group received math instruction in a REP classroom that was limited to 18 students who received additional support. I conducted this study by performing an analysis of covariance (ANCOVA) using the seventh- and eighth-grade CRCT math scores. The seventh-grade scores were the covariate.

Six middle schools were given the option to participate and three chose to submit data. Principals at the participating schools assigned each student an identification number to keep student identities private. Students were placed into one of two groups regardless of the school attended: those who received math instruction in REP setting and those who received instruction in regular classroom setting.

To examine the research question: Is there a significant difference in CRCT scores between at-risk eighth-grade students receiving instruction in the REP program and at-risk risk eighth-grade students receiving instruction in the traditional program, while controlling for their seventh-grade CRCT scores? I conducted an analysis of covariance to assess whether there were differences in the eighth-grade CRCT scores between the group receiving REP instruction and the group receiving regular instruction after controlling for the seventh-grade CRCT scores. Prior to analysis, I assessed the assumptions of normality with a Kolmogorov Smirnov test. The results of the test were

not significant, thus verifying the assumption of normality. Equality of variance was assessed with a Levene's test. The results of the test were significant, violating the assumption of equality of variance. In many cases, however, the ANCOVA is considered a robust statistic where assumptions can be violated with relatively minor effects (Howell, 2010).

Descriptive Statistics

Based on their CRCT scores in seventh grade, 52 students participated in the study, 26 of whom were placed in the REP program and 26 of whom were placed in the regular program. The seventh-grade scores ranged from 774 to 819 for the REP group and 776 to 819 for the regular group. The regular group had one more point on average (M = 797.04, SD = 11.57) than the REP group (M = 796.04, SD = 11.40). Students took the CRCT test again in eighth grade, after the intervention. The eighth-grade scores ranged from 777 to 850 for the REP group and 769 to 804 for the regular group. The REP group had 14.73 points more on average (M = 803.54, SD = 17.09) than the regular group (M = 788.81, SD = 10.08). However, the REP group had a larger standard deviation than the regular group at eighth grade, showing that the REP scores varied more than the regular group. Means and standard deviations for the CRCT scores are presented in Table 5.

Table 5

Means and Standard Deviations for Seventh and Eighth-grade CRCT Tests by Group

	Seventh-grade CRCT		Eighth-grade CRCT	
Group	*M*	*SD*	*M*	*SD*
REP	796.04	11.40	803.54	17.09
Regular	797.04	11.57	788.81	10.08

A passing score on the CRCT was defined as 800 or above. For the seventh-grade scores, 28 or 53.8% of the participants had a score of 800 or less. The rest of the students achieved a score of 801 to 815, which put them at possible risk for not achieving a passing score on their eighth-grade CRCT test. Some students were placed in REP despite a passing grade to provide extra support and ensure success on the eighth-grade CRCT. Some parents chose not to allow their students in the REP program, other students attended schools where the self-contained REP classes were not offered, and some students had scheduling conflicts that prevented them from participation in the REP program.

After the intervention on their eighth-grade CRCT test 16 or 64% of the participants in the REP program had a passing score of 800 or higher while 5 or 20% of the students in the regular program obtained a score greater or equal to 800. Table 6 shows the frequencies of passing scores before and after the intervention.

Table 6

Frequencies and Percentages of Students with passing and not passing

	REP		Regular	
	n	%	*n*	%
Seventh-grade CRCT				
Not passing	12	48	12	52
Passing	13	52	13	48
Eighth-grade CRCT				
Not passing	9	36	20	80
Passing	16	64	5	20

Analysis of Design and Findings

The results of the ANCOVA were significant, F (1, 49) = 15.66, p = .001, suggesting that there was a difference in the eighth-grade CRCT scores by group after controlling for the seventh-grade CRCT scores. Pairwise comparisons revealed that the group who received the REP program instruction had significantly higher eighth-grade CRCT scores (M = 803.54) than the group who received regular instruction (M = 788.81), after controlling for the seventh-grade CRCT scores. The partial η^2 of 0.24 was considered to be a medium to high effect size. Therefore, 24% of the variance was explained by the REP treatment. Results of the ANCOVA are presented in Table 7.

Table 7

ANCOVA for eighth-grade CRCT Scores by Group after Controlling for Seventh-grade CRCT Scores

Source	*SS*	*df*	*MS*	*F*	*p*	Partial η^2
Seventh-grade CRCT	651.49	1	651.49	3.48	.068	0.07
Group	2936.82	1	2936.82	15.66	.001	0.24
Error	9187.01	49	187.49			

Concluding Statements

The results of this study seem to indicate that there is a significant statistical difference in the math performance as measured by the eighth-grade CRCTs in the two groups. The research question sought to examine whether there would be a significant difference between the two groups of students, and the results of the ANCOVA show there was a significant difference.

The hypothesis indicated that students who received their instruction in the REP setting would outperform their peers that did not receive their instruction in an REP setting. The results of this study show that there was a significant difference between the two groups, and the REP students did significantly better than their at-risk peers who received math instruction in the regular classroom.

