2018

Teachers' Perceptions of the Impact of a Remedial Math Program on Student Success

Wintter Naitalya Samuel
Walden University

Walden University

College of Education

This is to certify that the doctoral study by

Wintter Naitalya Samuel

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. Fatima Mansur, Committee Chairperson, Education Faculty
Dr. Mario Castro, Committee Member, Education Faculty
Dr. Paul Englesberg, University Reviewer, Education Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2018

Abstract

Teachers' Perceptions of the Impact of a Remedial Math Program on Student Success

by

Wintter Naitalya Samuel

MED, Georgia College and State University, 2007

BS, Albany State, 2004

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

April 2018

Abstract

Mathematics scores of middle school students are a major concern for educators, community leaders, parents, and other stakeholders. The purpose of this qualitative case study was to examine the perceptions of teachers regarding (a) Voyager Math (VM) as a tool to improve students' academic performance and (b) their ideas about its implementation. The theoretical foundation was guided by the theories of discovery learning, sociocultural theory, expectancy theory, and social constructivism. The research questions addressed how teachers in Grades 6-8 implemented the VM program and perceived mathematics learning effectiveness. Data collection included administrator and teacher interviews, classroom observations, and related documents of one middle school in a single southeastern school district. Twelve purposefully selected 6-8 grade mathematics teachers and 2 administrators participated in classroom observations and semistructured interviews at the research site to provide triangulated data. Data were recorded and transcribed, then analyzed and coded for themes. Teachers and administrators agreed that the VM program was an effective remedial mathematics program. The results revealed differences in remedial mathematics teaching strategies, how students are grouped according to mathematics scores, and an overall emphasis placed on mathematics throughout the school. The implications for social change include educational leaders implementing relevant professional development classes and understanding teachers' experiences.

Teachers' Perceptions of the Impact of a Remedial Math Program on Student Success

by

Wintter Naitalya Samuel

MED, Georgia College and State University, 2007

BS, Albany State, 2004

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

April 2018

Dedication

This study is dedicated to my mother Cheryl who has inspired me to reach beyond the stars because there is an entire universe awaiting my arrival. To my oldest son, CJ, you are the reason I have so much determination to continue when the road gets tough. To my husband, Charles, I am thankful for all the encouragement you have given me and I love you. To Keron and Jayden, your resilience and excitement helped me through this process. To my dad James, brother, and sisters thank you for teaching me how to survive. Thank you for the love and support.

Acknowledgements

A huge thank you to Demetria because without you I would have truly given up on this process. To Dr. Mansur, thank you for everything. You helped me overcome so many challenges and obstacles. Thank you Dr. Castro for sticking with me throughout the years and challenging me to become better. Dr. Mansur, Dr. Castro, and Dr. E. this would not be possible without your support and guidance.

Table of Contents

Section 1: The Problem

Introduction

For many years, much emphasis has been placed on closing the achievement gap. Yet it remains one of the most pressing educational policy challenges that states currently face (National Governors Association Center for Best Practices [NGACBP], 2013), as the gap remains wide. This achievement gap is true for African American and European American students, especially in mathematics. Although educational administrators and teachers are held accountable for preparing students for standardized assessments in mathematics (Bahr, 2008; Rosas & Campbell, 2010; Ottmar et al., 2013), academic frameworks that ensure students are progressing in the content areas, particularly in mathematics, are needed (Bahr, 2008; NGACBP, 2013). Additionally, educators must work to create invigorating, challenging, and engaging lessons that promote successful learning outcomes so that the achievement gap can be closed.

This section will cover the following topics: (a) legislation surrounding educational reform efforts, emphasizing closing the achievement gap; (b) student achievement in mathematics at the study site; (c) nature of the study, the research questions to be answered, the conceptual framework, significance of the study are included.

In January of 2002, President George W. Bush signed into law the No Child Left Behind Act (Monks, 2014). This legislation sought to determine not what schools were teaching or implementing, but how the schools performed (Monks, 2014). National mandates were established that demanded: (a) school accountability for student outcomes, (b) flexibility for state and local school districts, (c) emphasis on evidence-based education methods, and (d) alternative options for parents of children in failing schools (White, Loker, March, & Sockslager, 2009). In efforts to improve the academic achievement levels of American students, the NCLB Act required states to set the same performance targets for all students (Trolian & Fouts, 2011). In general, it made American school systems accountable for helping students improve test scores (Rowley & Wright, 2011). Shirvan (2009) and Trolian & Fouts (2011) also noted it made districts accountable for improving standardized assessment scores of at-risk and low-achieving students. Specifically, it mandated that states and school districts must improve the achievement level of low-performing students in the subject areas of mathematics and reading before 2014 (Shirvani, 2009; Trolian & Fouts, 2011).

Educational supporters challenged Congress to reform the NCLB Act (Meyer, 2013; Posey, 2014). This challenge resulted in President Obama granting states waivers in 2011, which offered more flexibility in complying with the burdensome requirements of the NCLB Act (Posey, 2014). The acceptance of waivers by states allowed the U.S. Department of Education to implement changes in education to include student performance on state assessments tied to teacher evaluation (Posey, 2014). States that accepted the initial waivers during the 2012-2013 school year were required to explain the initiatives that they implemented with the use of waiver to improve student achievement (Posey, 2014). The options included states working to narrow the achievement gap that exists between at-risk subgroups and regular education students in math and reading (McNeil, 2012). Closing this achievement gap will help to have all students at a proficient math and reading level by 2020 (McNeil, 2012). States that accepted the initial waiver were allowed an extension to the waiver but had to request it before the renewal deadline of February 21, 2014 (Posey, 2014). The state of Georgia implemented an achievement target in mathematics of 92% for all students, which would close the achievement gap by 2017 (House, 2013; McNeil, 2012). The waiver was accepted and a new statewide accountability system, the College and Career Ready Performance Index (CCRPI), was implemented. It measures the achievement of schools in Georgia on assessments and other indicators, and replaces AYP (Georgia Department of Education, 2014). The CCRPI report attempts to provide an easier representation to parents and the public on the performance of students (Georgia Department of Education, 2014).

In 2009, President Obama and his administration created the Federal grant program, Race to the Top (RT3), which required states to compete against other states in implementing new ideas to improve student achievement (Abbott, 2013; Lee & Wu, 2017; Tanner, 2013). RT3 is an extension of NCLB with the goal of preparing students for success and financially rewarding schools that meet the challenge of the program (Lee & Wu, 2017; Tanner, 2013). The RT3 and NCLB challenge educators to implement programs that improve achievement and close the achievement gap between students, especially among minorities (Abbott, 2013; Lee & Wu, 2017). Georgia was awarded

$400 million to help reform education (Badertscher & McWhirter, 2010). Twenty-six counties, including the county in which this study was conducted, were selected to participate in the RT3 initiative (Badertscher & McWhirter, 2010). The next section describes the specific problem this study was designed to address in the context of a south Georgia school.

Statement of the Problem

Continuous low student achievement levels in mathematics over the years have become a major concern of administrators, teachers, and all stakeholders across America (Robinson et al., 2014). Low proficiency levels in mathematics not only adversely affect student and school performance, they adversely affect society and the economy in general because mathematics is needed in virtually every career (Change the Equation, 2010; Robinson et al., 2014). Thus, educational administrators, teachers and other stakeholders are searching for strategies to reverse this downward trend. Educators in the school at the site of this study are no exception.

The school has experienced fluctuations in progress on student math achievement. For instance, the school experienced gains in mathematics in 2009 and 2010, resulting in AYP success. However, in 2011, the school did not make AYP in mathematics (Georgia Department of Education, 2011). Under the new accountability measurement, CCRPI, the school experienced gains in 2012, 2013, and 2014 with the CCRPI score, but failed to meet the academic performance target (Georgia Department of Education, 2014). The most points a school can receive with CCRPI is 110. The targeted schooled earned a score of 54.8 points with a score of 19.8 out of 50 in the category of achievement and the category of progress a score of 31.2 out of 40 (Governor's Office of Student Achievement, 2017). With regard to mathematics, the school's assessment scores in mathematics, on the CRCT, declined for two consecutive years and did not meet Performance Indicator 3 (percent of students meeting or exceeding in mathematics). The scores were 72.2% in 2012, 67.8% in 2013, and 66.4% in 2014 (Georgia Department of Education, 2014). Under the new student performance end of grade (EOG) assessment, Georgia Milestones, the school was graded with the following performance categories (a) beginning, (b) developing, (c) proficient, and (d) distinguished learner. The student must perform in the proficient and distinguished learner category to pass the assessment. During the 2014-2015 school year, 6.9% of students performed as proficient and 0.8% performed as distinguished learners while 2015-2016 school year 6.6% of students performed as proficient and 0.8% performed as distinguished learners (Governor's Office of Student Achievement, 2017). This decline resulted in school administrators, teachers, and other stakeholders agreeing that mathematics remediation was needed to help low-achieving students and would help in accomplishing the requirements of NCLB and RT3 (Governor’s Office of Student Achievement, 2017).

As a result, school personnel determined that mathematics remediation was needed to accomplish the goal of the NCLB and RT3 requirements (Governor’s Office of Student Achievement, 2017). This school implemented a Voyager Math (VM) remediation program for its low-achieving students. VM was implemented to help students improve their level of achievement in mathematics.

Nature of the Study

This study examined teachers' perceptions of the mathematics program VM. It is a math intervention system that helps students with basic skills and concepts in math. Cambium (2013) explained that the VM program integrates small group interventions with the instructional modules (Voyager Sopris Learning, 2014). This study used a qualitative approach to focus on the exploration of teachers' perceptions of the VM program, the benefits and limitations of the program, and the implementation of the program.

Qualitative data were collected in the form of transcribed interviews and field notes from observations of Vmath classroom instruction. The semi-structured interviews helped to understand teachers' perceptions. The interviews were conducted using a one-on-one session with each participant. Teachers were asked to meet at an agreed-upon time for a minimum of 20 minutes. The meetings were recorded and transcribed. The transcripts were read and coded to identify key themes. A detailed explanation the research method and design is provided in Section 3.

Research Question

The guiding research question that addressed the study was: How do teachers implement the VM program and perceive mathematics learning effectiveness? Two subquestions helped answer the guiding question: (a) What are teachers' perceptions about the effectiveness of the VM remediation program? (b) What is the teacher's role in the delivery of the VM remediation program?

Purpose of the Study

Student achievement among at-risk students has become a major concern for educators, community leaders, and parents. The purpose of this qualitative study was to examine the perceptions of teachers about VM, the selected math remediation program used at the middle school study site. Specifically, the purpose was to examine the perceptions of teachers regarding VM as a mathematics tool to improve academic performance and to review their ideas on its implementation. The findings are expected to contribute to existing research studies on teachers' perceptions of the use of remediation programs, such as VM, as a tool to improve mathematics skills.

Conceptual Framework

The conceptual framework for this study focuses on teachers' perceptions and how the behaviors and actions of teachers may influence student achievement in mathematics. Teachers' attitudes and behaviors not only influence curriculum and instruction; they influence the implementation of strategies that enhance student performance and achievement. Thus, to guide the research in this study, the following theories were used: (a) discovery learning theory, (b) sociocultural theory, (c) expectancy theory, and (d) social constructivist theory. These theories were selected because they explain perceptions that influence student learning and impact student academic achievement.

Discovery learning permits the teacher to help students discover learning via strategies such as scaffolding and other methods (Bruner, 1960). Teachers also encourage the students to become self-motivated and independent while working on challenging assignments (Alfieri, Brooks, Aldrich, & Tenenbaum, 2011). The idea of sociocultural theory relies on one's understanding, which develops from experiences and cultures (McBride, 2011). Teachers create lessons which evolve from their culture and understanding of the culture of their students. The expectancy theory is based on the premise that effort results in positive results. The student should expect that the assignment is achievable before considering putting forth the necessary effort. Teachers who focus on instruction and student learning believe the students have the ability to complete the assignment; otherwise, it may be that they do not understand the assignment. The social constructivist theory is based on the principle that students are actively engaged in the learning process and receive encouragement and support from teachers. Detailed information on the conceptual framework and the selected theories are included in Chapter 2.

Operational Definitions

Some terms included in the context of this study are fundamental but may not be readily understood. Thus, for purposes of clarity, they need to be defined. The selected terms and their corresponding definitions are listed below.

Adequate Yearly Progress: A measure which makes schools and districts accountable for the performance of all students under Title 1 (Klein, 2015).

Enrichment. A class that builds on the skills already learned. This class practices and extends the skills in mathematics or other subjects (Georgia Department of Education, 2011).

Assumptions

Three assumptions were made about the work conducted for this study: (a) the teachers were honest and would provide reliable data; (b) during the one-on-one interview, the participants would cooperate; (c) participants would present a positive attitude whereas self-efficacy affected their role in the remediation process.

Scope and Delimitations

The scope of this study was confined to one school in a school district in Georgia. Student's grade point averages, academic grades in math, and discipline reports were not considered in this study. Not all participants had the same math experiences before middle school.

Limitations

This study was limited to one technology program, VM, which was used to support the strengths and weaknesses of low-achieving students in Grades 6-8. Since this study was limited to student performance in mathematics, the findings cannot be generalized to other subjects. Data were collected from teachers of one school in one Georgia school district, and the sample size was limited to 12 teachers and two administrators. Two classroom observations were observed and data was collected from the observations. There was no detailed information about the participants, teachers or administrators working experiences and how their experiences may influence their opinions. The study was also limited to five lesson plans and six VM student progress reports. Data were collected for the period of one academic school year.

Significance of the Study

This study was significant for six reasons. (a) Findings from this study could contribute significantly not only to educators at the targeted site and school district at large but also to other school districts utilizing math remediation programs. (b) The findings could aid middle school teachers and future educators in addressing emerging concerns about low student performance in mathematics. (c) They could also aid middle school educators in identifying, reducing or alleviating student deficiencies in mathematics and provide information that would help fill gaps identified in the existing literature. (d) The findings could benefit students because teachers would be able to draw conclusions and provide learning environments that would meet the needs of individual students. (e) The noted benefits and patterns established could also provide community leaders with information to help them understand how struggling students learn mathematics. (f) Most importantly, the nation benefits when students perform well in school because they are then equipped with the necessary skills to be productive citizens and to meet the needs of the workforce in a modern and global society.

Summary

The academic achievement of students is an important issue in a global society. Thus, it is critical that students reach proficiency in [name the subject or subjects]. Levels of achievement can determine if students are successful in their career choices. This study focused on the perceptions of teachers about a mathematics remediation program, VM, which the site chose to help improve the success of its low-performing students. The purpose of this qualitative study was to explore teachers' perceptions of the VM remediation program and to take a close look at teachers' perceptions of the benefits and limitations of the program, ideas on the implementation of the program, and patterns in its effectiveness.

A review of existing literature on student achievement and the factors that influence student achievement in general and mathematics, in particular, is presented in Chapter 2. Section 3 is used to provide the details about the methodology that was used in the investigation. The research design and data collection techniques are described in Section 3. Lastly, Sections 4 and 5 are used to present, respectively, the results of the study, and the conclusion and recommendations based on the findings.

Section 2: Literature Review

Introduction

Many American students are falling below average in mathematics, especially in middle school, a critical grade level in the teaching–learning process (Legewie & DiPrete, 2012; Cheryan, 2012). Therefore, school administrators and teachers are in search of strategies to reverse the downward trend. The purpose of this qualitative study was to examine the perceptions of teachers about the mathematics remediation program implemented at the study site along with the benefits, limitations, and implementation of the program. One guiding question, with two subquestions, was addressed.

Legewie and DiPrete (2012) and Cheryan (2012) suggested that mathematics achievement in elementary and secondary school may help determined one’s success in post-secondary education, math-related careers, and the work force. Because of the NCLB Act, many schools have implemented several initiatives to help improve student achievement and motivation (NGACBPNGACBP, 2013). Student motivation and achievement toward mathematics involve factors such as ability, motivation, positive teacher interactions, and home factors (Cheryan, 2012; Schwery, Hulac, & Schweinle (2016); Naizer, Hawthorne, & Henley, 2014). Burton (2012), Fulmer and Turner (2014), and Zwiep and Benken, (2013) proposed that educators’ perceptions of the curriculum and content, and their expectations of students may affect student performance.

Topics researched to aid in answering the questions established are included in this study. This section covers the following topics: (a) achievement gaps among American students are presented generally and specifically by race and gender, (b) remediation is defined and the purpose is provided, (c) a description on how students have been remediated in the educational system (d) research related to factors that impact student success in the classroom and their career choices, (e) the importance of student and teacher preparation, the impact of mathematics anxiety on student performance, research designs, and methodologies, (f) VM is described and research related to technology that highlights the success of the program, (g) a summary of key points that will be made to provide the rationale for the study.

Literature Search Strategy

The subjects of the literature review were as follows: academic achievement, remediation, gender gap, and the factors that influence student achievement. The review includes summaries of the literature that validate the study's framework. A search of databases in the Walden University Library included SAGE Journals, Education Source, Academic Search Complete, Education Research Complete, and ERIC. The government websites were used to obtain information and copies of studies from the Department of Education and NGACBP. The keywords used in searching online materials, both alone and in combination, were as follows: *teacher, perceptions, mathematics, achievement, gender gap, remediation, middle school, cognitive theory, constructivism, online, remediation, technology,* and *achievement*.

Literature on the Conceptual Framework

The theory of discovery learning has been linked to the teaching and learning of mathematics (Bruner, 1960). Discovery learning provides opportunities for the students to use prior knowledge to discover the target information for learning.