Section 5 will discuss the summary of the study, the implications of the data, future recommendations for action, and why its significance for social change.

Chapter 5: Conclusions

Summary of Study

The purpose of this study was to determine whether there was a difference between at-risk eighth-grade students receiving instruction in the REP math program or in the regular classroom, as measured by eighth-grade CRCTs. The study controlled for seventh-grade CRCT math scores and compared them to eighth-grade scores to see if there was a significant difference between them. Three out of six middle schools in the county submitted data for this study data. The principals who provided the data assigned random numbers to each of the schools and students involved, so that all data were kept confidential and no identifiers were known to me. Compiling data and completing an ANCOVA revealed significant difference in achievement between the two groups.

Interpretations of Findings

To analyze the research question, I conducted an ANCOVA. The seventh-grade scores were the covariate. The analysis revealed there was a significant difference between the REP and regular students on the eighth-grade CRCT scores while controlling for the seventh-grade CRCT scores, F (1, 49) = 15.66, p = .001. Pairwise comparisons revealed that the group that received the REP program instruction had significantly higher eighth-grade CRCT scores (M = 803.54) than the group that received regular instruction (M = 788.81). The partial η^2 of 0.24 was considered to be a medium to high effect size, with the REP treatment explaining 24% of the variance. Students in the REP class showed significant gains in the number of students who passed; 64% of students who received their math instruction in the REP setting achieved a passing score on the

eighth-grade CRCT, whereas only 20% of the students who did not have REP math instruction passed. This is further demonstrated by their mean scores, which started out virtually the same in seventh grade but varied in their eighth-grade year. The traditional math students had a mean score of 797.04 on their seventh-grade CRCT scores and their eighth-grade mean was 788.81, demonstrating a decrease. The students in REP math had a seventh grade mean score of 796.04 and an eighth-grade mean of 803.54, a significant increase. The analysis shows that the REP program provided a better math setting than the traditional program. In addition, students in the traditional math showed a decrease in the number of students who passed the CRCT in their eighth-grade year.

These results could be due to a three factors: (a) Smaller class size might mean more individualized attention for students when struggling with a concept (Graue et al., 2009; Jepsen & Rivkin, 2009). It is easier to get individualized attention in a class of 18 than a class of 32. (b) Since students are grouped with other students who also are experiencing difficulties, they may not feel embarrassed about asking for help. (c) REP students are not held to the same rigorous pacing as traditional classrooms.

Constructivism theory states that learning is done by reflecting on our experiences, understanding things around us, and building on background knowledge (Piaget, 1969; Phillips, 1981; Lambert et al., 2002). New information is more readily assimilated when the previous information is learned well and provides a building block for new concepts (Lambert et al., 2002). Students learn best by figuring things out themselves under the guidance of a teacher. In the REP setting, there are more opportunities for the teachers to permit this discovery learning and to make sure concepts

are learned before moving on the next concept. This is especially important for adolescent students trying to make sense of the world while discovering their own sense of self.

One of the main tenets of constructivism is that physical and social contexts influence and dictate cognitive processes (Lambert et al., 2002; Schunk, 2004). In the REP setting, students are more likely to take a risk when answering questions because the other students are experiencing similar problems in math; this would address the social contexts of learning. The physical setting of the REP classroom allows more one-on-one instruction and more hands-on activities. These factors might make a safe learning environment for the struggling math student. REP teachers are in a position where they can know their students better, make sure a concept is taught before moving on to a new concept, and have more freedom to make math a discovery process due to the logistics of having less students to manage.

Social Change

The significant difference in scores could be contributed to the combination of alternative teaching methods and resources that the available to the REP program and available smaller class size, which results in more one-on-one attention to the student who is having a problem.

Positive social change is a deliberate process of creating and applying ideas, strategies, and actions to promote the worth, dignity, and development of individuals, communities, organizations, institutions, cultures, and societies (Harper, 1998). As it refers to this study, the most effective type of math instruction for at-risk students could

result in positive social change for the school districts that struggle to utilize funds in the most expeditious and efficient means available to them. This study looked at two instructional methods utilized at middle schools for their at-risk math students. Based on the results of the inferential statistics, the REP model would give districts a more efficient use of funds.

In addition to schools experiencing positive social change due to higher test scores, positive social change would also occur within the individual students. Self esteem and self worth of students would increase if they felt they were more successful (Harper, 1998). Students who feel successful are more likely to view school positively and will therefore do better in school (Pintrich, 2000). Self efficacy, or the ability to believe in one's own ability to succeed, is integral to success in school (Pintrich, 2000). When students meet with academic success, they develop self efficacy, which can lead to positive social change on all levels, including success in high school, college, in their careers, and as a contributing member of the American economy (Ketterlin-Geller et al., 2008; Rafael, 2008).

Students who meet with academic success in school and feel positive about their math experiences will in turn do better in math, in school, and in other school applications (Ketterlin-Geller et al., 2008; Rafael, 2008). As school districts struggle to utilize ever-diminishing and limited funds, it is imperative that research studies are done that will help districts find the best ways to use these funds to enact positive social change. This would create a domino effect: students would feel better about their abilities and would succeed, which would make teachers feel more successful and

positive about their jobs (Harper, 1998). When teachers are motivated by their gains, it reflects on the school itself—with teachers showing more pride and a sense of positive community involvement. Schools that, in turn, do well and meet with academic success positively influence the school district level and create a county wide positive work and learning environment for both employees and the students. When students meet with more success and experience higher self worth, it creates a domino effect of positive change throughout the system.

Recommendations for Action

Schools in the state of Georgia receive additional funding for math instruction in the form of REP funds. The schools and districts can use these funds by employing a variety of teaching methods. One method is a math connections class that students attend in place of a traditional connections class like PE or music. The second method, and the one addressed in this study, is where the lowest 25th percentile of math students receives math instruction from highly qualified math teachers in a small class setting. The students in this method go to the REP math class instead of a math class taught by a regular teacher. Class size is capped at 18 maximum, and students receive their math instruction using a variety of hands-on techniques and other applications that make math easier to comprehend.

The results from this study show that when students received their primary math instruction in an REP self-contained classroom, academic improvements were evident compared to students of similar math skills that received their instruction in a typical math classroom. Schools need to use the data collected in this and other studies to

determine how to use REP funds in the future to help at-risk math students meet with the most success. The results seem to indicate that the REP program when done as a self-contained math class is a better model to have at-risk students meet with academic math success than the traditional math classroom. The arguments of class size and heterogeneous versus homogenous groupings have been going on since education began. This study implies that the smaller homogeneous setting in an REP class is beneficial to the middle school student.

Educating middle school students presents a unique set of problems not present in elementary and high school academic settings. Studies have shown that one in 10 middle-school-aged children has some type of emotional or leaning issue that affects his or her ability to succeed in school (Bearman et al., 2003; Vander Stoep et al., 2003). In addition, adolescents are at an increased risk for low self esteem, depression, and other issues that could be exacerbated by poor academic success in school (Bearman et al.; Mullins & Irwin, 2000). The onset of puberty can bring awkwardness, unease, and the need to fit in more in school (Alspaugh, 1998). School districts need to take into account these complex issues surrounding middle school students when finding ways to use the REP math funds to best educate the at-risk math students who might be in danger of being retained in eighth grade if they fail to meet the standards and/or pass the CRCT eighth-grade math test. These findings apply to middle school math instruction because instructors are not just teaching math but overcoming the complex issues of puberty and the emotional issues that these adolescent middle school students face in addition to trying to learn complex math issues.

Results from this study will be shared with the middle schools who participated in the data collection process as well as with the county level. The county level administrators meet with other counties in the state, and the data can be disseminated there as well. States, districts, and individual schools should consult this data and other similar studies when planning on ways to best utilize math funds for the at-risk students.

Recommendations for Further Study

This study was limited to Grade 8 middle school math classes in one district in North Georgia, specifically comparing students in traditional and REP classes. Additional studies should be completed to include more districts and more grade levels to determine if the findings will be consistent in elementary schools, at all grade levels, and in districts with other demographics.

Additional studies could be done on the effectiveness of REP connections classes versus REP self-contained math classes in a variety of grade levels and could be tracked over more than one school year. Additional studies could examine whether the unique emotional makeup of middle school students has an effect on the way instruction methods are delivered to obtain the best results for both the students and the schools. Small classes and homogenous grouping could be more beneficial to these middle school students facing puberty than to students in other stages of development. Further studies in various schools, districts, and grade levels might help districts decide how to best utilize the REP funds to achieve the maximum results from their students.

Concluding Statement

Education has always been a field subjected to many different theories, viewpoints, and philosophies. Each group argues that its methods are the best and will achieve the best results. Each year teachers are asked to read the latest books on what works, try the newest theories, analyze the new methods, and then utilize them in the classroom. Most of the time these new methods last a few years, only to be replaced with another new theory or method and a new set of books to read and analyze, and the process starts again.

As educators, we owe it to our students, parents, and stakeholders to look at research-driven data before we jump on the latest bandwagon and try new theories that have no statistical basis proving their effectiveness. Studies like this one use data and research to determine whether a way of teaching worked for the students involved. Quantitative data using statistical methods must be utilized when trying to evaluate a new program to see if it works and is worthy of implementation in schools. With funds as limited as they are, it does not benefit the stakeholders for educators and administrators to buy into new methods that have no data-driven proof of effectiveness.

This study implies that small, homogenous grouping for the middle school student is effective in helping at-risk eighth graders meet with academic success in math. Further studies involving larger and more diverse groups of students should be completed to ensure that districts can best use their resources to help students meet with the most success possible.