In'am & Hajar (2017) suggested that teachers should teach students how to use their critical thinking skills to become discovery learners and investigators. Janssen, Westbroek, and van Driel (2014) asserted that students should be given support to aid in developing the necessary skills that will inspire them to be successful in the classroom. Bruner (2006) contended that the teacher should teach so that the student gains information and skills to use in future learning. Mukherjee (2015) discussed discovery learning as allowing students to discover the learning by asking questions, evaluating information, and thinking critically. The student and teacher should share the role of teaching and learning to assure a balance of "cognitive functioning" (Bruner, 1960, p. 612). When the teacher removes manipulation, the student has an opportunity to discover learning independently. For example, Bruner described a young boy who used critical thinking skills to discover the learning of mathematics while playing with snail shells. The young boy learned that, through discovery, he could find a new way to complete a mathematics task and was able to apply his learning of mathematics to another situation (Bruner, 1960). Bruner and In'am and Hajar (2017) emphasized that teachers should implement scaffolding and critical thinking skills, so students can apply their prior knowledge to any task.

The idea of sociocultural theory relies on an individual's understanding and cognition that develops from experiences and cultures (McBride, 2011). Vygotsky's sociocultural theory explained that an individuals' culture and history may influence their teaching and learning (Allahyar & Nazari, 2012; Mansour, 2013). Vygotsky's theory connects human behavior to critical thinking skills that may be used in the classroom (Cicconi, 2014; Petrova, 2013). What teachers observe in the classroom is linked to their beliefs and values to create a perception or idea about a phenomenon. When determining the perceptions of teachers in education, researchers must understand the influences of the teachers who develop curriculum and instruction. Mansour (2013) suggested that teachers' perceptions are influenced by pedagogy training, historical and societal experiences, and other educational influences such as colleagues. The students' behavior, teacher beliefs and values, and educational knowledge impact teachers' perceptions.

Teacher perception is created when teachers develop an awareness of the events or situations that develop in the classroom, and they are connected to the cognitive functioning of the teacher. Teachers' experiences in the classroom with student behaviors and pedagogical knowledge create an idea of what may or may not occur and affect teacher behavior and thoughts (Allahyar & Nazari, 2012; Barak, 2014; Wang, 2012). Teachers' behaviors affect student performance and beliefs in the classroom because of past understandings and experiences (Robinson-Cimpian, Lubienski, Ganley,& Coput-Gencturk, 2014). Allahyar & Nazari (2012) explained that to understand the perception of teachers in the classroom regarding instruction, pedagogy, attitudes, and beliefs toward students, the teachers' experience, cultural experiences, and cognitive functioning must be observed.

The perception of students is important and influential in the educational process (Allahyar & Nazari, 2012; Firmender, Gavin, & McCoach, 2014). Jansen and Bartell (2013) asserted student achievement and performance play a major role in how teachers perceive activities and events that occur in the educational setting. Teacher perception may influence the student's learning and achievement in mathematics. For example, some teachers continue to use traditional methods of teaching instead of using mobile devices that improve higher level and abstract thinking in the classroom (Barak, 2014).

According to Barak (2014), teacher perception of the use and implementation of technology in the classroom influences student achievement and performance. The traditional methods of teaching such as lectures and note-taking may not permit students to take an exploratory approach to learning, actively participate, or for students to take responsibility for their learning. The perceptions teachers hold about instruction and curriculum may be influenced by standardized assessment or student behaviors.

Many teachers' instruction may not evolve with the implementation of new ideas (Barak, 2014). For example, they may not offer students challenging or higher-level instruction because they believe the students are unmotivated and do not have the ability to complete the task and student performance may harm student achievement on standardized assessments (Fulmer & Turner, 2014). The perceptions teachers have of students indicate their expectations and may result in the development of positive or negative ideas about the students (Allahyar & Nazari, 2012). Thus, student expectations, behaviors, and performances must be discussed when discussing teachers' perceptions.

Student motivation and engagement in the classroom may be influenced by teachers' perceptions and attitudes (Wang, 2012). The attitudes teachers display toward students impact their learning and motivation in the classroom. Classroom instruction that supports student independence and intrinsic motivation builds competence in the mathematics classroom (Senko & Hulleman, 2013).

To understand teachers' perceptions, I will explore student achievement and performance through the expectancy theory. The expectancy theory is a belief that an individual puts forth effort that will produce a positive outcome useful to the individual (Lambright, 2010; Legewie & DiPrete, 2012). The individual believes the task is achievable to put forth the effort (Robinson-Cimpian et al., 2014). A student's decision to take advanced mathematics courses will be determined by his or her expectation to be successful in the class (Andersen & Ward, 2014). Teacher support is important for the student to gain motivation and competence.

Wang (2012) explained that the support provided by teachers may impact the student's competence and influence his or her future academic goals. Wang (2012) suggested that student achievement in mathematics will influence whether students take advanced math courses in the future. Minority students may not believe mathematic careers are suited for them because of the low number of minorities in those career fields (Anderson & Ward, 2014). Research has revealed that girls are more likely to perform lower than boys on mathematical examinations because of the beliefs they have about mathematics (Ross, Scott, & Bruce, 2012). Wang (2012) reported that girls are expected to have low performance in mathematics, although they need more extrinsic motivation.

Self-efficacy, an important quality related to expectations, impacts student success and achievement. It is the degree of motivation or confidence one has about himself or herself (Orange & Murakami-Ramalho, 2013). When students who have low self-efficacy are presented with challenging assignments, they need a supporter to provide encouragement.

Self-efficacy stereotype threat is seen in students who do not take challenging math courses or avoid STEM majors or careers (Schwery et al., 2016). This threat has been seen in peer culture where boys develop anti-school behaviors and attitudes (Legewie & DiPrete, 2012). This behavior, which has been seen more often in low quality schools, results in underperformance in boys and disruptive behaviors in the classroom (Legewie & DiPrete, 2012; Orange & Murakami-Ramalho, 2013). Research suggested that girls perform lower on standardized assessment than boys. This results in girls needing immediate feedback and motivation on assignments to help build the confidence needed to continue working toward mastery in math (Legewie & DiPrete, 2012; Robinson-Cimpian et al., 2014; Schwery et al., 2016).

If students are not provided the necessary support, their performance in the classroom, as well as achievement on standardized assessments, may be below average (Crosnoe et al., 2010; Fulmer & Turner, 2014). However, students who have high self-efficacy in mathematics seek challenging assignments. They are likely to take advanced mathematic courses or pursue mathematic career choices (Andersen & Ward, 2014). They possess confidence and motivation.

The social constructivist theory includes instructional goals that encourage and support learners through coaching, modeling, scaffolding, or collaborative work to develop their own learning experience (Schreiber & Valle, 2013). Collaboration allows students to gain a deeper understanding from other student's perspectives (Ahn, Ingham, & Mendez, 2016). Stearns (2017) found that students were able to use conversations with other students to seek clarity and knowledge for their learning. Flint (2015) reported that student experiences can contribute to the classroom learning environment impacting peer learning. Since social learning supports the remediation approach of guiding students to their academic potential, the problem of low academic achievement in mathematics relies on remediation to reinforce the concepts so teachers and support teachers can guide students to understanding and learning.

Literature Review Related to Key Variables and Concepts

Gaps in Achievement

The achievement gap between students has been an important issue in America as well as countries throughout the world. Academic achievement is an important issue for teachers, parents, and students in the United States (Reardon, Greenberg, Kalogrides, Shores, & Valentino, 2012). Many students are not meeting standards as set by the NCLB Act (Peterson & Kaplan, 2013). National Assessment of Educational Progress (NAEP) reports 65% of the United States' 8th graders were not proficient in mathematics in 2011, which leaves only 35% being proficient (Peterson & Kaplan, 2013). This percentage is of importance because it has implications for the percentage of students who enter high school and become prepared for college. Moller et al. (2013) reports the importance of mathematics in technological careers and the daily usage of mathematical concepts. Mathematics preparation is important for longitudinal accomplishment as twenty-first century citizens and workers (Moller et al., 2013; Roschelle, Feng, Murphy, & Mason, 2013). Thus, early preparation improves the chances of students being successful in college and developing high paying careers.

Hansen and Gonzalez (2014) stated that when compared to other academically challenging countries, American students were performing academically below other students in mathematics. Ottmar et al. (2013) reported that United States schools still performing below other countries although there has been an increase in mathematics achievement. Zhang, Trussell, Gallegos, and Asam (2015) stated that the mathematics performance of students in the K-12 educational system indicates a need to improve mathematical ability. Zhang et al. (2015) reported that approximately 10% of students in Grades 1-6 are successful in solving problems found in the number and operations mathematics domain.

The NCLB Act was established to close the achievement gap between high and low performing students (Goodman, 2014). The focus was placed on low-achieving students by requiring schools to increase student achievement. To meet this goal of student achievement schools were tasked to experience annual progress for their low performing students in percentages between 5% and 7% (Shirvani, 2009). A major feature of NCLB required student assessments each year on standardized tests and results reported to the public in various ways (Goodman, 2014; Rosas & Campbell, 2010; Monks, 2014, Sun, Saultz, & Ye, 2016; Trolian & Fouts, 2011).

To monitor how students are performing nationwide, educators and policyholders rely on results of the National Assessment of Educational Progress (NAEP) assessments. The NAEP is also known as the Nation's Report Card, which includes standardized mathematics and reading assessments administered to a random sample of students across the country (Rosas & Campbell, 2010; White et al., 2009). The NAEP assessments for mathematics measure student achievement in Grades 4, 8, and 12. This instrument is also the only ongoing assessment of mathematics achievement in the United States (Goodson-Espy et al., 2014; Rosas & Campbell, 2010).

The Nation's Report Card (as cited in Gottfried, Marcoulides, Gottfried, & Oliver, 2013) revealed students in Grades 4, 8 and 12 performed below proficiency. Only "40% fourth, 35% eighth, and 26% 12th graders" (p. 68) met grade level proficiency. Thus, American students must improve their mathematics skills. Specific reasons are listed below.

1. The United States falls behind many countries in mathematics capabilities, including Japan, Korea, and Canada (Peterson, Woessmann, Hanushek, & Lastra-Anadon, 2011; Vigdor, 2013).

2. Students cannot move to the next academic level in school if they do not achieve proficiency level.
3. Students with high standardized test scores make more money in careers. There is a disparity in skill level among students entering school because many enter with various mathematical abilities (Simms, 2012; Smith, Cobb, Farran, Cordray, Munter, & Dunn, 2010). Some enter with some knowledge of math facts while many are not able to perform simple arithmetic, such as counting objects (Simms, 2012; Smith, Cobb, Farran, Cordray, Munter, & Dunn, 2010). The difference in skill levels, such as counting and reciting the alphabet, can be visible as early as kindergarten (Robinson-Cimpian et al., 2014). These differences can widen the achievement gap about one-fourth of a standard deviation each year in regard to gender and race (Robinson-Cimpian et al., 2014). The gap in achievement tends to widen as students transition from elementary to middle school (Cheema & Galluzzo, 2013; Legewie & DiPrete, 2012). These gaps are attributed to factors such as attendance, economic status, and parental involvement (Nidich et al., 2011; Schwery et al., 2016; Smith, Cobb, Farran, Cordray, Munter, & Dunn, 2010).

Student achievement and race. The achievement gap that educators across the nation are trying hard to close is an important issue. Cheema and Galluzzo, (2013) reported that race is an important factor in math achievement. *A Nation at Risk,* a report written almost 35 years ago, explained that the United States lagged behind many high achieving countries and explained that many factors that affected and continue to affect the U.S. Low test scores are one factor (Ornstein, 2010). Hines and Kritsonis (2011) stated that the gap is the result of racial disparities in student achievement on standardized assessments. When comparing the achievement gap in relationship to race, European American students outperform African-American and Hispanic students in the United States. (Cheema & Galluzzo, 2013; Hines & Kritsonis, 2011). The achievement gap between minorities and their European American peers continues to exist, although minorities are represented in higher levels or advanced placement math classes (Cheema & Galluzzo, 2013; Riegle-Crumb & Grodsky, 2010). Findings with regards to racial achievement report that European Americans outperform Hispanics and Hispanics outperform African Americans (Cheema & Galluzzo, 2013; Hines & Kritsonis, 2011).

When reviewing scores extracted from the 2013 Nation’s Report Card, the NAEP reported that Grades 4, 8, and 12 on students in the United States assessed in mathematics. The NAEP scores over a four-year test period (2003-2007) revealed a maximum math increase of less than 3% for minority students, which is little progress in closing the gap between minorities and European Americans in over 90,000 public schools (Shirvani, 2009). The Council of the Great City Schools (2010) reported that achievement of African-American males in Grades four and eight on the NAEP assessments.

The NAEP reported that fourth-grade African-American males’ achievement remained consistent between 2011 and 2013; however, European American males’ achievement increased one point between 2011 and 2013 on the mathematics achievement assessment (NAEP, 2013). Regardless of the academic gain, fourth grade African-American males continued to remain around 25% to 26% percent below European American male students who performed at proficient levels (NAEP, 2013). At the Eighth grade level, African-American males who met the standard increased 1% over a 2-year period (2011-2013) and 26% between 1990 and 2013. Conversely, European American males improved from 26% on the mathematics assessment within 23 years (1990-2013), which showed growth for African-American males but still left them at least 31% lower than European American males (NAEP, 2013).

The Nation's Report Card reported that fourth and eighth grade students had experienced growth in mathematics. However, females have shown the most growth in these grades, with males remaining consistent in performance (NAEP, 2013). On the contrary, when reviewing students during the 2013 testing year, male students have a higher percent of students who are reaching or exceeding proficiency (NAEP, 2013).

The Nation's Report Card (NAEP, 2013) reported that mathematics score gaps in 2013 as 14% of African-American students meeting proficiency in mathematics and 45% of European American students meeting proficiency. Hispanic students were in the middle, with 21% at or above proficiency (NAEP, 2013). The National Center for Educational Statistics (NCES) reported that 68% of Georgia's students met the standard, which remained consistent from 2011 (NCES, 2013). The National Center for Educational Statistics (NCES) (2013) reported that Georgia students had mathematics score gaps in 2013 with African-American students being 29 points lower than European American students and Hispanic students only 16 points lower than European American students.

Riegle-Crumb and Grodsky (2010) suggested that if the United States wants to produce highly qualified workers then there should be an improvement in the educational knowledge and performance expectations for all youths. Ornstein (2010) reported that the McKinsey consulting firm discovered the decline in product output and skilled workers was because of achievement gaps in mathematics and science. For example, if the United States had improved student achievement by closing the gap in mathematics and science from 1983 to 1998 and raised its performance to the level of top performing countries, the gross domestic product (GDP) would have been tremendously higher (Ornstein, 2010).

Gender gap. There are several explanations concerning the male and female gap in subjects such as mathematics in the classroom. Sociocultural factors can be used to show students how to think and learn in a scholastic setting (Voyer & Voyer, 2014). These factors can threaten an individual's knowledge and performance when he or she is not expected to perform well in subjects. An individual's expectations of a task and one's behavior can predict how well he or she will value that task (Cheema & Galluzzo, 2013; Voyer &Voyer, 2014).

Ross, Scott, and Bruce (2012) referred to the gender gap as one gender having an "advantage" over the other in a subject (p. 278). It can be considered one of the most common gaps that appears during elementary school affecting student achievement in mathematics.

Robinson-Cimpian et al. (2014) suggested that the gender gap does not exist at the beginning of kindergarten; rather, it develops based on the school experiences of each boy and girl. Cimpian et al. (2016) reported the gap emerging in the first 3 to 4 years of school learning. Niederle and Vesterlund (2010) claimed that boys are more competitive than girls, and they learn better when they are receiving a grade on an assignment. Girls, however, perform best when they are working in cooperative learning groups on math assignments.

Regardless of the differences, attitudes toward mathematics are affected during the middle school years (Naizer et al., 2014). During the junior high or middle school years, this gap seems very minute, but by the end of high school, boys are leading girls in mathematics, which may have an impact on college major and career decisions (Cheema & Galluzzo, 2013). Ellison and Swanson (2010) reported a wider gender gap with higher achieving students.

Girls are underrepresented in higher-level math courses as well as STEM fields and careers that are important to our economy (Ellison & Swanson, 2010; Schwery et al., 2016). Similarly, as females progress in school their confidence in math tends to diminish and the success that they once saw in elementary and middle school declines (Naizer et al., 2014). The achievement gap tends to increase with girls falling behind due to low motivation and peer pressure (Cheema & Galluzzo, 2013; Schwery et al., 2016).

Many girls tend to shy away from mathematics courses because they do not feel they may have the ability to perform the tasks. Research suggests girls excel on assessments that are not quantitative. In contrast, boys excel on quantitative assessments because of their development of spatial skills (Hansen & Jones, 2011; Niederle & Vesterlund, 2010). Teacher perception continues to play a significant role in how boys and girls feel toward math. Robinson et al. (2014) asserted teachers have higher expectations for boys because of the perception boys are naturally talented in mathematics. Cimpian et al. (2016) found evidence that when both genders' behavior and performance are similar teachers give girls lower scores than boys. Thus, believing that girls must work harder than boys for mathematics achievement (Cimpian et al., 2016). Robinson-Cimpian et al. (2014) cited two studies, Study A and Study B. Study A confirmed girls put forth more effort than boys, although boys have the mathematical ability to be successful.