Education is a unique field. Teachers are entrusted with helping their young charges develop the best skills they can in all the subjects, which will hopefully translate into success as adults. Math, in particular, is one subject where students tend to struggle. Students meeting with success in math will translate to success in many fields, since math develops good problem-solving skills. Math is an integral part of life, and math skills are needed to do well in employment and life. Educators owe it to their students to do research and analyze others' research when designing and implementing programs to help students succeed. This and similar studies should be utilized by educators when they are trying to determine the best use of REP funds in their schools and to determine which instructional method will work best to meet the needs of students.

References

Achilles, C. M. (2003). *How class size makes a difference: What the research says. The impact of class-size reduction (CSR).* (ERIC Document Reproduction Service No. ED475012)

Akos, P., Queen, J., & Lineberry, C. (2005). *Promoting a successful transition to middle school*. Larchmont, NY: Eye on Education Press.

Alspaugh, J. (1998). Achievement loss associated with the transition to middle school and high school. *Journal of Educational Research*, 92, 1, 20-25. doi:10.1080/00220679809597572

Anderson, A. (2000). How parental involvement makes a difference in reading achievement. *Reading Improvement*, *37*(2), 60-86. Retrieved from http://www.projectinnovation.biz

Austin, A. W. (1982). *Minorities in higher education*. San Francisco, CA: Jossey-Bass.

Baker, J. D., Rieg, S. A., & Clendaniel, T. (2006). An investigation of an after-school math tutoring program: University tutors + elementary students = successful partnership. *Education, 127*, 287-293.

Ball, D. L. & Bass, H. (2000). Interweaving content and pedagogy in teaching and learning to teach: Knowing and using mathematics. In J. Boaler (Ed.), *Multiple perspectives on teaching and learning* (pp. 83-104). Westport, CT: Ablex Publishing.

Bearman, P. S., Jones, J., & Urdry, J. R. (2003). *The national longitudinal study of adolescent health*. Retrieved from http://www.cpc.unc.edu/projects/addhealth

Beilke, J. & Peoples, G. (1997). Failure to thrive syndrome (FTTS): Predicting educational failure at the middle school level. *Education*, *117*, 512-515.

Benabou, R. & Tirole, J. (2003). Intrinsic and extrinsic motivation. *Review of Economic Studies*. *70*, 489-520.

Blankenship, T. (2009). *An evaluation of a personalized education program for at-risk ninth grade students* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3355327)

Bliven, J. (2009). *Student characteristics used for curricular placement: Who should make the final decision?* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3352755)

Bottage, B. & Hasselbring, T. (1993). A comparison of two approaches for teaching complex, authentic mathematics problems to adolescents in remedial math classes. *Exceptional Children*, *59*(6), 556-566. Retrieved from http://www.cec.sped.org/Content/NavigationMenu/Publications2/ExceptionalChildren/default.htm

Boylan, H. R., Bonham, B. S., White, J. R., & George, A. P. (2000). Evaluation of college reading and study strategy programs. In R. F. Flippo & D. C. Carverly (Eds.), *Handbook of college reading and study strategy research* (pp. 365-401). Mahwah, NJ: Lawrence Erlbaum Associates.

Brady, A. (2008). *Effects of standardized testing on teachers' emotions, pedagogy and professional interactions with others* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3326877)

Brown, C. A. & Borko, H. (1992). Becoming a mathematics teacher. In D. A. Grouws (Ed.), *Handbook of research in mathematics teaching and learning* (pp. 209-239). New York: Simon & Schuster Macmillan.

Burris, C. & Welner, K. (2005). Closing the achievement gap by detracking. *Phi Delta Kappan*, *86*(8), 594-598.

Burris, C., Heubert, J., & Levin, H. (2006). Accelerating mathematics achievement using heterogeneous grouping. *American Educational Research Journal*, *43*(1), 105-136. (ERIC Document Reproduction Service No. EJ746810)

Cakmak, M. (2009). The perceptions of student teachers about the effects of class size with regard to effective teaching process. *Qualitative Report*, *14*(3), 395-408. (ERIC Document Reproduction Service No. EJ855981)

Carruthers, D. (2009). *A study of students failing TAKS: Some children are left behind* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3358)

Chory, R. & McCroskey, J. (1999). The relationship between teacher management communication style and effective learning. *Communication Quarterly*, *47*(1), 1-11. Retrieved from http://www.tandf.co.uk/journals/titles/01463373.asp

Cohen, J. H. (2006). 'Supplemental services': Theory vs. practice. *Education Week*, *25,* 34-35.