Study B suggested that teachers believe girls outperform boys in mathematics, as they have higher grades in math, even when data reveal boys are more successful (Robinson-Cimpian et al., 2014). During the elementary and middle years, girls and boys may receive different messages from teachers or parents about math performance, which affects their confidence and feeling of competency in mathematics (Legewie & DiPrete, 2012; Schwery et al., 2016). Stereotypes such as mathematics being a masculine subject and girls lacking the ability to be successful in mathematics results in girls believing they will not perform successfully in mathematics (Cheryan, 2011; Ross, Bruce, & Scott, 2012).

Although the gender gap in mathematics achievement has decreased, stereotypes, as well as differences and similarities, continue to exist (Ross, Scott, Bruce, 2012). Stereotypes such as girls perform behind their male peers and girls are not successful in mathematics has narrowed over the years (Ross, Scott, & Bruce, 2012; Cimpian et al., 2016). Cheryan (2011) asserted that a gender gap does not exist because females perform better than males on assessments and receive better grades in math classes. Rather it is due to the parallel success of boys and girls in mathematics, females continue to be underrepresented in STEM or mathematics career fields (Cheryan, 2011; Cimpian et al., 2016).

Remediation

Many schools are implementing programs to help their low-achieving students improve mathematics performance. Implementing remedial interventions to improve achievement provides the low-achieving student more opportunities to achieve, even when early prevention measures have been instituted (Fuchs et al., 2010). Mathematics remediation is intended to provide a ladder of basic skills that lead up to the minimum of math competency of knowledge (Bahr, 2007).

Bahr (2010) defined remediation as a remedy that seeks to restore opportunity to those who may be "relegated to meager wages, poor working conditions, and other consequences of socioeconomic marginalization" (p. 209). The intention of remediation, as discussed by Bahr (2008; 2010), is to provide a balance between the advantaged and disadvantaged groups. Additionally, the students who consist of these groups would benefit from remediation and eventually become college attainment participants. Preparing students for advanced math courses will ensure they are seeking competitive careers in the global workforce as well as helping to improve the U.S. economy.

Researchers suggest that mathematics is the subject which requires many students to receive the most assistance in remediation (Adelman, 2004; Bahr, 2008; Bahr, 2010). As a resolution, many states are developing curricula that are aligned from elementary to high school (Howell, 2011; Hoyt & Sorensen, 2001).

Oregon implemented a relationship between secondary and postsecondary institutions to help bridge the transition to post-secondary education (Howell, 2011). Other states followed by implementing dual enrollment between high school and college (Howell, 2011; Hoyt & Sorensen, 2001). Dual enrollment permits students to take classes at a postsecondary institution while completing high school. This relationship has been effective in providing minorities opportunities to take college courses and pursue postsecondary education (Howell, 2011). Postsecondary institutions provide feedback to secondary schools about their previous students, which enables them to adjust or improve the curricula, if necessary, for upcoming students (Hoyt & Sorensen, 2001).

Many schools and colleges are working to develop programs to provide opportunities for the students to experience college life (Howell, 2011). The middle school level is of concern for educators because this is the level that many detrimental factors affect student lives (Nidich et al., 2011). Because of the concern that develops during this educational level, an urban middle school attempted a peculiar intervention that remediated the students in math.

The intervention involved mediation that proved to increase the academic achievement of low performing students (Elder et al., 2011; Nidich et al., 2011). This form of mediation involved settling down the mind and experiencing “a state of restful alertness” (Nidich et al., 2011, p. 558). This program was implemented by successfully showing the students how to meditate and allowing them time throughout the day to practice this intervention (Elder et al., 2011; Nidich et al., 2011).

Forty-one percent of the students who used this approach showed significant gains in mathematics (Nidich et al., 2011). Although this is not a program that helps recall or reteach information, it allows the student to repair or improve an area that will help them move toward academic success. “The transcendental meditation program increases the electroencephalographic brain integration and coherence that is responsible for higher order processing” and allows the student to use this higher order processing to improve on mathematics skills (Nidich et al., 2011, p. 558). Young et al. (2012) suggested teachers should connect mathematics to students’ prior knowledge and use real world scenarios to make learning meaningful and significant.

Factors that Influence Student Achievement

When students transition to middle school and high school, there is a decrease in academic achievement due to several factors that may affect the student’s life. Middle school is a period in an adolescent's life where his or her physical and cognitive abilities are undergoing constant changes (Cimpian et al., 2016). This developmental stage represents a critical period for life skills development in children (Cimpian et al., & Moller et al., 2013). This is a period when peer pressure and a sense of belonging are of importance. These students also are at risk for a decline in achievement (Mowrey & Farran, 2016; Nidich et al., 2011).

Students' gender, race, behavior, ability level, and attitudes account for the student differences seen in the education system (Burton, 2014; Ross, Scott, &Bruce, 2012). As students enter the educational system and transition through the levels, their academic attitudes about school, subjects, and teachers are developed. Many students can overcome many obstacles, but some students are not able to move past factors that may influence their ability to be successful.

Student Preparation

Being prepared is an important asset that can prepare students for success in the academics and in a career. Students enter the education system at different skill levels. Many students receive some form of instruction in daycare centers, at home, or at preschool. Parents who value education tend to prepare their children by introducing concepts and imparting knowledge early on, before they enter the school system, as they are their children's first teacher (Crosnoe et al., 2010). These early learning experiences give the students an academic edge over other students who may not have received any type academic instruction before entering school (Crosnoe et al., 2010). Hansen and

Jones (2011) agreed that early learning at home or in a structured environment prepares students and widens the gap between prepared and non-prepared students.

Home is a child's first environment of learning. This environment can determine how successful a child should or should not be in academics. Family influences on the education of their children have been investigated and have been identified as factors which continue to operate throughout the early school years and can explain a great deal of the achievement gap between children in school (Armor, Duck, & University of Arkansas, 2007). Hansen and Jones (2011) discussed the family's decision of who should be educated based on the family's cultural belief. Many cultures have customs or standards that forbid a woman to work outside of the home; thus, education should not be wasted on a girl (Hansen & Jones, 2011). This idea has caused many families to only focus on the boys because girls are needed at home.

Many children use media as models of how life should be; therefore, the media should begin to project more images to support mathematics as well as other STEM careers (Cheryan, 2011). Ross, Scott, and Bruce (2012) explained that when children, especially girls, do not see women in STEM career fields as engineers, scientists, or mathematicians, they may feel those jobs are not for women. Cimpian et al. (2016) stated that girls are underrepresented in mathematics fields which creates a gender imbalance in STEM careers. Many adolescents see images on television that influence their ideas about individuals who are portrayed to have successful careers in STEM. However, students may feel intimidated because they may not see many individuals of who this can identify with that have prestigious positions in STEM (Cheryan, 2011; Cimpian et al., 2016, & Ross, Scott, & Bruce, 2012).

Children enter school with different achievement levels of exposure. Opitz et al. (2017) reported student deficiencies in basic mathematic concepts began during the early years of school in Germany. Research reported that girl's early learning may influence their perception of mathematics and their ability level (Cimpian et al., 2016). These levels of exposure result in a class placement where the more advanced student will be assigned to a classroom with more advanced learners, and the less advanced student will be placed in a class where there are more students with lower achievement levels of exposure (Crosnoe et al., 2010). The advanced class may have higher expectations for students and more rigorous lessons, which will move the advanced student to an increased level of learning. These differences may widen the academic gap and continue as the student transitions from one grade level to the next (Crosnoe et al., 2010).

Many students who have lower achievement levels of exposure receive a curriculum that is less advanced (Crosnoe et al., 2010). If students are placed into classes regardless of their academic levels, teachers can differentiate the lessons, considering the different achievement levels, and all students will be exposed to the same lesson. Otherwise, students will continue to fall behind if they are constantly differentiated by skill level (Crosnoe et al., 2010; Robinson-Cimpian et al., 2014).

Teachers' Perceptions

Teachers' perceptions about educational programs can influence how well the program is implemented. Firmender, Gavin, and McCoach (2014) asserted that the strategies and instructional practices that teachers use in the classroom influence student learning. The task of a classroom teacher is to identify student deficiencies and prepare lessons that will help fill in the learning gap between students who are on target and students who have not yet reached their full potential (Crosnoe et al., 2010). This task may be difficult for teachers if they are not familiar with the program (Burton, 2012; Fulmer & Turner, 2014).

Teachers reported that their self-efficacy prevented them from implementing new strategies in the mathematics classroom due to lack of training (Burton, 2012; Fulmer & Turner, 2014). The ideas teachers present to their students in the mathematics classroom are based on their understanding and knowledge of the content, which can impact a student's achievement in the subject (Akpan, & Saunders, 2017; Burton, 2012; Fulmer & Turner, 2014; Zwiep & Benken, 2013). Teacher competency in mathematics classrooms has been one of many issues that the NCLB Act attempted to improve (Rosas & Campbell, 2010).

Rosas and Campbell (2010) reported that many schools in the United States have mathematics teachers who lack a major or minor in math education. For example, Rosas and Campbell (2010) reported "61% of middle school students were taught by teachers who did not have a minor in mathematics or a related field" (p. 103). This issue results in many students not being instructed by a highly qualified teacher, which may adversely impact their performance in the classroom and achievement on standardized assessments (Rosas & Campell, 2010).

When teachers assigned to teach math do not have a solid understanding of mathematics, they are not preparing students to solve mathematical problems beyond the classroom (Burton, 2012; Zwiep & Benken, 2013). Rather, they are simply teaching how to memorize rules and how to use an abstract way of thinking. Furthermore, the students are not learning how to apply rules to the real world or non-math classrooms, but rather how to pass the class. Teachers' perception of the mathematics should be positive; this may help students to value math and to ensure success in the classroom (Zwiep & Benken, 2013). Teacher attitudes often contribute to student success in any subject.

With the pressures of high stakes testing and daily challenges of the classroom, many teachers may feel bound by the textbook or may not want to implement new strategies into the classroom (Burton, 2012; Fulmer & Turner, 2014). This lack of mathematic content may negatively impact students' learning as early as elementary school because of teachers' limited understanding (Burton, 2014). Zwiep and Benken (2013) explained that the mathematics curriculum requires teachers "that promote and integrate, a connected view of content" (p. 300) which will allow them to connect these concepts to real world experiences and non-math applications. Teachers need professional development classes that will challenge their content knowledge to help bridge their understanding with their instruction (Burton, 2014; Zwiep & Benken, 2013).

Zwiep and Benken (2013) conducted a study where teachers participated in professional development classes that focused on content knowledge in the mathematics and science classroom. Zwiep and Benken (2013) discovered many mathematics teachers' perceptions of what they understood as mathematics learners are strengthened after participating in a professional development class.

Teacher expectations of their students' performance have a great impact on teacher instruction as well as student achievement. Many teachers may feel their students are not motivated and unable to complete challenging assignments. This leads them to use basic teaching strategies and not incorporate higher-level thinking strategies into the lessons (Fulmer & Turner, 2014).

Fulmer and Turner (2014) reported that although teachers desire to incorporate higher-level thinking strategies and challenging instruction into the lessons, they were cautious of the motivation and ability that students display in the classroom. This belief in student motivation may result in wasted time in the classroom, which may impact student achievement on standardized assessments (Fulmer & Turner, 2014; Zwiep & Benken, 2013). This expectation of student motivation and interest can be related to student autonomy and independence (Fulmer & Turner, 2014; Zwiep & Benken, 2013).

Many students may not believe they are able to complete the assignments and thus rely heavily on their teachers for support. Teachers must be competent to teach challenging assignments and support students when they feel there is a lack of motivation, interest, or effort. For example, a math teacher reported that many of her students relied on others to complete assignments or would constantly ask questions to help solve a problem. The mathematics teacher increased the student autonomy and independence by requiring them to think on their own to achieve the assignment (Fulmer & Turner, 2014). Less guidance will be needed in mathematics classes if teachers increase independence in mathematics by providing challenging and higher-level thinking questions that require open ended response answers (Fulmer & Turner, 2014; Zwiep & Benken, 2013).

Mathematics Anxiety

Another problem that has been shown to have a negative impact on achievement in mathematics is mathematics anxiety. The negative attitude toward mathematics develops as young as elementary school and continues to grow over the years (Finlayson, 2014). Finlayson (2014) informed that children develop an idea toward mathematics as they enter the classroom environment and begin to interact with others and their environments. These ideas are often turned into negative experiences as early as elementary school and are related to achievement in math (Beilock & Maloney, 2015; Finlayson, 2014; Ramirez, Gunderson, Levine, & Beilock, 2013).

Finlayson (2014) defined mathematics anxiety as a feeling one experiences that he or she will not be able to perform efficiently in situations where mathematics will be used. Finlayson (2014) also described anxiety as a feeling of tension that is related to mathematics. Math anxiety can result in poor cognitive and reasoning thinking when having to complete a task (Beilock &. Maloney, 2015).

The fear of mathematics develops from the anticipation of getting the answers wrong and fear of failure (Beilock & Maloney, 2015; Finlayson, 2014; Ramirez et al., 2013). Ramirez et al. (2013) stated this fear impacts the achievement and performance of students in the classroom. When elementary students begin school, the ideas they developed about mathematics are replaced with other factors such as time testing, teaching from the textbooks that may suggest only one way to solve a problem, and the idea of failure (Beilock & Maloney, 2015; Ramirez et al., 2013).

According to Burton (2012), students began to have negative interactions as early as elementary school because they are taught how to solve a problem for the answer rather than how to understand and interpret the concepts in mathematics. Burton indicated that the teacher's role in the classroom may impact a student's classroom experience. Teacher behavior in the classroom may be negative or positive, but teachers who do not meet the student's needs or present hostile environments contribute to student anxiety of mathematics. These factors not only affect student confidence, but also change student ideas of the importance of math in the classroom, which impacts student performance.

Beilock and Maloney (2015) described mathematical anxiety as a fear that may be experienced in the classroom and while completing daily tasks. Daily tasks can include healthcare workers calculating medication or financial planning. Math anxiety appears as early as elementary school and increases until high school. It can influence a student's learning and understanding of mathematics (Young &Young, 2016). Students who suffer with mathematics anxiety will try to avoid tasks related to mathematics (Beilock & Maloney, 2015; Young & Young, 2016). This avoidance may result in negative consequences such as avoiding math and STEM careers, poor math performance, and poor math attitudes (Beilock & Maloney, 2015). However, students can be taught how to manage their behavior and attitudes to improve basic mathematics skills. Strategies such as scaffolding and spatial activities can be used to help prevent children from being anxious about doing math. Teachers can teach students how to learn from their faults in the math class (Beilock & Maloney, 2015).

Mathematics anxiety is a very complex issue in society today. Furner and Gonzalez-De-Hass (2011) reported that more than two-thirds of all Americans have a phobia in mathematics that may result in math anxiety. These phobias lead to many adults not seeking STEM careers and students not achieving success in the mathematics classroom (Beilock & Maloney, 2015).

Many students do not understand the math concept, as they use rote memorization to learn rules and procedures for completing mathematics (Finlayson, 2014). Ramirez et al. (2013) suggested that math anxiety may affect students' working memory and impact performance in mathematics. Ramirez et al. (2013) explained that working memories "are resources that are crucial for successful math problem solving" (p. 188). When students experience math anxiety, the working memory is influenced and the anxiety may be compared to an eraser because it erases or deletes the resources needed to complete the math problem and students find it difficult to continue. A person with more working memory capacity will be more successful in mathematics courses but may have more math anxiety than a person who has little working capacity (Ramirez et al., 2013). For example, people who show advanced mental ability to retrieve information instead of relying on counting objects such as fingers or other objects may have less anxiety in math (Ramirez et al., 2013).

Teacher behaviors impact the way students feel about math. Finlayson (2014) found that teachers are responsible for the math anxiety that their students feel and develop in elementary grades. The ideas and concepts students have for math may be passed from their teachers due to their uncomfortableness or confidence in math when they are instructing their students (Beilock & Maloney, 2015; Finlayson, 2014).

The instruction implemented in the classroom may have a negative effect on students' ideas about math (Aksu et al., 2016; Beilock & Maloney, 2015; Finlayson, 2014; Cheryan, 2011; Ross, Scott, & Sibbald, 2012). Math anxiety is a social anxiety most often learned in school (Beilock & Maloney, 2015; Finlayson, 2014). For example, if the teacher relies on the textbook or strategies that are not challenging, then students may not see the usefulness of mathematics in their lives.

Technology and Its Effectiveness

The National Mathematics Advisory Panel (NMAP) reported that in 2008 the mathematics achievement of youths, when compared to other countries, had declined (Rave & Golightly, 2014). Many students need assistance in improving basic computation, skills, and problem solving in mathematics (Beal, Rosenblum, & Smith, 2011). Many schools are implementing innovative technology programs to facilitate learning in the classroom which will encourage the new generation of an advanced technological population that will eventually enter the workforce.

Technology should be used as a tool to teach students and to guide curriculum (Bottge, Grant, Stephens, & Rueda, 2010). It has been found to improve student performance and achievement in mathematics (Barak, 2014; Zhang et al., 2015). Bryant et al. (2011) found the NMAP encouraged early interventions that provide effective instructional practices for at risk students. Lopez and Patron (2012) contended teaching should include various techniques that include different learning styles to ensure students are gaining the most from the learning experience.