Colamarino, G. (2008). *The impact of ability grouping on the academic growth of at-risk students* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3336656)

Cole, C. (2009). *Ten weeks of academic intervention designed to improve math word problem solving among middle school students: Effects of a randomized pilot study* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3321427)

Coombs, M. (2009). *A case study of class size and student success in three southern Wisconsin high schools* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3356099)

Costello, M. (2009). *A preparation program for secondary mathematics teachers* (Master's thesis). Retrieved from ProQuest Dissertations and Theses. (AAT 1463983)

Cravens, A. (2006). *The relation of class size to student achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3219966)

Creswell, J. (2003). *Research design qualitative, quantitative, and mixed methods approach* (2nd ed.). Thousand Oaks, CA: Sage.

Daly, E. J., Hintze, J. M., & Hamler, K. R. (2000). Improving practice by taking steps toward technological improvements in academic intervention in the new millennium. *Psychology in the Schools*, *37*, 61-72.

Owens, D. T. & Wagner, S. (Eds.) (1993). *Research ideas for the classroom: Middle grades mathematics*. New York: Macmillan.

Deci, E. L. & Ryan, R. M. (2000). The "what" and the "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*, 227-268.

Dodgson, P. G. & Wood, J. V. (1998). Self-esteem and the cognitive accessibility of strengths and weaknesses after failure. *Journal of Personality and Social Psychology*, *75*, 178-197.

Ebeling, D. G. (2000). Adapting your teaching to any learning style. *Phi Delta Kappan*, *82*(3), 247-248.

Ellias, M. (2001). Middle school transition is harder than you think. *Middle Matters*, *Winter 2001*, 1-2. Retrieved from http://www.naesp.org

Feger, E. (2009). *Quality teaching in high-stakes learning environments in third grade* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3359115)

Foley, R. M. & Pang, L. (2006). Alternative education programs: Program and student characteristics. *High School Journal*, *89*(3), 10-22.

Foley, M. (2009). An *exploratory action research study investigating the consequences of the implementation of a middle school alternative education program* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3341585)

Fortune, G. (2009). *Initiating the process of secondary teacher change in an era of high stakes testing* (Master's thesis). Retrieved from ProQuest Dissertations and Theses. (AAT 1466121)

Fowler, F. C. (2000). *Policy studies for education leaders: An introduction*. Upper Saddle River. NJ: Prentice Hall.

Fuchs, L., Fuchs, D., Craddock, C., Hollenbeck, K., & Hamlet, C. (2008). Effects of small-group tutoring with and without validated classroom. *Journal of Educational Psychology*, *100*, 491–509.

Georgia Department of Education. (2008a). *What Georgia educators need to know about Georgia's testing program*. Retrieved from http://public.doe.k12.ga.us/DMGetDocument.aspx/Testing%20Newsletter%20FINAL.pdf?p=6CC6799F8C1371F684B90AD0BF50E2823D1430BC7D1DBC33ACE614F238EF2455&Type=D

Georgia Department of Education (2008b). *An Assessment & Accountability Brief: Validity and Reliability for the 2008 Criterion-Referenced Competency Tests.* Atlanta, GA: Author.

Goble, J. (2009). *No Child Left Behind legislation and its impact on local curriculum decisions, classroom instruction and teacher job satisfaction in downstate Illinois* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3358715)

Gonzalez-DeHass, A., Willems, P., & Holbein, M. (2005). Examining the Relationship Between Parental Involvement and Student Motivation. *Educational Psychology Review*, *17*(2), 99-123. (ERIC Document Reproduction Service No. EJ732429)

Gonzer, M. (2008). *The effects of high stakes testing on teaching methodol*ogies (Master's thesis). Retrieved from ProQuest Dissertations and Theses. (AAT 1462766)

Gordon, E. E. & Gordon, E. H. (1990). C*enturies of tutoring: A history of alternative education American and Western Europe*. Lanham, MD: University Press of America.

Gordon, E. E., Morgan, R. R., Ponticell, J. A., & O'Malley, C. J. (2004). Tutoring solutions for No Child Left Behind: Research, practice, and policy implications. *NASSP Bulletin*, *88*, 59-68.

Graue, E., Rauscher, E., & Sherfinski, M. (2009). The synergy of class size reduction and classroom quality. *Elementary School Journal*, *110*(2), 178-201. (ERIC Document Reproduction Service No. EJ863501)

Grouws, D. A. & Shultz, K. A. (1996). Mathematics teacher education. In J. Sikula, T. J. Buttery, & E. Guyton (Eds.), *Handbook of research on teacher education* (pp. 442-458). New York: Simon & Schuster Macmillan.

Harper, C. L., (1998). *Exploring social change: American and the world* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Hawley, W. (2002). *The keys to effective schools*. Thousand Oaks, CA: Corwin Press, Inc.

Hendricks, K. (2009). *The impact of ability-grouping on the achievement, self-efficacy, and classroom perceptions of gifted elementary students* (Doctoral dissertation). Retrieved from Walden University Dissertations and Theses database. (AAT 3342475)

Hiebert, J., Carpenter, T. P., Fennema, Fuson, K., Human, P., Murray, H., … Wearne, D. (1996). Problem solving as a basis for reform in curriculum and instruction: The case for mathematics. *Educational Researcher*, *25*(4), 12-21.

Howell, D. C. (2010). *Statistical methods for psychology* (7th ed.). Belmont, CA: Wadsworth Cengage Learning.

Jackson, C. (2009). *Elementary classroom assessment practices: Method, application, and influence* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3355017)

Jacobson, L. (2008). Class-size reductions seen of limited help on achievement gap. *EducationWeek*, *27*(25), 9.

Jepsen, C. & Rivkin, S. (2009). Class size reduction and student achievement: The potential tradeoff between teacher quality and class size. *Journal of Human Resources*, *44*(1), 223-250. (ERIC Document Reproduction Service No. EJ825706)

Juvonen, J., Le, V., Kaganoff, T., Augustine, C., & Constant L. (2004). *Focus on the wonder years; challenges facing the American middle school.* Santa Monica, CA: Rand Corporation.

Ketterlin-Geller, L., Chard, D., & Fien, H. (2008). Making connections in mathematics: Conceptual mathematics intervention for low-performing students. *Remedial and Special Education*, *29*, 33-45.

Klosterman, P. & Gainey, P. H. (1993). Students thinking. In R. J. Jensen (Ed.), R*esearch ideas for the classroom: Early childhood mathematics* (pp.85-95). New York: Macmillan.

Lambert, L., Walker, D., Zimmerman, D. P., Cooper, J. E., Lambert, M. D., Gardner, M. E., & Szabo, M. (2002). *The constructivist leader* (2nd ed.). New York: Teachers College Press.

Lampert, M. (1991). Connecting mathematical teaching and learning. In E. Fennema, T.P. Carpenter, & S.J. Lamon (Eds.), *Integrating research and learning mathematics* (pp. 121-125). Albany, New York: State University of New York Press.

Lauer, P. A. (2006). Out-of-school-time programs: A meta-analysis of effects for at-risk students. *Review of Educational Research*, *76*, 275-313.

Linchevski, L. & Kutscher, B. (1998). Tell me with whom you've learning and I'll tell you how much you've learned: Mixed-ability verses same-ability grouping in mathematics. *Journal for Research in Mathematics Education*, *29*(5), 533-554.

Linnenbrink, E., & Pintrich, P. (2002). Motivation as an enabler for academic success. *School Psychology Review*. *31*, 313-327.

Lorain, P. (1997). *Transition to middle school*. Retrieved from http://www.nea.org/teachexperience/msk030408.html

Losen, D., Orfield, G., & Balfanz, R. (2006). *Confronting the graduation rate crisis in Texas*. (ERIC Document Reproduction Service No. ED500818)

Machen, S., Wilson J., & Notar, C. (2005). Parental involvement in the classroom. *Journal of Instructional Psychology*, *32*(1), 13-16. Retrieved from http://www.projectinnovation.biz/jip

Manke, M. (1997). *Classroom power relations: Understanding student teacher interaction*. Mahwah, NJ: Lawrence Erlbaum Associates:

Maresca, J., (2004). *Identification of the existence of some factors associated with ability grouping in high school and its implications for high school senior* (Master's thesis). Available from ProQuest Dissertations and Thesis (UMI No. 1397478)

Marchant, G. J., Paulson, S. E., and Rothlisberg, B. A. (2001). Relations of middle school students' perceptions of family and school contexts with academic achievement. *Psychology in the Schools*, *38*(6), 505–519.

Marzano, R., Pickering, D., & Pollock, J. (2001). *Classroom instruction that works*. Alexandria, VA: Association for Supervision and Curriculum Development.

Marzano, R (2003). *What works in schools: Translating research into action*. Alexandria, VA: Association for Supervision and Curriculum Development.

Moorer, C. (2009). *A mixed methods study: The examination of a developmental education program at an urban public Maryland community college* (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses. (AAT 3365799)

Morris, J. (2009). *A qualitative investigation of interdisciplinary mixed ability cooperative classes in an inner-ring suburban high school* (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses. (AAT 3341349)

Moses, R. (2001). *Radical equations: Math literacy and civil rights*. Boston: Beacon Press.

Mullins, E. R. & Irvin, J. K. (2000). Transition into middle school: What research says. *Middle School Journal*, *31*(3). Retrieved from http:// www.cahppaqua.k12.ga.us

The No Child Left Behind (NCLB) Act of 2001, Pub. L. No. 107-110, § 115, Stat. 1425 (2002).

Owens, D. T. (1993). Introduction. *In D.T. Owens (Ed.) Research ideas for the classroom: Middle grades mathematics* (pp. xi-xvii). New York: Macmillan.

Phillips, J. (1981). *Piaget's theory: A primer*. San Francisco. W.H. Freeman and Company.

Piaget, J. (1969). *Science of education and the psychology of the child*. New York: Grossman Press.

Pintrich, P. R. (2000). Multiple goals, multiple pathways: The role of goal orientation in learning and achievement. *Journal of Educational Psychology*, *92*, 544-555.