Using technology techniques can make the learning environment exciting and can improve student achievement (Bofill, 2013; Lopez & Patron, 2012). Children are better prepared to complete tasks when they are provided an example and the information is communicated to them. Students may benefit from classrooms that offer a variety of instructional practices through the use of technology rather than the teacher using technology to present classroom lessons (Higgins, Huscroft-D'Angelo, & Crawford, 2017). Bottge et al. (2010) maintained that students prefer to use technology in the classroom to complete assignments.

Kiger, Herro, and Prunty (2012) explained that students are more engaged when they are able to use smart phones, iPod, and other mobile technology in the classroom. These mobile devices offer valuable resources and learning opportunities for students.

Many educators are implementing them into lessons and class assignments, including field trips.

They are also using them to engage students in the classroom (Kiger et al., 2012). When students are given the opportunity to use technology to improve their learning, they benefit. Bellamy and Mativo (2010) contended that students will be able to learn and recall the information when they are given the opportunity to use technology.

Mobile learning is becoming very popular with school and teacher instruction. Teachers must facilitate technology applications into mathematics classrooms to engage learners and improve student performance (Blair, 2012). When mobile devices are used as a learning tool, students are able to "create individualized learning environments" (Kiger et al., 2012, p. 63) that fit the needs of students and adapt to their mathematical ability. For example, Kiger reported the findings of a study with a comparison group and a mobile learning intervention (MLI) group. The MLI group performed better than the comparison group that used daily manipulatives such as flashcards, math games, and other practice methods while the MLI group used iPod Touch and math apps to practice mathematics concepts (Kiger et al., 2012).

Many students are very technology motivated. Many students have iPhones, MP3 players, gaming devices, and tablets that they use for entertainment (Kiger et al., 2012). Kiger et al. (2012) explained that schools are reconsidering technology instruction due to the availability of the Internet and digital learning resources among students. Educators have begun to use math applications that provide individual learning and adjust to the students' educational needs (Zhang et al., 2015). Math applications provide immediate feedback to improve student achievement (Kroeger, Brown, & O'Brien, 2012; Ysseldyke & Tardew, 2007). For example, Splash Math is a math application that adjusts to student learning and allows students to work at their own pace (Zhang et al., 2015).

Splash Math provides feedback by summarizing student progress. It allows teachers to give students clear instruction and activity sheets for a working period (Zhang et al., 2015). Long Multiplication is another mathematics application program that uses a scaffolding strategy to break the complex information into simple parts for students (Zhang et al., 2015). Long Multiplication uses a step-by-step approach so students can solve the problem using this scaffolding strategy (Zhang et al., 2015). The use of mathematics applications has proven to improve student performance (Kiger et al., 2012; Zhang et al., 2015).

Data reported by NMAP reveal many students will need intervention strategies or accommodations to improve their mathematics achievement scores. The National Center for Education Statistics (2007) reported that the United States ranked ninth out of 47 countries for eighth graders having high math achievement. Studies have shown that integrated learning systems have been used to help improve the academic growth and achievement of students. An integrated learning system can be categorized as computer software systems that provide academic support in subject areas to students via the use of a computer-based program (Riordan, Hine, & Smith, 2017).

Computer-based programs are used to remediate students in the classroom and provide "efficient intervention delivery" (Burns, Kanive, & Degrande, 2010, p. 2). Students discover learning by receiving some instruction from the teacher and applying that learned information to the applications in the computer-based program (Burns et al., 2010). Via technology, immediate feedback is given to teachers and students on the data, making it easy for teachers to analyze student progress.

Ysseldyke, Thrill, Pohl, and Bolt (2005) conducted a study on the use of Math Facts in a Flash (MFF). MFF is a mathematical computer-based program that increases fluency in mathematics (Burns et al., 2010). This study included 13 elementary schools and middle schools with a sample size of 4,000 students and 148 teachers (Ysseldyke et al., 2005). The students for the program were chosen from the general population. The experimental group used the MFF, and the control group did not use the program. The experimental group showed more growth and performed better academically. Ysseldyke et al. (2005) found the students who participated in the program experienced an increase in math skills.

Burns et al. (2010) conducted a study on the effects of a computer-based math fluency program on at-risk students. This study was different from Ysseldyke et al.'s (2005) because the at-risk students were selected for the program study. The MFF was also used as the intervention of choice. Burns et al. concluded that the MFF program increased math skills of at-risk students who had some basic math skills. Burns et al. asserted that a struggling math student should have knowledge and understanding of how to complete the math skill independently before the teacher can allow the student to begin a computer-based program such as MFF independently.

Voyager Mathematics Program (VM)

Educators have implemented many programs into the classrooms, hoping to improve student achievement. VM is one of many programs educators have and are implementing in the classrooms to move struggling students to grade level proficiency. VM is a math intervention program for students in grades 2-8 who have difficulties in mathematics. It has two components consisting of teacher-led and student-centered online instruction (Cambium, 2010).

VM is research based and incorporates strategies and effective instruction so that students are successful. One of the approaches that have been recommended through research is the explicit approach, which provides clear direct instruction to the learner. VM has shown positive results nationwide. One teacher who used the program with her elementary school students expressed VM was easy to use for her struggling students. She loved the assessments that allow her to target her students' weaknesses (Voyager Sopris Learning, 2014). A 2011-2012 report presented information from students in Grades 2 through 8 who had increased their overall proficiency from .92 to 1.35, which was considered large and educationally meaningful (Voyager Sopris Learning, 2014).

Poole, Carter, Johnson, and Carter (2012) discussed one school that implemented VMath as a RTI tier 2 math intervention program. The VMath program was used to target basic math skills for at risk students in mathematics. The students were placed in a small pull-out group for supplemental instruction for 30 minutes four times a week. One student who showed progress was transitioned out the VMath intervention program, but returned to the VMath intervention program because he began to show weakness and struggled in the general education math class. Two more students were able to exit the program after 12 weeks of successful intervention. The two students saw gains and growth as a result of the program and improved in the general education program. Poole et al. (2012) reported that the teachers saw a positive improvement for the 10 third graders in the program.

The VM program uses the quantile framework, which uses scores that note deficiencies and growths (Cambium, 2010; Voyager Sopris Learning, 2014). This framework also monitors the success of the student by reporting the goals toward the next grade level mastery as well as the student's learning readiness (Cambium, 2010; Voyager Sopris Learning, 2014). A Georgia report revealed the students in Grades 2 through 8 increased their overall proficiency from .63 to 2.42, which is considered a large and educationally meaningful growth in achievement (Voyager Sopris Learning, 2014). As reported on Voyager Sopris Learning website, VM students experienced gains between .75 to 1.3 as well as during the 2007-2009 school year students across the United States showing student success in their problem solving and math skills after 26 weeks (2014).

The VM 2009 - 2010 national results reported that "students who completed at least one VM module had increased their overall proficiency as measured by the initial and final assessments" (Cambium, 2010, p. 9). The new generation of students has opportunities to use many types of technology as a support in improving academic achievement. Students can work with authentic situations that reinforcement concepts learned in the classroom (Bellamy & Mativo, 2010). They can learn math concepts with the use of technological programs and tools that support and motivate their learning (Blair, 2012; Cambium, 2010). With the use of technology, school districts will be able to address the needs of many students while working toward the goal of NCLB.

Literature Related to the Use of Differing Methodologies

Qualitative research uses methodologies that have been used in sociology and anthropology (Lodico, Spaulding, & Voegtle, 2010). This type of research is used by the researcher to observe a natural setting to gain a perspective for the researcher’s viewpoint (Creswell, 2014; Taylor, Bogdan, & DeVault, 2016). Qualitative research connects the researcher's ideas and viewpoints to the facts that data have been collected while taking a subjective role (Taylor, Bogdan, & DeVault, 2016). The method most appropriate for this study was a qualitative design.

The mixed-method design can assist the researcher in gaining a better understanding by combining qualitative and quantitative methods to confirm findings from data sources (Creswell, 2014). For example, one study found African-American males who are motivated and encouraged to participate in STEM fields are more prepared for college and desire to work in STEM jobs (Strayhorn, 2015). African-American males who are confident are better prepared for college and are more successful in STEM fields (Strayhorn, 2015). The data in this sequential mixed-methods study were collected from 140 participants who were surveyed and 38 interviewees. The study results also found that African-American males who felt acknowledged by instructors in STEM classes were motivated to pursue STEM careers (Strayhorn 2015).

In another mixed-method study Dickerson, Eckhoff, Stewart, Chappell, and Hathcock (2013) found that students in Grades 4, 5, and 6 desired more opportunities to participate in STEM classes. The findings also suggested that the standardized assessment found a narrowing of the achievement gap between African-Americans and European Americans over the decade that the participating school used STARBASE (Dickerson et al., 2013). The participants for this study included 2,201 students with 75 follow-up interviews completed.

Quantitative design allows the researcher opportunities to gather information from small samples of participants and apply the findings to a larger population of concern (Creswell, 2014). According to Creswell (2014), quantitative research tests or verifies a theory through the process of collecting data from a population. The quantitative researcher finds valid evidence when gathering statistical information in the research (Taylor, Bogdan, & DeVault, 2016). In a quantitative study, girls were rated as having lower skill levels than boys in mathematics (Robinson-Cimpian et al., 2014). Quantitative research uses the literature as a logical framework to support research questions and hypotheses (Creswell, 2014). Ross, Scott, & Sibbald (2012) used a quasi-experimental approach to determine the impact of a program used on the achievement of elementary school students. This study found teachers who possessed high levels of self-efficacy helped to create lessons and classroom environments that improved student achievement (Ross, Scott, & Sibbald, 2012). Researchers also found that students who have an advantage in school by attending an early learning program or parental involvement continue to have an advantage in school. This study also suggested that economic status also influences student achievement. For example, differences between African American students who received free lunch and those who did not receive free lunch increased over time (Rugutt et al., 2002). This study suggested the need for teachers to use formative assessments to acquire a better understanding of student weaknesses and gains. The researchers explained that when summative assessments were reviewed, educators only saw a small portion of the students' performance and the assessment did not give educators a clear understanding of the students' strengths and weaknesses (Blackford & Khojasteh, 2013).

Technology plays an important role in student achievement when implemented in the classroom. One quantitative study by Neil and Mathews (2009) reported that although the at-risk students performed below the non-at-risk student, the at-risk students increased their academic achievement when using technology. This study, which took place in a school setting, used a causal-comparative design. The educators at the school claimed the success of the students was due to computer intervention and planned to implement this intervention in the future to improve student achievement (Neil & Mathews, 2009).

Literature Related to the Study Methods

Qualitative research is the study of individuals or places in their natural research setting via a collection of observations, conversations, and interviews (Creswell, 2015). Stake (2010) explained that qualitative research primarily relies on the perceptions and understanding of humans. This method uses three key elements, such as personal experience, intuition, and skepticism (Stake, 2010). The qualitative research study is more appropriate due to the subjective role of the potential participants.

Qualitative researches focus on a design that may change during the collection of data (Creswell, 2017; Lodico et al., 2010). Lodico et al. explained that qualitative researchers focus on a phenomenon and try to make sense out of the actions, narratives, and perceptions of the participants. Various qualitative approaches have been used to complete research: (a) narrative, (b) phenomenological, (c) grounded, (d) case study, and (f) ethnography.

Narrative research is the study of the lives of the participants and retells or describes a phenomenon (Creswell, 2017; Lodico et al., 2010). It involves a number of interviews to generate an account or description of lives. It can be used to explain or clarify perceptions and outcomes of specific past occurrences (Glesne, 2011).

The phenomenological approach focuses on the lived experiences of the participants and how the experiences create logic (Lodico et al., 2010). Topkaya (2015) used a phenomenology design to determine the factors that influenced an adult's decision to pursue psychological help. This approach was not appropriate because the proposed study is not describing the feelings and experiences of the participants.

Grounded theory is a theory that uses theories to explain the behaviors or views of the participants (Creswell, 2017). When using this approach, qualitative researchers collect data, analyze the data and link the data to a theory when determining perspectives or interactions (Creswell, 2017). Ronau, Rakes, Bush, Driskell, Niess, and Pugalee (2015) conducted research using a ground approach to determine the quality of literature related to mathematics, technology, and education. A sample of papers that had to meet three criteria were reviewed. The papers were coded by six researchers, and each paper went through multiple processes for coding until the categories that the researchers had created were few in numbers. Ronau et al. (2015) found that younger researchers produce a majority of the new research on mathematics technology and that more attention should focus on the quality of the research papers.

Another study used grounded theory to investigate a mathematics education concept. Showalter (2013) investigated place based mathematics education (PBME) using the grounded theory approach. The study consisted of 15 mathematics teachers who had contact with place based mathematics education. The author used participants to investigate PBME due to the lack of foundational evidence found with PBME. Showalter (2013) found that some of the participants' interview responses supported prior research on the difficulties of teaching PMBE.

Ethnography is an approach that paints a picture of the group or culture being investigated (Lodico et al., 2010). This approach can focus on shared meanings or understandings within a group to discover an idea (Glesne, 2011). Lindenberg, Henderson, and Duran (2016) used ethnographic methods to conduct a qualitative study in Nicaragua to gain an understanding of teachers' experience of an educational intervention. In this study, teachers participated in a 5-day professional development to support teacher understanding of content pedagogy (Lindenberg et al., 2016). The researcher's roles included a teacher mentor and a program facilitator. The results indicated that teachers felt that Nicaragua's educational system produced several obstacles for implementing educational interventions and teacher growth. The study also found that implementation of technology does not change teacher practice in the classroom. In another study, Baker and Harter (2015) reviewed several studies using meta-ethnography. For example, studies that were examined by Baker and Harter (2015) determined that the teachers felt they needed to understand the student before teaching them. This study used six qualitative studies to challenge the negative perception on differentiation.

The case study is a type of approach used to gain meaning to a group or individual. It is similar to other qualitative approaches (i.e., ethnography) because of the characteristics of the design. However, it is different because the number of study participants binds it. For example, in a school setting, the participating number will be bound by the number of people in the school or school district. Kritzer and Pagliaro

(2012) investigated whether an early math intervention influenced the interactions between parent and child. The six parent participants had to meet three special criteria to take part in the study. The parents recorded interactions with their child in a natural environment. The first set of recordings happened before the intervention began. Kritzer and Pagliaro (2012) found that parents who participated in the study learned how to better communicate with their child by making eye contact first with their child before continuing to talk.

The most appropriate approach for this study was the case study. It involves a thorough examination of teachers' perceptions about a mathematical program, VM and highlights what can be gathered from individual cases.

Summary

This review of literature focused on studies that examined the academic achievement of students and factors that may explain the difficulty with achieving success in mathematics. Several variables were identified, which apparently influenced the students and their academic success in school. Patterns from the data are inconsistent, as it has been reported the achievement gaps between African American and European American males and between Hispanic and European American males have narrowed, increased, or remained the same over the years (Finkel, 2010; Robinson et al., 2014). Although the gap is narrowing, there has been little consistent improvement experienced in this area (National Center for Education Statistics, 2011; NCLB, 2002; USDOE, 2013).

Teacher support has been identified in the literature as influencing the behaviors, attitudes, and skill levels of students. Supportive teachers help students move forward in the learning process. The literature reviewed in this section identified the influences of early preparation for success and supported the potential benefits of the connection between early preparation and student readiness in the classroom. To fully understand what occurs in the classroom, teachers were provided an opportunity to share experiences acquired while implementing the VM remediation program. Specifically, this study examined teachers' perceptions about the VM remediation program for middle school students.

Section 3 provides the methodology used in the study along with the research design, sampling size, the research study, the role of the researcher, a description of how I selected the participants, the data collection procedures, data analysis and procedures for ethical protection of participants.

Section 3: Methodology

Introduction

Reaching proficiency in mathematics has become a difficult task for American students. When students are not able to perform at or above grade level, all stakeholders including teachers, parents, school, and society suffer (Change the Equation, 2010; Robinson et al., 2014). In an attempt to rectify this problem, educators at the target school approved the remediation program, Voyager Math, to help their struggling students attain proficiency in mathematics.

Information was collected to respond to the research question about teachers' perceptions of the VM program and two related subquestions. According to Creswell (2014), a qualitative research design is needed if the goal is to understand a phenomenon or concept where there is a shortage of research or the participants can provide a perspective based on their individual experiences. Research also suggests that teachers' perceptions of their students and their work can influence student outcomes. In this study, the researcher knew (based on past research) that what occurs in the classroom is critical for the academic success of the students. Therefore, an exploratory method was selected because it would aid the researcher in (a) examining variables to understand the effectiveness of the VM remediation program, (b) discovering the benefits of implementing the program, and (c) in identifying students more likely to benefit from participation in the remediation program.

The purpose of this study was to examine teachers' perceptions about VM, the selected math remediation program implemented at the study site, a middle school. The specific perceptions were the benefits, limitations, and implementation of the program, including quality of instruction, strategies used, and degree of modeled instruction provided to the students. Included in this chapter are details about the strategies used in collecting data to respond to the central or guiding research question and subquestions, which consist of the research design and rationale; the role of the researcher; and methods used. Also included are the selection of participants, instruments, procedures for recruitment, recruitment, data collection and analysis, and validation.

Research Design

When deciding on a research design and approach, the researcher must be familiar with the different designs and ensure that decisions are based on his or her research questions and hypotheses (Creswell, 2014). Quantitative research is used when a collection of numeric data is used to test a hypothesis (Creswell, 2015) and to determine the existence of a relationship between the variables or the observation of significant differences (Taylor, Bogdan, & DeVault, (2016). The focus of this study was on understanding teachers' perceptions about a remediation program for math and identification of its benefits, limitations, and effectiveness.