Pintrich, P. R. & Schunk, D. (2002). *Motivation in education: Theory, research, and applications* (2nd ed.). Upper Saddle River, NJ: Prentice-Hall.

Popham, W. J. (2003). *Test better, teach better.* Alexandria, VA: Association for Supervision and Curriculum Development.

Rafael, R. (2008). *An examination of teacher qualifications and student achievement in mathematics* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. **(**AAT 3333147)

Reed, M. C. (2005). *How do low performing high schools reorganize in the face of high stakes accountability policy?* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3179399)

Robinson, D. (2009). *A correlation study between below-grade-level reading and graduation rates in a southeast Georgia school system* (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses. (AAT 3349796)

Schullery, N. & Schullery, S. (2006). Are heterogeneous or homogeneous groups more beneficial to students?, *Journal of Management Education*, *30*(4), 542-556. (ERIC Document Reproduction Service No. EJ797836)

Schunk, D. (2004). *Learning theories: An educational perspective* (4th edition). Upper Saddle River, NJ: Pearson Merrill Prentice Hall.

Sexton, J. (2010). Leveling the playing field: Increasing student achievement through data-driven ability grouping and instructional practices [Online Submission]. (ERIC Document Reproduction Service No. ED507764)

Smith, P. & Tillman, T. (1999). *Instructional design.* New York: John Wiley & Sons.

Springer, L., Stanne, M. E., & Donovan, S. (1997). *Effects of cooperative learning on undergraduates in science, mathematics, engineering, and technology: A meta-analysis*. Unpublished manuscript, National Institute for Science Education, University of Wisconsin, Madison.

Stone, J. (2007). Making math work. *Principal Leadership*, *7*(5), 43-45.

Thompson, A., Simonson, M., & Hargrave, C. (1996). *Educational technology: A review of the research* (2nd ed.). Washington, DC: Association for Educational Communication and Technology.

United States Department of Education (2007). *What works clearinghouse: Middle school math*. Retrieved from http://www.whatworks.ed.gov

Vander Stoep, A., Weiss, N. S., Kuo, E., Cheney, D., & Cohen, P. (2003). What proportion of failure to complete secondary school in the US population is attributable to adolescent psychiatric disorder? *Journal of Behavioral Health Services & Research*, *30*(1), 119-124.

Vaughn, S., Bos, C., & Schumm, J. (2000). *Teaching exceptional, diverse, and at-risk students in the general education classroom*. Needham Heights, MA: Allyn & Bacon.

Vorbach, A. & Foster, S. (2003). *The relationship between emotional competence and social competence in early adolescents* [Research report]. (Eric Document Reproduction Service No. ED475380)

Walker, C., Greene, B., & Mansell, R. (2006). Identification with academics, intrinsic/extrinsic motivation, and self-efficacy as predictors of cognitive engagement. *Learning & Individual Differences*, *16*(1), 1-12. (ERIC Document Reproduction Service No. EJ731991)

Wasik, B. A. (1998). Using volunteers as reading tutors: Guidelines for successful practices. *The Reading Teacher*, *51*, 562-570.

Warner, R. (2009). *A comparison of teaching models that promote academic achievement in an inclusive secondary classroom* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3358173)

Woods, R. (2009). *Training culturally responsive remedial math instructors* (Doctoral. Dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3325085)

Wyllie, J. (2009).The impact on student achievement of the Pennsylvania System of School Assessment (PSSA) prep program (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3349291)

Appendix A

REP Math		Non Rep Math	
7th grade	8th grade	7th grade	8th grade
2009 score	2010 score	2009 score	2010 score
808	816	808	803
781	793	785	780
806	850	810	804
774	800	776	786
804	800	804	769
801	790	800	790
793	793	793	788
801	825	800	789
793	801	795	798
806	825	808	795
800	803	800	779
806	795	810	792
800	795	800	790
808	806	808	801
806	803	808	800
803	803	804	779
776	777	776	779
779	825	779	769
781	785	780	780
793	790	793	780
790	795	795	784
792	825	790	800
787	800	788	793
790	825	790	800
800	795	804	784
819	777	819	797

Appendix B

December 8, 2010

Dear

I am a teacher in _____ County at _____ Middle School. I am completing my Ed. D. from Walden University. My dissertation will be looking at students who had their math classes in a REP setting last year instructed in a small REP classroom as opposed to having math in a traditional setting and seeing if there was a difference on their 8th grade CRCT math scores. Some students receive REP in a connections setting and would be in the control group.

I have received permission from the central office and IRB approval from my college to gather data. The data I am going to collect is the 8th Grade "At Risk Spread Sheets" that were compiled at the schools for the 2009/2010 school year. The only data I need is their 7th and 8th grade CRCT scores and if they attended REP programs either as a connections or as an independent class. I would need to know which REP they attended. I will be looking at two groups of students, those who had their primary Math instruction in an REP setting and those that had their primary math instruction in a traditional classroom setting.