Other approaches for this study were considered. However, the case study was the approach that enabled me to respond to the research question this study was designed to address. For instance, the grounded theory approach, which was not appropriate for this study, utilizes the participants to help discover a theory based on their experiences (Creswell, 2017). A narrative approach seeks to understand the stories of the participants and would not be appropriate for this study (Creswell, 2017). The case study approach is more appropriate for the proposed research because it seeks to explore teachers' perceptions of a phenomenon bounded by time and space (Baxter & Jack, 2008; Creswell, 2017). It explores individuals or events to gain a better understanding of the problem, phenomenon, or situation (Creswell, 2017; Gravetter & Forzano, 2012; Hancock & Algozzine, 2006). The phenomenon in this study was the VM remediation program.

A qualitative case study allows the researcher to investigate a phenomenon and make sense of the stories and behaviors of the participants in the natural setting and how these occurrences make connections (Creswell, 2015; Glesne, 2011; Lodico et al., 2010; Stake, 2010). Stake (2010) explained that this type research is based on how humans understand or perceive their environment or a specific research site. Qualitative researchers make a holistic interpretation of the data gathered on the problem from multiple perspectives via interviews, documents, physical artifacts, and observations (Creswell, 2015; Hancock & Algozzine, 2006). These multiple interpretations allow the researcher to explore shifts in data and multiple views of the problem from different perspectives (Creswell, 2015). The multiple sources are used to determine the answers to the research questions (Gillham, 2010). Qualitative approaches use multiple sources to create a vivid representation of the phenomenon that will be explored (Hancock & Algozzine, 2006).

The constructivist model is built on social learning. This model supports the approach's collaboration between the researcher and the participants during the interview process (Baxter & Jack, 2008; Creswell, 2017). A qualitative approach allows the researcher to record a participant's thoughts and observations and then present them from the participant's perspective (Stake, 2010). This design seeks to empower individuals to report on a problem that occurs, will occur, or has occurred in their research site whether it is their home or work research site (Creswell, 2017).

Research Questions

The guiding research question that guided the study was: How do teachers implement the VM program and perceive mathematics learning effectiveness? Subquestions which aided in answering the overarching question were (a) what are teachers' perceptions about the effectiveness of the VM remediation program? (b) what is the teacher's role in the delivery of the VM remediation program?

Context

Setting

The setting for this study was an urban public middle school located in southeast Georgia within a school district that serves over 14,000 students. Student enrollment at the school is approximately 733 in grades six through eighth. Ethnic and racial demographics reveal the student body being 2% multiracial, 1% Asian, 6% Hispanic, 7%

European American, and 84% African American (Governor's Office of Student Achievement, 2017).

The gender demographics indicated there are slightly more males than females, with a male population of 51% and a female population of 49%. Employees in the school include the following: One principal, two assistant principals, two counselors, one school nurse, 55 teachers, and two instructional support staff (Governor's Office of Student Achievement, 2017). The school is categorized as a Title I school because 99% of the students qualify for free and reduced priced lunches (Governor's Office of Student Achievement, 2017).

Title I is a federal education program endorsed by Congress in 1965 as part of the Elementary and Secondary Education Act (GDOE, 2015). Because of continuous low student achievement levels in mathematics, school administrators and teachers determined there was a need for math remediation to accomplish the goal of the NCLB requirements (Governor's Office of Student Achievement, 2015). Thus, they took decisive action by implementing the VM math remediation program for low-achieving students to improve achievement in mathematics by the extension date of 2017.

Criteria for Selection of Participants

All teachers were informed about the study during a regular staff meeting at the site of the study. Creswell (2015) suggested that participants be selected who would help the researcher understand the problem and the research questions; thus, purposive sampling was used. Criteria used in the selection process included: (a) experience in teaching math, (b) knowledge of and experience in the VM program, (c) contact with students in the VM program, and (d) teacher of Grades 6 through 8. Participants who met the criteria for selection were provided an opportunity to participate in the study. The initial population sample included 61 educators. Two administrators volunteered to participate in the study. The administrators were selected because they had knowledge of the VM program, knowledge of the data shown by VM, and contact with students and teachers who were in VM classrooms. As recommended by Lodico et al. (2010), recruitment and selection continued until saturation. Using stratified purposeful sampling, 12 teachers and two administrators were selected and agreed to participate in the interviews and two teacher participants agreed to be observed. The limited number of potential participants was selected based on the recommendation of Hatch (2002), who asserted that the "fewer participants involved, the more time spent with each one" (p. 49). Lodico et al. (2010) contended the researcher should select a sample that will help provide detailed and sufficient information to answer the research questions. Stratified purposeful sampling was selected because the participants needed to be very knowledgeable of information related to the purpose of the study (Hatch, 2002).

Measures for Ethical Protection of Participants

Adverse risks to participants are unintentional and are assumed safe, but research can "pose the risk of significant physical, psychological, social, legal, and economic harms" (p. 2221). Ethical practice for research with humans includes consideration of any risks and benefits for the participants (Creswell, 2015). Because of the nature of the investigation (i.e., qualitative, interviews, classroom observations), it was determined no psychological or physical risks existed for the participants, and they were not expected to experience any more stress than they would in a regular work day. However, it was also established that if any participant experienced stress or felt uncomfortable, he or she was provided an opportunity to opt out at any point without any consequences. Additionally, the participants understood that their participation was voluntary, and they would not receive any funds or services for participating in the study. As indicated previously, no information was collected that could be used to identify the participants.

The participants' names were not used in the study. They were assigned a pseudonym that was used for identification purposes. Responses to the teacher interview questions and the classroom observations were also assigned numbers and secured in a locked file cabinet to protect the ideas and perspectives of the participants. The archival lesson plans and VM progress reports were obtained from the school's records. I also requested archival reports of the VM program.

Narrative information was stored on my computer, which was password protected. The researcher strived to help the participants feel comfortable and free to be open and honest in responding to and asking questions and in sharing valuable information for present and future educators. They were informed, however, that they were not obligated to answer or respond to any questions. The participants acknowledged that their participation was voluntary and understood they could resign from the study at any time without penalty.

Role of the Researcher

I served in an objective role as interviewer and observer in this study. Other roles included data collector, analyst, and presenter. As the interviewer, I conducted one-on-one interviews with the participants. As data collector, I recorded and transcribed the interviews, and as the observer, the researcher documented (with specific details) verbatim statements and actions during classroom visits. As the presenter, I presented information about the study to the faculty in the school at the site of the study.

I am a sixth-grade Language Arts teacher in the middle school at the site of this study. While I enjoyed a good working relationship with the participants, sincere efforts were made to ensure working and research relationships remained separate and did not pose a conflict of interest. I am not in a supervisory position and did not in any manner attempt to coerce the participants; neither did the participants express or exhibit feelings of coercion at any time toward the researcher. I did not issue incentives; rather, an emphasis was placed on (a) the importance of improving student achievement in mathematics, (b) examining the remediation program utilized, and (c) the importance of preparing the students for entrance into the global society.

Data Collection

Permission to administer the study was initially requested from the school district. After receiving approval, I requested permission from the principal to administer the study in the targeted school. After approval was granted, the proposal was submitted to the Institutional Review Board (IRB) of Walden University for review and clearance.

Upon approval, I scheduled a meeting with the principal of the targeted school to discuss selection criteria for prospective participants and to schedule a time that I would be able to speak to the faculty about the study. The principal granted me permission to receive the VM student report progress reports and teacher lesson plans from the teachers or academic coach. The principal also approved a date and time, and I presented an overview of the study at a scheduled staff meeting in the school at the site of the study.

After informing the teachers about the study, I expressed that consent forms were available. After providing the potential participants ample time to decide if they would participate in the study, I posted signs in the teachers' workroom and sent contact information via e-mail to those who appeared to meet the criteria. Fourteen were selected. Of the 14, 12 were teachers and two were administrators (principal and assistant principal). I communicated with the selected participants via email and asked if they would consent to be observed. Only two participants agreed, and I asked them to provide a convenient date and time for the classroom observation. Six archival student VM progress reports and five lesson plans were acquired from the academic coach. In reviewing the lesson plans, I examined strategies, daily instructions, assessments, and lessons implemented in the VM classroom in preparing the students for working on the online modules. The documents were used to provide evidence of what the teachers may have learned from the program as related to the effectiveness of the program. Notes were taken on the related documents before the teachers were observed and interviewed.

The qualitative data collected for this study were interpretive (Hatch, 2002; Stake, 2010). Interpretive data are the actions, perspectives, thoughts, and words of the participants (Stake, 2010). For this study, I collected data from (a) classroom observations, (b) semi-structured interviews and (c) related documents (archival printouts of student progress in the VM program and archival teacher lesson plans). Data were collected to address the central research question and the two subquestions from individual teachers who met the criteria for selection and agreed to participate in the study. The data were sequentially collected from the interviews and observations to inform the study. Although the observations were secondary to the interviews, they were conducted first. They were used as a supplement to the interviews to assist in the creation of probing questions (see Appendix C) during the interview process.

Classroom observations. Gravetter and Forzano (2012) indicated that when behavior is observed in its natural setting a better understanding can be obtained about the phenomenon under investigation. Creswell (2014) stated that one advantage during an observation would be the opportunity for the researcher to observe and record unique characteristics that take place during the observation. Glesne (2011) and May (2002) suggested that researchers observe and use this information to support and inform them of the participants. In this study, classroom observations were conducted to discover the teacher's role in the delivery of the VM program.

Upon meeting with each participant on the scheduled date for the classroom observation, I issued two copies of the consent form. One copy was for the researcher;

the other was for the participant. I provided contact information in case the participants had questions afterward. They were labeled Classroom A and Classroom B. The teacher introduced me to the class and ensured the students the researcher would only be observing.

As an unobtrusive observer, I took a seat in the back of the classroom, which made it easy to record information and to not interfere with the lessons being conducted. An observation protocol (See Appendix B) was developed by the researcher, using Creswell's (2014) observational protocol sample as a guide. The instrument included the time and length of the study, date, and the pseudonym assigned to each teacher. A section on the observation protocol was used to record the reflections on student engagement, program implementation and teacher implementation, including additional descriptive and reflective notes.

The descriptive notes provided a detailed summary of what I saw and observed in the classroom. The reflective notes indicated how I reacted to interactions and noted ideas and thoughts during the observation process (Lodico et al., 2010). Field notes, handwritten observations of what I saw, heard, thought, and felt (Glesne, 2011; Lodico et at., 2010), and teacher side notes were recorded during the observation in the VM classroom, transferred to the observation protocol, and kept in a spiral notebook during the observation process. Glesne (2011) stated, "a participant observer must constantly analyze his or her observations for meaning" (p. 68). The observation protocol captured the behaviors, sounds, and teacher-student interactions, which helped inform the study of teachers' perceptions of the VM classroom. Lodico et al. (2010) stated descriptive and reflective notes are a good way to control the bias that the researcher may have.

The hand-written field notes were transcribed and transferred to my computer then saved to a flash drive, which provided easy access. The hard copy and computerized copy of the field notes were secured in a locked file cabinet. The field notes were used to create probing questions used in following the prepared open-ended questions. The observations helped to discover information on the teacher's role in the delivery of the program that will help inform the study. The observation notes were reviewed to determine comparisons and patterns.

The classroom observations were a segment of the fieldwork conducted to receive a first-hand account of the phenomenon being investigated (i.e., the VM remediation program). They were a legitimate form for collecting qualitative data and were used to observe the teacher and student interactions. The observations, which included (a) teacher interactions, (b) strategies, (c) order of activities to improve student success, and (d) goals established to improve student success, enabled me to better examine the teacher's role in the VM remediation program for mathematics learning effectiveness. They were used to supplement the interviews. The resources or tools used in the classroom, the order of activities, and behaviors of students further explained that teachers respond to the VM remediation program. I understood the possibility of teachers only expressing how VM impacts student progress or ability; however, through the lens of the classroom observations, I could examine how the VM remediation program impacts teacher implementation.

Semi-structured interviews. Semi-structured interviews were used as the primary data source to inform the research questions generated in this study. As explained by Creswell (2014), the semi-structured interview is used to generate discussions and to provide flexibility so the researcher can follow up on statements made by the participants as needed. I emailed three schedules (including date and time) to the 12 teachers and two administrators, requesting them to select the schedule most convenient for them. The participants were asked to meet during a scheduled time for a minimum of 30 minutes and a maximum of 45 minutes.

For convenience, they were offered three-time slots from which to select. After scheduling the interview, I left a hard copy of the interview questions with the participants to review before the interview. (See Appendix A). Although demographic information was collected (e.g., sex, age, number of years in the teaching profession, amount of experience with the VM remediation program, race/ethnicity), a pseudonym was assigned to each participant before the interview to ensure confidentiality. The reason for recording the interview (to ensure accuracy in the transcription process) was explained to each participant and permission to record it was requested. I also provided contact information in case the participants had questions afterward.

The semi-structured interviews were conducted in one-on-one sessions with all participants. An interview protocol consisting of seven open-ended probing questions, with additional space to record participant and interviewer comments (see Appendix C) in following the prepared open-ended questions was used. When necessary, I used probing to acquire clarity and deeper responses. The researcher also took notes during the interview.

I reassured the participants of confidentiality and informed each that a summary of the transcript of the interview would be shared within 3 weeks after the interview, via e-mail, or placed in their mailbox at the school. They were asked to ensure the transcript was accurate and to inform the researcher within three days if changes were needed (Creswell, 2014). After 3 days, no interviewee advised of inaccuracies or suggested changes, and the researcher sent a note, via email, to all participants thanking them for contributing to the study. I included a statement informing the participants all files and recordings would be deleted when the study was completed. The verbatim audio recorded semi-structured interviews provided details and elaborations on the teachers' perspectives of VM and identified their thoughts on the program regarding benefits, limitations, and implementation.

Related documents. Unobtrusive data, which included archived lesson plans and student progress reports, were collected upon approval of the principal and the selected teachers. This data provided a continual view of the objectives established by the teachers in implementing VM for mathematics effectiveness (Hatch, 2002). VM student progress reports were reviewed and analyzed to provide evidence on the effectiveness of the VM program. Archival teacher lesson plans were analyzed to supplement teacher interviews.

They were used to determine how teachers implemented strategies, activities, and lessons in the VM classroom, based on the perceptions of teachers and mathematics learning effectiveness.

Data Analysis

Data analysis has been described as a way for researchers to organize the collection of data so that others can understand what they have discovered (Hatch, 2002). Creswell (2015) states, it is "making sense out of text and image data" (p. 190) so that patterns and relationships may be discovered. The analysis of data involves "synthesis, evaluation, interpretation, categorization, hypothesizing, comparison, and pattern finding" (Hatch, 2002, p. 148). In this study, data were collected and appropriate qualitative data analysis was performed (Creswell, 2014; Hatch, 2002). An analysis was conducted for each research question (i.e., the central research question and the two sub-questions). Qualitative data analysis involves culling the information to find common themes and patterns from the participants' responses (Creswell, 2014; Gravetter & Forzano, 2012; Hatch, 2002).

I used the following models of analysis to analyze the collected data: (a) typological, (b) inductive, and (c) interpretive to analyze the data. A typological analysis is a process that is used to pull the data apart and put it into groups to determine meaning (Hatch, 2002). Inductive analysis begins to look for the patterns while the interpretative analysis makes judgments to determine a clearer picture (Hatch, 2002). Triangulation was used to combine the types of data and multiple data perspectives collected. The teachers' interviews were triangulated with the administrators' interviews to help answer the research question. This strategy was used to build a coherent explanation for themes that relate to the study (Creswell, 2014; Hatch, 2002; Merriam et al. 2002). Member checking was used to ensure interview transcripts and observations were accurate. It was important that I organized the data due to the types and amount of information that was collected by the researcher. A computer software program and a laptop computer were used in the organizational process.

The interviews were the primary source of data collection, but other sources of support to triangulate data were related documents and observations. These sources helped build upon the themes and added an in-depth understanding of teacher and administrators' perceptions of the learning effectiveness of VM. As suggested by Glesne (2011), the data were analyzed sequentially (i.e., observations and interviews). The data taken from the fieldnotes and interviews were reviewed and analyzed daily during the collection process to discover connections and patterns related to teachers' perceptions of the implementation of VM. The fieldnotes reflections were also analyzed.

The first stage of analyzing the data involved transcribing and organizing the interviews, related documents, and notes taken from the observations. The data were read, organized, and arranged to create connections and links to determine teacher-student interactions and the perceptions of the participants. I gained an understanding of the collected data, via reading the documented observations, related documents, and interview notes, and via reflecting on the meaning. In doing so, I recorded ideas that created a pattern and generated an understanding of the research questions. I transcribed the interview responses from the recorder and the notes taken during the interview were analyzed. The notes on the observation protocol were read, organized, and summarized. Notes taken from the related documents (i.e., VM progress reports and teacher lesson plans) were also organized and summarized. Key words and themes that identified teacher perspectives of VM were highlighted.

Coding

Glesne (2011) explained coding as taking the relevant data for the study and organizing and defining it into an outline. Some researchers suggest that taking the data apart in small parts such as a sentence, line, or paragraph allows the researcher to categorize the data and eventually tell a story based on what all the participants and data present (Creswell, 2014; Gravetter & Forzano, 2012; Lodico et al., 2010; Stake, 2010). A detailed analysis using three types of coding: (a) open, (b) axial, and (c) selective coding was conducted.