I am aware of how busy you all are school but would really appreciate your support in completing this project. If you need me to come in after school to obtain the spreadsheet, I would be happy to do so. I can disaggregate the data if needed. Please feel free to contact me by cell phone _____ or email _____

Thank you for your support.

Sincerely,

Mary Mills
Doctoral Candidate
Walden University

Curriculum Vitae

Mary K. Mills
Canton, Georgia

Education

Walden University, Online
Ed.D Teacher Leadership
GPA 4.0
Dissertation: Evaluation of a Remedial Educational Program at Southern Suburban Middle School

University of South Florida, Tampa, FL
M.A. Elementary Education
Concentration: Literacy in a Diverse Society (ESOL)
August 1998
GPA 4.0

University of South Florida, Tampa, FL
B.A. Specific Learning Disabilities
April 1990
Cum Laude, GPA 3.5

Teaching Experience

Dean Rusk Middle School, Canton, GA, 2000-present
English for Speakers of Other Languages (ESOL) Teacher and seventh and eighth grade Remedial Reading Teacher, 2010-present

- Teach literature to approximately 125 seventh graders yearly, including classes working in conjunction with special education teachers.
- Improve reading comprehension skills and introduce students to different forms of literature.
- Prepare students to take the GCRCT state tests. Teach after school tutoring in reading and math.

Seventh grade Life Science teacher, 2008-2010
Seventh grade Literature and Language Arts Teacher, 2004-2008

Broward Elementary School, Hillsborough Co., FL, 1998-2004
Fifth Grade Teacher, 2001-2004

- Fused (co-taught) with Specific Learning Disabilities (SLD) and Gifted teacher. All fifth grade SLD, gifted, and most of the bilingual students were in my room to allow for fusing to occur.
- Resource students were not pulled out for services, instead the special service teachers came into my room and we co-taught.
- Prepared my students to take the state assessment tests and pass fifth grade benchmarks in order to be promoted to middle school.

Fourth Grade Teacher, 2000-2001
Fourth Grade PEP (dropout prevention) class teacher, 1999-2000

- Worked in conjunction with a paraprofessional to provide intensive reading, writing, and math instruction.
- Prepared students to take the FCAT Writes Test, FCAT Reading State Assessment Test, and FCAT Math Problem Solving tests.

First/second grade teacher, 1998-1999

- Provided instruction in all academic areas.
- Fused with the bilingual teacher for language arts instruction. Over half of my students were bilingual.
- Used intensive vocabulary instruction for students with limited English proficiency.
- Prepared students for the state SAT testing and the second graders for the countywide benchmark tests in reading, writing, and math.

Cecile Essrig Elementary School, Hillsborough Co., FL, 1992-1998
Specific Learning Disabilities Teacher

- Provided instruction in a self-contained SLD classroom consisting of first through fifth graders.
- Worked in conjunction with other special education teachers to meet the needs of students in my class who required special education resource services.
- Supervised Specific Learning Disabilities interns.

Twin Lakes Elementary, Hillsborough Co., FL, 1990-1992
Specific Learning Disabilities Teacher

- Responsibilities included classroom instruction of all areas of curriculum in a self-contained sixth grade Specific Learning Disabilities classroom.

Dover/Kenly Elementary School, Hillsborough Co., FL, April 1990-June 1990
Specific Learning Disabilities Teacher

- Responsibilities included classroom instruction in reading and language arts for primary students with learning disabilities.
- Worked in conjunction with traditional education classroom teachers to provide appropriate curriculum for students for the one to two hours per day they were in my classroom.
- Itinerant Position: Mornings at Dover Elementary, afternoons at Kenly Elementary

Certifications

State of Georgia
Early Childhood (P-3)
Middle Grades (4-8)
Subject Area Concentration: social science, reading, math, science and language arts
Learning Disabilities (p-12)
Special Ed (K-3) (4-8). Highly qualified in all five core subjects.
English for Speakers of Other Languages Endorsement & Gifted Endorsement

Special Skills

- **Computer**: Proficient with Accelerated Reader software and proprietary grade book software. Present class notes on PowerPoint and update to webpage on the school website.
- **Learning Focused Training**: Began training in 2004/2005 school year. Attended workshops and periodic review from administration. Continue to implement in my classroom.
- **Leadership**: Grade Level Chairman, 2001-2004. School Intermediate, conducted Math workshops for the school faculty on professional day. Passed administrative PRAXIS in 2008.
- **Clinical Education Training**: Completed May 1995. I have supervised seven final interns and numerous level one and two pre-interns.
- **Harry Wong Training**: Completed September 1999.
- **Up scaling Your Math Eisenhower Training 1, 2, 3 & 4**: Summers of 1999, 2000, 2001, 2002
- **Science**: Completed extensive training in life, earth, and physical science for the elementary and middle school student.