The first stage was open coding, which involved analyzing the data by separating the field notes from the interviews and observations (e.g., activities, behaviors of teachers, reflections, teacher interview, etc.) line by line to find frames of analysis to examine. The data were coded and categorized which helped develop common themes. By using the collected data from the observations and interviews, I looked for consistent words or comments made by the teacher and administrator participants that would consistently appear. Through axial coding, the codes created during open coding allowed the researcher to identify patterns from the interview data and the classroom observation data (e.g., interview notes, field notes, and reflective notes). During the process of selective coding, I constructed one idea or theory from the collected data to discover the interpretative analysis.

Data gathered from the interviews were transcribed, and the field notes from the observation protocol were organized into codes, categorized, and then themes. I carefully read the interview responses and notes and looked for related codes and patterns that related to the themes created. The interviews were compared to find connections and links for categorization into patterns to further the investigation. I formed phrases or word patterns that described the meaning of the data. This procedure was continued as new theme patterns emerged. They were arranged into groups of commonalities that helped new themes emerge. I re-read the data identifying similarities and differences in the interview data. The lesson plans, observations, and progress reports were analyzed to compare and contrast to the interview data. I reviewed the transcripts looking for themes and categorizing the data. The patterns or common themes that emerged were organized and used in the final report.

ATLAS.ti (2017), a qualitative data analysis software program was used to assist with coding, management, and storage of the data (i.e., themes, patterns, and coding). First, an analysis project was created. A hermeneutic unit which is a program file allowed me to open a file and download the interviews, observation notes, and related documents into the unit. The data were read and coded by clicking on the line or phrase and selecting an appropriate code. I was able to write my thoughts and understandings of the data in the margins. The program was used to analyze the data and see what relationships and patterns existed in the data. Weak link networks were created from the data. These networks connected elements (i.e., quotations, codes, memos or reflections) from relations that do not receive any specific name. For example, I selected a primary document and created a network, and then I imported neighbors or elements that were connected to the document. The neighbors were quotations and codes that were a part of the primary document. The network shows the work that was completed with the specific primary document. Quotations and codes were also used to complete networks so that I could analyze the data and create patterns and then themes from the data. Meanings were revealed while analyzing the data. The program was used to create spreadsheets and charts from the revelations revealed. Auto coding was also used to provide relationships and patterns within the data. Auto coding finds text in the passage and codes the text with a previously selected code. A search was conducted to locate codes in the text and find words that matched with the search completed. For example, the code of motivation was created in the program and auto coding was opened. In the search field a category was defined that included the words incentive, rewards, impulse, etc. The program searched the documents by sentences and highlighted words and phrases when it found a match.

Interpretation

The final step in the data analysis process involved the findings being interpreted. Next, the findings, as related to each research question, were presented in a descriptive form to represent the perspectives of each participant. It is expected that findings from this study will add to the research literature and help inform educators in the school about the use of the VM program from the perspective of teachers, one group of key stakeholders in the teaching-learning process.

Trustworthiness

Creswell (2017) contended there are eight primary strategies to help determine the outcome of a study, and at least two strategies should be used to "check the accuracy of the findings" (p. 196). Hatch (2002) suggested that providing participants an opportunity to review the interpretations and to comment on what the researcher interpreted. The use of multiple sources in this study provided a collaboration of evidence that helped to validate the authenticity. Hatch (2002) contended when studying a phenomenon, multiple sources add to the validity of the study. Member checking was used in permitting the participants to review the interpretations of the researcher, which included notes from the related documents, notes from the classroom observation, descriptive and non-descriptive reflections, and interview data to ensure accuracy in capturing the experiences of all participants. I provided all participants with written summaries after the interviews and observations and afforded them the opportunity to ensure their environments, documents, perceptions, and ideas were correctly documented. I accomplished this by allowing the participants to review the findings.

Ethical Procedures

Clarifying researcher and participant biases is necessary for validating findings. I was a member of the faculty in the school at the site of this study. To manage bias, I tried hard to create an environment which promoted integrity to the utmost, never alluding to any other strategy, program, or personal perspective. Also, I tried to ensure that the questions were structured in a manner that disclosed no bias regarding strategies, as all questions were centered on the VM program and one question did not influence the next. Additionally, biases were monitored so that they would not shape the participants' perspectives or the collection of data. Thus, biases were monitored not to influence interactions that occurred between the researcher and the participants during the face-to-face interviews and the classroom observations.

Summary

The guiding research question that guided this study was: What are the perceptions of teachers on the use of the Voyager Math program to improve student performance? Two subquestions which aided in answering the guiding question revolved around teachers' perceptions regarding student engagement or motivation, student accountability, and student performance. The data were collected through individual face-to-face interviews between the teacher and the researcher and classroom observations. Data were collected sequentially from the interviews and observations to inform the study and to answer the research questions. Although the observations were secondary to the interviews, they were conducted first and used as a supplement to the interviews in creating probing questions during the interview process.

More visual and specific information on data collection and analysis is presented in Chapter 4. Also, the findings or results are related to each research question.

Section 4: Results

Introduction

The purpose of this qualitative case study was to examine teachers' perceptions of the impact of the VM program on student success. In this section, teachers' perceptions are analyzed and their perceptions' may or may not have contributed to the effectiveness of the VM program. This section includes findings taken from interviews, classroom observations, and related documents.

Descriptive Data

The site of the study was a middle school in central Georgia with a population of 933 students and 61 educators. The school district serves over 14,000 students. Because of continuous low achievement in mathematics, school administrators and teachers determined that mathematics remediation was needed to meet NCLB and RT3 requirements (Governor's Office of Student Achievement, 2011). Thus, I needed to assess the teachers' perceptions of Voyager Math, the remediation program selected and implemented at the target school. Individual teacher interviews, classroom observations, and related documents (e.g., archival VM printouts of student progress reports and teacher lesson plans) were collected and reviewed.

Data Generating and Gathering

A data collection process was used to ensure confidentiality and to protect the rights of participants. After approval was granted by the Walden University Institutional Review Board (IRB; Approval Number 04-05-16-0131439), I scheduled a meeting with the principal to discuss the purpose and steps I wanted to take to gain access to data and the participants. After meeting with the principal, I was allowed to present an overview of my study to the teachers, post invitation signs, and send e-mail messages to teachers inviting them to participate in the study. The sample size was 61 educators. The archival lesson plans and VM progress reports were obtained from the school's records.

Stratified purposeful sampling was used to select 14 participants: 12 teachers and two administrators (labeled A1 and A2). Table 1 shows the participant number, identification number, observation number, and teaching role for the 14 participants at the researched school. Data were collected from 2 classroom observations, 14 interviews, 6 VM student progress reports, and 5 lesson plans.

The participants were assigned a pseudonym for identification purposes. Narrative information was stored on my computer, which was password protected. Each participant was assigned a manila folder and a folder with information compiled on my computer. An identification card that contained the participant's actual name, pseudonym, and observation checklist, if applicable, was placed in the folder. Transcribed responses to the interview questions and the classroom observations were also assigned numbers and secured in a locked file cabinet to protect the ideas and perspectives of the participants.

Table 1

Identification Number, Observation Number, and Teaching Role

Participant No.	Identification No.	Observation No.	Teaching role
1	T1	Not observed	Teacher
2	T2	Not observed	Teacher
3	T3	OB1	Teacher
4	T4	OB2	Teacher
5	T5	Not observed	Teacher
6	T6	Not observed	Teacher
7	T7	Not observed	Teacher
8	T8	Not observed	Teacher
9	T9	Not observed	Teacher
10	T10	Not observed	Teacher
11	A1	Not observed	Administrator
12	A2	Not observed	Administrator
13	T13	Not observed	Teacher
14	T14	Not observed	Teacher

Interview Data

The 14 participants were interviewed and perceptions were gathered regarding the effectiveness of the VM remediation program on mathematics learning effectiveness. The semi-structured interviews consisted of seven open-ended questions that were used to understand teachers' perceptions of the effectiveness of the VM program. The 14 interviews were conducted and recorded in late October and November 2016. The interview protocol can be found in Appendix C. Field notes and transcribed audio recordings were summarized for participant review within 3 weeks.

Fifteen codes were applied to the identified themes. Table 2 indicates the codes that were revealed from the teacher interview responses. The table also depicts the participant pseudonym numbers on row 1 and indicates the number of times the participants referenced each category. The data were helpful in determining the themes to support the research questions. Based on the analysis of responses from teacher and administrator interviews the following codes were identified as (a) accountability, (b) achievement, (c) curriculum alignment, (d) student achievement and success, (e) parental support and involvement, (f) collaboration, (g) implementation, (h) academic curriculum, (i) motivation, (j) off-task behaviors, (k) student overcoming math fears and anxiety, (l) instructional planning, (m) student preparation, (n) teacher support, and (o) work ethic.

Observations

The classroom observation protocol is outlined in Appendix B. Information collected from the classroom observations included the teacher number, date, time, and length of the observation. Descriptive and reflective field notes on student engagement, teacher implementation, and program implementation were entered on the classroom observation protocol. Strengths and weaknesses were also entered. Under *Student Engagement*, reflective and descriptive field notes were entered on the type of classroom environment (student-centered or collaborative). Methods created a sense of independence, encouraged critical thinking skills. Under Program and Teacher Implementation, reflective and field notes were entered on (a) instructional delivery, (b) strategies used in implementing the VM program, (c) the use of data to monitor progress, (d) feedback, and (e) remediation. Observations were scheduled based on the availability of the participant.

Related Documents

Information collected from related documents was documented. Six student VM progress reports were reviewed to examine motivation and engagement. Specifically, notes on the amount of time the students spent on task and their level of achievement were reviewed and recorded. Five teacher lesson plans were reviewed for strategies and planned activities; notes were entered under teacher implementation. Probing questions for use in the interview sessions were generated from reflective notes entered during the classroom observations and from reviews of the related documents.

Findings

The present study examined perceptions and interactions of teachers about a mathematics program known as VM via the analysis of teacher interviews, classroom observations, and related documents. The central research question revealed five themes in the data regarding how teachers implemented the VM program and perceived mathematics learning effectiveness. Several components were included in the first research question, and two subquestions were created to help answer the central research question using the data. The presentation of the findings began with discussing the subquestions findings and concluded with the findings of the overall research question. By beginning with the sub questions, explanations on how the data was triangulated are provided.

Subquestion 1: What are teacher's perceptions about the effectiveness of the VM remediation program?

Three themes emerged from the data analysis process aligned to sub question 1. The identified themes were: (a) student ownership and accountability was low, (b) student engagement and motivation was low, and (c) student growth and achievement was high. The themes characterized the teacher's and administrators' perceptions about the effectiveness of the VM program on student achievement. Themes were developed from interviews, classroom observations, and related documents.

Theme 1. The first theme, student ownership and accountability, is about how teachers and administrators perceive the amount of investment students had in their learning on the VM program. The investments are the topics that students learned in the classroom, the behaviors of the students when learning took place, and the methods the student used while in the VM class. When students take ownership of their learning they facilitate their learning through becoming independent thinkers and having a willingness to work.

The theme of student ownership and accountability was low and emerged from the interview data. The overall responses from the data analysis indicated students had low to no levels of student ownership in the VM program. Teachers felt that students' behaviors and attitudes showed that they were working in the program because they were made to take the class. Teachers perceived the program to be useful and improve student achievement. Teachers indicated that VM learning was most effective when students were willing participants and put forth effort in the class. Teachers also stated that more learning occurred when students were held accountable and not given multiple opportunities to retake an assessment or reset their score. Prior knowledge is an advantage with the program. Teachers agreed that prior knowledge and information learned from collaborative groups would be needed to apply learning directly to the technology component. T1 explained that, "Students whose parents introduce manipulatives at an early age are encouraged to succeed from their parents tend to become more successful than students who receive lack of support." Teachers also felt that girls took the program more seriously than boys.

Participants shared their perceptions of student ownership and effectiveness on the program. Three teachers reported that students were not held accountable for their learning because students were able to have their test reset when they received a failing grade. One teacher added that teachers do not get a true representation of student knowledge due to students responding by trial and error. The comment from T5 reflected some frustration with student efficacy in the program. He said, “The students have the opportunity to guess at their questions without explaining their answer.” Teachers noted that students were not held accountable for their learning and noted that achievement was hard to measure. The majority of the participants felt that they did not get a true ethical picture of student’s performance because the students could get their test reset up to three times. T13 added, “The program allows students to respond by trial and error.” Participants noted that students were not held accountable for their learning and noted that achievement was hard to measure.

Effort was also described by the participants. The majority of the participants felt that students were not putting enough effort in their work. Teachers reported that students were on other software programs or on the internet looking up non VM related information. Ten of the participants acknowledged that students were not focused in class. Participants noted that students could perform better if they (students) put forth more effort. According to T3, students could do better, but do not seem to care if they perform well. T3 stated that, “Some of the students in the class are not willing to obligate themselves to doing the necessary work to improve their knowledge of math. I have some students who could do better than what they do in class but choose not to." A12 stated, "I don't think the students take it seriously. I don't think the students find it challenging at all." Administrators and the majority of teachers felt that the students needed more challenging assignments.

Although many participants felt that students were not putting forth effort, T8 felt that students put forth effort when the information being taught seemed meaningful to them. T6 and T7 also shared that students have to believe that the instruction in the program must be meaningful to be interesting to the students. T6 shared that, "remediation is successful for students who are willing to put forth the effort." T7 stated, "I believe that the students have to buy into the program and believe in it (VM) for it to make a difference." A11 also agreed that students must be intrinsically motivated to become self-starters. Students should want to do well in the program so that they achieve success. A11 stated, "The Voyager program as a stand-alone program for providing remediation is tricky because again kids have to be highly intrinsically motivated to complete the program with little to no assistance from the facilitator." Seven teachers and one administrator perceived the program as a good program. The majority of teachers and administrators agreed that students must transition from teacher-led instruction to self-directed learning. All participants understood the importance of students using strategies taught to be successful in the VM class.

Administrators agreed with teachers that students must want to improve their math skills to show growth in the program. They felt that students who get on online games or sit idle during the program are not maximizing their time in the program in the classroom. They also felt that some students used the time for free computer time instead of working on the program. The administrators felt that although it is the teacher's responsibility to implement the program, the program can't be implemented with fidelity if the students are not taking ownership and working in the program to improve their performance and math skills.

An analysis of data collected in two observations and six VM progress reports provided evidence of student ownership in the classroom. Twelve participants felt that students working with peer tutors or in collaborative groups help students understand concepts that they may have difficulty with. Collaboration may help students understand the material better from a peer. In the first classroom students were observed working in whole group and collaborative group instruction. This observation provided evidence that students had ownership of their learning. Students were able to stop and start the learning process when they wanted to because they were working in collaborative groups. During OB2, one student asked another student how to work out a problem and the student worked with the student to help them get the problem correct. Teachers and administrators felt that if teachers give students the tools to succeed then students are more likely to be motivated to become self-directed learners and take ownership of their learning.

Although teachers felt that collaboration worked well in the VM classroom, there were some variations observed. During OB1, two of the five student groups were off task and not completing the assignment. The students' conversations did not appear to be math-related. The students were laughing and talking across the room to get other students off task. During OB2, one student asked another student for the answer to a problem. The student was given the answer to the problem without the helpful student showing them how to work it out. It was observed that students were not challenging themselves; students chose to get the assignments given to them rather than work to achieve the task.

During OB1 one student asked another student for the answer to a problem. The student was given the answer to the problem without the helpful student showing them how to work it out. Another student was given the login and password by the teacher, but the student never logged in. The teacher told the student to log-in and the student responded, "I can't! If you don't help me I can't do my work." This evidence supported the theme that students had low or no ownership.

The observation showed that the behaviors and attitudes of most students was that they showed little interest in the program. It also showed that this is was a task they had to complete, yet they could not control how much time they had to complete the assignment.

PR1 showed that the student had not been working consistently on the program, because it showed the time spent on the program and within 2 weeks the student hasn't maximized their time. PR6 showed that the student received low grades on the assessments and had not spent a lot of time in each lesson in VMath Live. Progress report

5(PR5) showed that the student had not met their goal of 100 minutes per week. Progress report 2 and 4 showed that the students had met their goal of 100 minutes weekly. PR2 and PR4 also showed that the students had moved on to the activities and completed work in each of the 4 modules listed on their progress report.

There was an agreement among teachers that was evident from the two themes. The teachers felt that the students did not take ownership in the program. The data showed that the teachers felt that most students were not investing into their learning although teachers perceived that the VM program was a good program for improving student achievement.

Theme 2. Student engagement and motivation were both common factors that teachers perceived as important. Student engagement and motivation were low emerged as a theme from the data. Students must be interested in a task and that task should have meaning to them.

Teacher and administrator participants shared their perception on student engagement and motivation. Seven participants believed that many of the students in the VM class are not motivated and get off task during class time. Teachers also shared that students who want to learn will do what is necessary to complete the assignments. One teacher reported giving rewards in the classroom for being on task and working quietly, but as soon as the student received the reward they became off task. Three teachers reported that students do not take the program serious because they do not want to be in the classroom therefore they are off task and disruptive by talking. T2 shared, “It does improve student achievement, but many students are not motivated to do the work that the teacher and the program ask them to do." Although several teachers reported students not being motivated, T4 shared an experience of one student who worked very hard in the program which resulted in the student showing gains in mathematics on the milestones and benchmarks. T4 shared:

> I believe that if a student wants to learn and is motivated to get good grades, then they will work hard to do the work. I have a student that is in the special education program who is really low. He comes in and tries his hardest. He has made some gains and has improved as much as he can.

Teachers noted that motivation and engagement are important for the students in the program. Teachers agreed that motivation could be positive or negative. The majority of the teachers and both administrators shared perceptions of students needing to be intrinsically motivated in the VM classroom. Some teachers felt that students may have behavior problems that interfere with learning in the classroom. For example, T6 stated, "If a student is not trying in the classroom due to behavior problems then remediation can be useless." Eleven participants agreed that some students do not want to do what is necessary to improve their knowledge of math. Some teachers and administrators felt that it was easy for students to get off task, but if they took the program seriously then they would do well. T7 shared:

> I really believe that any student, if they work hard and follow the protocol of the program can achieve success using VM for math

> remediation. Some students worked harder than others and with the computers there was always the risk of students getting off task and straying from the program.

T7 and T8 reported that students want to learn, but can be easily distracted by students who are talking. Some teachers noted student motivation and engagement can be intrinsic and extrinsic due to student beliefs and classroom behaviors. One administrator felt that the students who take the class serious are those students who take their learning seriously. A12 shared:

> VM is an academic class and it should be treated as an academic class and the student should take it as serious as an academic class and that is not happening from all students. You may have two or three students out of the class but that is because those are the ones who take their educational learning serious period. Many of the students who are assigned to the voyager class are also some who have behavior issues and don't take their learning seriously.

An analysis of data collected during OB1 and OB2 provided additional evidence of the connection between student engagement and learning effectiveness. The two observations provided evidence that students were not engaged and motivated during the class. During OB2 students were not completing class assignments because they were on other sites that were not related to mathematics. During OB1 one student was off task during the whole group lesson. This student appeared to be doodling. Although the observations showed many students off task, there were some students who were completing assignments and working in collaborative groups to complete assignments. Evidence from the observations was that students were not focused in class

Although there were variations in the data, the overall theme was that student engagement was low. This theme was evidenced in the interview and observation data. Students were observed off task and teachers and administrators felt that students needed to be consistently engaged while working in the class.

Theme 3. Teachers and administrators agreed that the students did grow academically as a result of the VM class. The third theme noted was that teachers felt that student growth and achievement was high. In the VM class teachers may have an effect on the progress of students and how well they perform. Student learning was evident due to student growth and achievement. Teachers felt that students showed growth and achievement when using VM. Teachers and administrators felt that VM student growth was visible on the standardized math assessments. One administrator felt that mathematics benchmark scores had improved.

The administrators agreed with the teachers on the effectiveness of the VM program. The perceptions of the administrators showed the learning effectiveness of the program and how the program has improved achievement in mathematics. A11 and A12 explained that they had seen higher marks on county and state assessments. A11 described an increase in student grades and standardized assessments and stated:

> All students have shown at least a 2% increase on the math benchmark post assessment at the end of school. The rising 8th-grade students have grades of C or

higher with no students failing math, and 60% of VM students performed proficiently on the state mandated math exam.

The administrators agreed that the VM program has helped the school meet the state's requirements and improve student growth. Four teachers and all administrators felt that students have shown growth on the CRCT and Milestones standardized assessment. Two teachers were excited to share the rewards students earned while using the program such as a community award and a top achievement school in the VM program. A12 stated, "We (the school) gained .05 for innovative practice on our CCRPI based on some of the gains that were made." A11 also stated that, "There are benefits of the VM program on student success because students can get individualized attention and programs designed to meet academic needs." Participants felt that students are benefiting from the program and have shown some growth.

According to A12, “I have noticed a significant increase in Star 360 math scores and in math progress assessment. Each grade level has made a 4% gain since the beginning of the year. This shows that the program is working.” A11 concurred with A12:, “The students are definitely making gains in mathematics in all grade levels. During a board presentation, we were happy to show how much our 8th graders had grown in mathematics; there was a 4% gain.” Five teachers reported that students who effectively use the program are able to revisit skills they may have forgotten and its help students grasp the concept better.

Some teachers and administrators felt that students did not show growth and achievement in the VM program. T2 shared, “The program impacts student achievement for these students because it helps them revisit skills that they may have forgotten or needed more remediation on.” T5 stated, “I have seen students answer questions that they probably would not have gotten correctly before taking the class. I have seen some growth in student’s assessments. A few of the students show some growth because they really work with the program.”

Although teachers and administrators reported student growth, two teachers and one administrator discussed an issue of students who continue to have a difficult time with mathematics and learning grade level concepts. T13 shared, “However, students who were successful in this program, continue to struggle with grade level concepts.” A12 shared, “We found that 8th grade math has been the most challenging for our students the skills and things that they did in the 7th grade in VM did not prepare them before we changed to GA milestones about 60% of the CRCT was algebra.” T14 stated, “They don’t know their basic math facts. They are so below grade level that they have to work on skills that are not on grade level.” Participants felt that students were not working on grade level.

The data analysis of the VM progress reports showed evidence of student growth and achievement and their performance in the program. On three of the six progress reports I found that the students showed growth in the modules by receiving points and rewards for completing the lessons and activities. The progress reports showed evidence of students progressing through the modules although some of the students have not met their goal. There is evidence on PR4 and PR5 that students have met goals and moved through the modules. Although I found evidence of growth on the progress reports, I also found that some students had not passed any of the tests because their scores were lower than 70%.

Although there were variations in the data, overall the theme that emerged was that student growth and achievement was high and improved with the VM program. This dominant theme was evidenced in the interview and progress report data. Students had showed growth when using the program and received trophies and rewards as a result of using the program.

Subquestion 2: What is the teacher's role in the delivery of the VM remediation program? Two themes emerged from the data analysis related to sub question two. The identified themes were (a) teachers effectively engage students in meaningful instruction and (b) teacher's role is beneficial in the learning environment. These themes characterize the teacher's role in the delivery of the VM program. The themes were developed from interviews, observations, and document analysis of lesson plans.

Theme 4: Teachers effectively engage students in meaningful instruction.

Teachers used teaching strategies and models that engaged students in the learning process. Evidence was visible in teacher observations and lesson plans that teachers used strategies to encourage higher-level thinking. Additionally, several teachers mentioned using strategies such as scaffolding to improve student learning. T3 stated:

> Scaffolding is used in the classroom to help improve student achievement. The" I do, you do, we do, now you do" helps the students with seeing the concept being worked out and working on achieving mastery or at least being able to grasp that math concept.

T4 provided an example of encouraging student success in the classroom through peer tutor. T4 stated, "When I see a struggling student I assign a peer tutor or classroom helper to help the students. This classroom helper is a student who is knowledgeable enough of that skill to help the other students." This encouragement shows teachers effectively engage students.

All five lesson plans included instructional strategies such as differentiated instruction. Students worked in collaborative groups to master the material given. OB1 showed the teacher used a variety of teaching strategies in the delivery of the VM remediation program. The teacher encouraged the students to use critical thinking skills by prompting answers and using guiding questions. Student learning was assessed by teacher responses and providing feedback to students.

Although there was evidence that teachers engaged students in meaningful instruction, there were some students off task during both observation, some students were off task. Teachers used strategies to refocus off task student attention to the classroom objectives. The teacher used nonverbal and verbal cues to get students on task.

During OB2, students were off task and the teacher used “give me five strategy” and the students began to raise their hands and stopped talking. This nonverbal cue restored order in the classroom and effectively engaged the students.

Lesson plan analysis indicated that teachers encouraged students to work at or above grade levels. The lesson plans listed purposefully aligned standards to classroom activities, assignments, and assessments. Teachers used standard based learning to address multiple learning styles and promote what students need to know and to be able to do in the classroom. All five lesson plans included state standards to help plan the curriculum and teach students what they need to know about the standard. In OB1, the learning targets were listed on the lesson plan to help teachers clearly communicate to students what they would learn and need to know as a result of the standards.

Theme 5: Teacher’s role is beneficial in the learning environment. The teacher’s role in the VM classroom is important in the learning effectiveness of the program. Teachers know what to teach and how to teach their students was evidenced in the data. T3 stated: “Guiding questions are used when I feel like students are struggling to understand a concept. I also use manipulatives in the classroom as well as the visual manipulatives on the VM program.” Teachers use positive reinforcement and modeling strategies to facilitate student learning. Evidence of teachers using immediate reward systems to encourage students to work toward achievement was seen in both observations. Extrinsic rewards are used to give students verbal praise and reward them for working hard. Although extrinsic rewards were reported and witnessed as a strategy that worked well in the VM class, I observed a student who received a candy bar but stopped working and became off task.

During both observations, teachers checked and monitored student progress. Teachers walked around the room to ensure that students were on task and were working efficiently. T3 explained that it is important not to overwhelm the students so one lesson is taught daily. Teachers arranged students’ desks so they could have visible access to the students and easily assess their needs. OB2 showed that the teacher monitored the classroom but stopped classroom instruction to get the students’ attention and restate the classroom rules and goals. Four lesson plans indicated that teachers had individual discussions with students about current course level gains, skills mastered, time spent on program, acceptable performance, and areas of difficulty.

Teachers created an environment that was suitable for all learning styles. Three teachers reported using manipulatives in the classroom to help kinetics learners master the concept. During OB1 the teacher was observed using guiding questions to help a student who was having trouble working on a problem. The lesson plans showed that the teachers were creating lessons with obtainable goals for students while following state standards and district curriculum. The goals tell the students what they will need to know, understand, and be able to do by the end of the week.

Discrepant Data

The research data addressed discrepant data that did not align with emerging themes (Creswell, 2014). During the review of the data, it was evident that there were discrepancies among a few participants. Although the data collected from the participants responses varied, I found some nonconforming data, such as evidence that a few teachers did not think highly of the VM program; thus, there were only a few discrepant cases within the study. In general, the teachers' and administrators' perceptions of the VM program were positive; however, many teachers felt the low degree of required student engagement and ownership makes it difficult to view the program as an effective learning tool. Teachers and administrators indicated a preference for learning opportunities in which students' mathematics learning could be applied for hands-on situation. Mathematics scenarios with open ended questions was a preference for most teachers and one administrator.

A11 felt that "the structure and delivery of the program needs to be revisited again." T13 and A12 also expressed concern about how VM does not align to the new standards. The teachers and administrators agreed that the program needed to be reviewed to align it with the new teaching standards. Administrators felt that the program could be more academically challenging, but student growth was evident that the program was an effective remedial mathematics program. T13 said, "The program lacks the academic rigor that is needed for student achievement. This program needs to be aligned to the Common Core Standards for Mathematics." A12 agreed with T13 by stating, "I did not see where it benefited them in given that we were preparing them to be successful with the math standards. The program is not aligned with the math standards and should be more aligned with the GSE."

Evidence of Quality

After the data were coded and themes were recognized for the research question, I shared the findings with the participants via member checking. Merriam (2002) identified member checking as a tool to ensure validity. Member checking was selected in this study so that participants could view tentative findings and determine if I was successful in capturing their ideas, experiences, and interactions via interpretations. After each interview was transcribed and interpreted, I asked the participants to review a summary of their comments. At this time the participants were provided an opportunity to comment and make corrections from my interpretations. Revisions of the interview responses were made and included in the findings.

Triangulation was another strategy used for validation of the study. The triangulation strategy was used to compare emerging themes across multiple data sources. This strategy is valuable because it maintains the accuracy of findings in the study (Merriam, 2002). The triangulated data revealed commonality of related codes, which were combined to uncover the central themes for the study. I triangulated the data collected via teacher and administrators interviews, classroom observations, and related documents.

Summary

In summary, data were collected from interviews, observations, and related documents and underwent a process by which data were generated, gathered, and recorded. This section identified the preparing and collecting data, recording data, and data results. The data were analyzed to answer one research question. Findings from the analysis was presented as a qualitative narrative. The following themes emerged from the research question: (a) student ownership and accountability was low, (b) student engagement and motivation was low (c) student growth and achievement was high, (d) teachers effectively engage students, and (e) teachers' role is beneficial in the classroom.

Section 5 includes an overview of why and how the study was conducted. A detailed overview of the interpretation of findings is discussed. The implication for social change is also discussed. Additionally, reflections on my experience and conclusions drawn are presented.

Section 5: Discussion, Conclusions, and Recommendations

Introduction

This qualitative study was conducted to discover teachers' perceptions of the implementation of VM as a tool for remediation to improve students' performance in mathematics. This study took place at a middle school in the southeastern United States. The VM program was adopted because of continuous low achievement in mathematics. The central question addressed in this study was: How do teachers implement the VM program and how do they perceive mathematics learning effectiveness? Subquestions that helped answer the guiding question were as follows: (a) What are the teachers' perceptions about the effectiveness of the VM remediation program? (b) What is the teacher's role in the delivery of the VM remediation program?

Seven semistructured interview questions were generated to capture the perceptions of the teachers, who are expected to prepare students for concept mastery, so that they can perform well on high-stakes assessments. The findings were organized according to research questions.

Interpretation of Findings

In Section 4, results from this qualitative case study were presented through interview responses from teachers and administrators, classroom observations, and analysis of related documents (teacher lesson plans and student progress reports). Five themes were identified through the data collection and analysis process: (a) student ownership and accountability was low, (b) student engagement and motivation was low

(c) student growth and achievement was high, (d) teachers effectively engage students, and (e) teachers' role is beneficial in the classroom. The interpretations of findings include a conclusion that addresses the central research question, namely, how do teachers implement the VM program and how do they perceive mathematics learning effectiveness? This interpretation also relates the findings to the conceptual framework and the literature.

Discovery Learning

Aligned with Bruner's (1961) discovery learning, the findings of this study conveyed how teachers encourage students to become self-motivated and self-directed learners while working on challenging assignments in the classroom. This study described participants' perceptions of a remediation program and how it was implemented to promote student achievement. Discovery learning has been linked to the teaching and learning of mathematics. Through it, students can use their prior knowledge to reach their learning goal. The teachers in the VM program used strategies, such as scaffolding, to help students discover the answers to the questions in the classroom. Students should discover learning with the help of the teacher asking questions and supporting critical thinking skills (Janssen et al., 2014; Mukherjee, 2015). The findings include the idea that the role of the teacher is beneficial and that the perception that student ownership must be evident. Both are consistent with the discovery learning idea, which is to encourage students to become self-motivated learners.

Social Constructivism

The social constructivist theory is based on the principle that students are actively engaged in the learning process and that they receive encouragement and support from their teacher (Schreiber & Valle, 2013). The findings of this study convey how teachers implemented the VM program to help students connect concepts learned in the program to the actual instructional content taught in the classroom. This connection helps to create classroom experiences that expand student learning. The teachers should show students that the work is valuable for students to want to achieve the goal. The findings that teachers encouraged students through the use of rewards and praise to encourage students to become self-motivated and independent workers is consistent with the social constructivist theory, which says that meaning is created through the interactions with others and reactions to expectations.

Social constructivism emphasizes learning that occurs through interactions with others (Schreiber & Valle,2013). Students working together to understand the concepts in a VM classroom creates meaningful learning communities. Student gain a better understanding of the concepts when they interact with other students or through whole group discussion. Teachers used collaboration with students to improve student performance in the classroom (Ahn, Ingham, & Mendez, 2016). Students worked to achieve a goal and to gain an understanding of the learning targets by drawing on the knowledge of their peers (Schreiber & Valle, 2013). Alfieri et al. (2011) explained that teachers could encourage students to become self-motivated and independent while working on challenging assignments. The findings that teachers who effectively engage students through the use of scaffolding and collaboration with peers encourage independent learning.

Expectancy Theory

Aligned with Vroom's (1964) expectancy theory, the findings convey how teachers felt that students must be motivated to do the work to get the results they expect to achieve. Teachers believed that students who take the program seriously will see some growth. If an individual puts forth effort then that effort will produce a positive outcome that is useful to the individual (Lambright, 2010; Legewie & DiPrete, 2012). The student must believe the task is obtainable to put forth the effort (Robinson-Cimpian et al., 2014). The expectancy theory connects the motivation an individual has with the work they perform (Caulfield, 2007). When students are self-starters, motivated intrinsically, and are encouraged by teachers then student growth and achievement will show.

Summary of Findings

The central research question focused on how teachers implemented the VM program and their perception of learning mathematics effectiveness. The participants expressed their thoughts about the VM program and about the learning effectiveness of the program. The findings detailed the participants' perceptions about the roles students and teachers share in the program. The teacher and administrator perceptions of learning effectiveness revealed that students need to be held accountable and to take an active role in their learning. Ten of the teachers believed that for the program to be successful and realize student growth, the students must be intrinsically motivated and have a desire to be successful in the program.

Overall, I discovered that teachers and administrators perceived the VM program to be a positive program to improve student performance via the use of strategies (i.e., small group, scaffolding), modeling, and student conferences. The teachers' and administrators' perceptions revealed that students and teachers are important in the planning and execution of the VM program to help improve student performance. I also discovered that teachers used strategies, activities, modeling, and positive encouragement and reinforcement to implement the VM program.

Student ownership and accountability was identified as a barrier with the program. The lack of student autonomy can affect how students perform in the VM program (Fulmer & Turner, 2014). Student investment in the program helps students become self-starters and gain initiative in the program. Participants often reported that most students were working in the program due to their placement in the class. Participants in this study believed students are not intrinsically motivated and will need to become self-directed learners to show growth in the program. Student ownership in the VM program will require students to invest time and effort in the program to improve learning.

Student engagement and motivation presented a challenge for teachers within the program. For some teachers, student interest in the program was low and presented some challenges for student learning. Orange and Murakami-Ramalho (2013) have suggested that self-efficacy is an important quality that is needed for students to achieve success. Fredricks et al., (2016) explained that student engagement lessens during middle to high school transitions. Fredricks (2016) discussed three types of engagement that are often present when discussing engagement which are emotional, cognitive, and behavioral engagement. In this study many participants reported at least one type of engagement. Participants reported students who exhibited off task behavior and who did not work to their potential. Student deficiencies were discussed by participants as a reason why students may be off task and not engaged in the program. Supports should be put in place which will help teachers to guide students toward competency to develop the skills for success (Janssen, Westbroek, & Van Driel, 2014). One participant shared an example of a student who had deficiencies, but worked hard to improve in the VM class. Nine teachers agreed that students who want to achieve will take the VM program seriously. Student support and encouragement may be the strategy for overcoming this barrier.

The teachers who participated in the study had high expectations about student growth and achievement. Student growth and achievement is beneficial because it gives students motivation and opportunities to advance academically with skills and concepts of mathematics and prepares students for better career choices (Peterson et al., 2011; Vigdor, 2013). Participants shared examples of student achievement and rewards from students in the program. Improving this achievement in mathematics is important when bridging the gap between at risk and students on grade level (Bahr, 2008, 2010).

Teachers effectively engaged students in meaningful instruction to provide student support. Teacher participants communicated teaching standards effectively for students to discover the targeted information to achieve the learning goal. In'am & Hajar (2017) suggested that teachers should help facilitate student learning so that students are able to apply the knowledge to other concepts. Participants held conferences to give feedback to students so that the instruction and information obtained becomes meaningful. Participants used a variety of teaching strategies in the classroom to help students discover learning. Students should not only learn knowledge and facts, but interpret the information by asking questions, evaluating the information, and thinking critically (Mukherjee, 2015). Teachers who effectively engage students create knowledgeable and self-directed learners.

There is a discrepancy in the following data between the themes: (a) student motivation and engagement and (b) student growth and achievement. The teachers and administrators discussed off-task student behavior in their interviews and it was evidenced in the data. Although students may not be motivated, the constant rote repetition daily contributed to the growth and achievement that was evidenced in the data. Students should be able to recall information due to the repetition of working in the program and the concepts learned in class.

The teacher's role in the classroom is beneficial because it provides consistent opportunities for teachers to integrate new teaching strategies and increase student achievement (Burton, 2012; Fulmer & Turner, 2014; Zwiep & Benken, 2013). Teachers in the study used strategies in the classroom to present challenging instruction to students and monitored student progress and keep them engaged in the learning environment. The teachers who were observed used challenging instruction to activate student's higher-level thinking. Teachers created lessons that support student content knowledge and help develop skills for success (Fulmer & Turner, 2014). The teacher lesson plans included small group instruction, student collaboration, and curriculum based standards to help students meet the class goals and includes rigorous content. Vygotsky identified cognitive growth as the Zone of Proximal Development (ZPD) which describes a child's growth as being encircled by his potential and the accomplishment through the guidance of a teacher or a knowledgeable peer tutor (Malik, 2017; Wass, & Golding, 2014). Through the use of ZPD teachers will help students transition to the next level of thinking.

Implications for Social Change

Closing the achievement gap is one of the biggest challenges that many states face (NGACBP, 2013). School officials across the nation are searching for meaningful and engaging ways to improve student achievement. This study contributes to social change by informing educational leaders, educators, policy makers, and stakeholders related to curriculum programs of the perceived learning effectiveness of VM within one pubic school in Georgia. It is important for the school board to understand the teachers' experiences and the perceived effects of the VM program because teachers are expected to prepare their students for academic achievement while providing meaningful learning experiences. The findings from this study may provide educators and educational leaders with more research related to how VM is implemented and the perceived effect on teacher's instructional practices. The findings could lead educational leaders to provide professional development classes for educators who implement the program to improve student engagement and student motivational strategies and allow teachers to have a voice by sharing their experiences with VM. The findings could also lead educators to understanding what works for students who are having difficulties in mathematics. This change could lead to educators understanding the key strategies that can be used in the VM program to engage, motivate, and empower students to become successful.

Recommendations for Action

Although the VM program was found to be a good tool for mathematics remediation, there is still a need to include effective strategies for increasing student math achievement. Thus, the following recommendations for action are offered because of the findings from the classroom observations and semi-structured interviews that the VM program needs to be aligned to the state's curriculum. The findings included discrepant data of teachers and administrators perceptions' of the data. All educators expressed a preference for learning opportunities in which students' mathematics learning could be applied for hands-on situations. In addition, educators felt that the program needed to be reviewed to align it with the new teaching standards. Align the program with the adopted State Department of Education's Standards of Excellence to ensure a balanced curriculum. This will aid the teacher in ensuring the students are prepared to succeed on state-mandated tests. Last, the administrators agreed that the program could be more academically challenging.

1. Provide the students with a more academically challenging curriculum. Include supplemental activities in addition to those provided in the program. This will help some students who may be bored to remain on task or be more engaged because of the diverse assignments.
2. Explain the importance of and the relationship between effort and achievement to the students on the first day in the program and continually reminding them throughout the program. Explain that the amount of effort they put into the tasks has a direct impact on achievement.
3. Know the needs of the students enrolled in the program and devise individualized instructional plans when needed, as a supplement to the program curriculum. This will help the students excel and be more engaged because they will be focused on specific areas of need.

Educational leaders and students who are serious about improving mathematics achievement should be interested in the results of this study. They will be shared with the district superintendent and the building principal in which the study was conducted.

Recommendations for Further Study

The purpose of this study was to discover teachers' perceptions of the VM remedial math program. This study was conducted at one site; thus, the following recommendations for further research are made on topics that need closer examination:

1. Conduct further studies in multiple schools that have utilized the VM program for student improvement to examine how teachers and schools implement the program.
2. Conduct further studies in multiple schools that have utilized the VM program for student improvement to examine teachers' perceptions of learning effectiveness.
3. Conduct further studies to compare the VM program with other math interventions for student improvement.
4. Conduct a longitudinal mixed-method study to acquire a deeper understanding of the implementation of the VM program regarding mathematics learning effectiveness.
5. Conduct further studies with an increase in the size of the sample used for this study and include a student sample.
6. Conduct further studies to include a variety of student subgroups to measure VM effect on student achievement.

Summary

This qualitative study assessed the effectiveness of the VM program implementation and the perceptions of VM teachers. The study found that teachers and administrators perceived the VM program to a positive program for learning effectiveness. The study also found that teachers use teaching strategies, modeling, and collaboration to improve student improvement. The study identified five themes: (a) student ownership and accountability was low, (b) student engagement and motivation was low (c) student growth and achievement was high (d) teachers effectively engage students in meaningful instruction, and (e) teachers' roles are beneficial in the learning environment.

It is important for educational leaders to know how teachers perceive VM and the effectiveness of learning. Educational leaders and stakeholders can learn and make changes based on the results of this study. The findings of this study demonstrate how important it is for educators to have a voice by sharing their experiences from the VM program. The results of this study could lead to professional development classes for educators who implement the VM program. It is important for educators to have a voice and share their experiences about the VM program.

Reflections

In reflecting on this study, I found that overcoming any obstacle was possible. The work was tedious, but it developed competence and capacity. With each collection of data, I became more competent in identifying actions, words, and behaviors that were essential to the themes in the data analysis process. In conducting the study, I became aware of a change in thought processes and more confident in decision making. It was especially evident in viewing and ensuring that the emerging patterns were accurate and the selected interview questions were relevant. Also, examining relationships in the data helped give me better understand the data analysis process. When reviewing the transcripts, I began to understand how the data connected to the literature. The relationships and patterns began to emerge while transcribing, reading, and organizing the data. These findings emerged into categories then into themes that helped me generalize.

While collecting interview data, I learned to listen to the tone of the interviewees' voice. By doing so, I heard more than just the words communicated by each participant. The feelings driving their perceptions and practices were also heard. These feelings influenced the way I understood the participants and their passion for educating struggling students.

Educators are constantly looking for innovative ways to educate today's youth and to close the achievement gap. With new accountability measurements for states, educational leaders in the school district and at the site of this study are searching for strategies designed to prepare students for standardized assessments in mathematics. Because teachers are a valuable commodity to the educational culture, a review of their perceptions on programs designed to help struggling students is very important. This study on teachers' perceptions presented themes that explained that the effectiveness of VM, a program designed to help struggling students in mathematics. The data revealed that VM teachers believe student ownership, motivation, and delivery of strategies, and student growth and achievement are very important factors in the VM program and are needed for overall success in student and school achievement in mathematics. Teachers can motivate students to work hard; therefore, it is important for educational communities to listen to the voices of classroom teachers. This can result in a positive social change within school communities. An analysis of data in this study revealed that teachers believed that effectively engaging students, motivating students enrolled in VM, holding them accountable for staying on task and completing assignments, and effectively implementing the VM program can increase the learning effectiveness of VM. Also, it was also revealed that effectively implementing the VM program could aid in building student confidence in the learning process, which should be the focus of all schools.

References

Abbott, C. (2013). The "Race to the Top" and the inevitable fall to the bottom: How the principles of the "campaign for fiscal equity" and economic integration can help close the achievement gap. *Brigham Young University Education & Law Journal*, (1), 93-123.

Adelman, C. (2004). *Principal indicators of student academic histories in postsecondary education*, *1972-2000*. Washington, DC: Institute of Education Sciences.

Allahyar, N., & Nazari, A. (2012). Potentiality of Vygotsky's sociocultural theory in exploring the role of teacher perceptions, expectations and interaction strategies. *WoPaLP*, *6*, 79-92.

Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2011). Does discovery-based instruction enhance learning?. *Journal of Educational Psychology*, *103*(1), 1-18. doi:10.1037/a0021017

Andersen, L., & Ward, T. J. (2014). Expectancy-value models for the STEM persistence plans of ninth-grade, high-ability students: A comparison between black, Hispanic, and white students. *Science Education*, *98*(2), 216-242. doi:10.1002/sce.21092

Ahn, R. r., Ingham, S., & Mendez, T. (2016). Socially constructed learning activity: Communal note-taking as a generative tool to promote active student engagement. *Transformative Dialogues: Teaching & Learning Journal, 8*(3), 1-15

Akpan, P., Saunders, P. (2017). From shame to mindfulness and self-compassion: A teacher's journey to greater self-efficacy. *JISTE, 21*(2), 41-49.

Aksu, Z., Ozkaya, M., Gedik, S., & Konyalioglu, A. (2016). Mathematics self-efficacy and mistake-handling learning as predictors of mathematics anxiety. *Journal of Education and Training Studies*, *4*(8), 65-71.

Atlas ti. (2017). Atlas ti. qualitative data analysis. Retrieved from http://atlasti.com/product/what-is-atlas-ti/

Badertscher, N., & McWhirter, C. (2010, August 24). Race to the top win means $400 million for Georgia. *Atlanta Journal Constitution*. Retrieved from http://www.ajc.com/news/race-to-the-top-598171.html

Bahr, P. (2007). Double jeopardy: testing the effects of multiple basic skill deficiencies on successful remediation. *Research in Higher Education, 48*(6), 695-725. doi:10.1007/s11162-006-9047-y

Bahr, P. (2008). Does mathematics remediation work?: A comparative analysis of academic attainment among community college students. *Research in Higher Education*, *49*(5), 420-450. doi:10.1007/s11162-008-9089-4

Bahr, P. (2010). Preparing the underprepared: An analysis of racial disparities in postsecondary mathematics remediation. *Journal of Higher Education, 81*(2), 209-237.

Baker, K., & Harter, M. E. (2015). A living metaphor of differentiation: A meta-ethnography of cognitively guided instruction in the elementary classroom. *Journal of Mathematics Education At Teachers College*, *6*(2), 27-35.

Barak, M. (2014). Closing the gap between attitudes and perceptions about ICT-enhanced learning among pre-service STEM teachers. *Journal of Science Education & Technology*, *23*(1), 1-14. doi:10.1007/s10956-013-9446-8

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, *13*(4), 544-559. Retrieved from http://www.nova.edu/ssss/QR/QR13-4/ballard.pdf

Beal, C. R., Rosenblum, L. P., & Smith, D. W. (2011). A pilot study of a self-voicing computer program for prealgebra math problems. *Journal of Visual Impairment & Blindness*, *105*(3), 157-169.

Beilock, S., & Maloney, E.(2015). Math anxiety: A factor in math achievement not to be ignored. *Behavioral and Brain Sciences, 2*(1) 4–12

Bellamy, J., & Mativo, J. (2010). A different angle for teaching math. *Technology Teacher*, *69*(7), 26-28.

Blackford, K., & Khojasteh, J. (2013). Closing the achievement gap: Identifying strand score differences. *American Journal of Business Research*, *6*(2), 5-15.

Blair, N. (2012). Technology integration for the "new" 21st century learner. *Principal*, *91*(3), 8-11.

Bofill, L. (2013). Constructivism and collaboration using web 2.0 technology. *Journal of Applied Learning Technology*, *3*(2), 31-41.

Bottge, B., Grant, T., Stephens, A, & Rueda, E. (2010). Advancing the math skills of middle school students in technology education classrooms. *NASSP Bulletin*, 94(2), pp.81-106.

Bruner, J. (1960). *The process of education.* Cambridge, Mass.:Harvard University Press.

Bruner, J. (1961). The act of discovery. *Harvard Educational Review, 31*, 21-32.

Bruner, J. S. (2006). *In search of pedagogy: The selected works of Jerome S. Bruner, volume 1*. Florence, KY: Routledge.

Bryant, D. P., Bryant, B. R., Roberts, G., Vaughn, S., Pfannenstiel, K., Porterfield, J., & Gersten, R. (2011). Early numeracy intervention program for first-grade students with mathematics difficulties. *Exceptional Children*,*78*(1), 7-23.

Burns, M. K., Kanive, R., & DeGrande, M. (2012). Effect of a computer-delivered math fact intervention as a supplemental intervention for math in third and fourth grades. *Remedial and Special Education, 33*(3) 184– 191.

Burton, M. (2012). What is math? Exploring the perception of elementary pre-service teachers. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, *5.*

Cambium Learning, Inc. (2010). VM research foundations and design. Retrieved from http://www.voyagerlearning.com/docs/default-source/white-papers/wp_VM.pdf?sfvrsn=2

Change the Equation. (2010). *Georgia STEM vital signs*. Washington, DC: Author.

Cheema, J. R., & Galluzzo, G. (2013). Analyzing the gender gap in math achievement: Evidence from a large-scale United States sample. *Research in Education*, (90), 98-112. doi:10.7227/RIE.90.1.7

Cheryan, S. (2012). Understanding the paradox in math-related fields: Why do some gender gaps remain while others do not? *Sex Roles*, *66*(3/4), 184-190. doi:10.1007/s11199-011-0060-z

Cicconi, M. (2014). Vygotsky meets technology: A reinvention of collaboration in the early childhood mathematics classroom. *Early Childhood Education Journal*, *42*(1), 57-65.

Cimpian, J., Lubienski, S., Timmer, J., Makowski, M., & Miller, E. (2016). Have gender gaps in math closed? Achievement, teacher perceptions, and learning behaviors across two ecls-k cohorts. *AERA Open, 2*(4), 1-19. doi:10.1177/2332858416673617

Creswell, J. (2014). *Research design: Qualitative*, *quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications.

Creswell, J. (2015). *30 essential skills for the qualitative researcher*. Thousand Oaks, CA: Sage Publications.

Creswell, J. (2017). *Qualitative inquiry and research design: Choosing among five approaches.* Thousand Oaks, CA: Sage Publications.

Crosnoe, R., Leventhal, T., Wirth, R. J., Pierce, K. M., & Pianta, R. C. (2010). Family socioeconomic status and consistent environmental stimulation in early childhood. *Child Development*, *81*(3), 972-987. doi:10.1111/j.1467-8624.2010.01446.x

Dickerson, D., Eckhoff, A., Stewart, C., Chappell, S., & Hathcock, S. (2014). The examination of a pullout STEM program for urban upper elementary students. *Research In Science Education*, *44*(3), 483-506.

Elder, C., Nidich, S., Colbert, R., Hagelin, J., Grayshield, L., Oviedo-Lim, D., & ... Gerace, D. (2011). Reduced psychological distress in racial and ethnic minority students practicing the transcendental meditation program. *Journal of Instructional Psychology*, *38*(2), 109-116.

Ellison, G., & Swanson, A. (2010). The gender gap in secondary school mathematics at high achievement levels: Evidence from the American mathematics competitions. *The Journal of Economic Perspectives, 24*(2), 109-128. Retrieved from http://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.24.2.109

Finkel, E. (2010). Black children still left behind. *District Administration*, *46*(10), 26-30. Retrieved from http://www.districtadministration.com/viewarticle.aspx?articleid=2635

Firmender, J., Gavin, M., & McCoach, D. (2014) Examining the relationship between teachers' instructional practices and students' mathematics achievement. *Journal of Advanced Academics, 25*(3), 214-236.

Flint, E. (2015). Engaging social constructivist teaching in the diverse learning environment; perspectives from a first year faculty member. *Higher Education for the Future, 3*(1), 38–45.

Fredricks, J., Wang, M., Schall Linn, J., Hofkens, T., Sung, H., Parr, A., & Allerton, J. (2016). Using qualitative methods to develop a survey measure of math and science engagement. *Learning & Instruction*, *43*5-15.

Fuchs, L. S., Powell, S. R., Seethaler, P. M., Cirino, P. T., Fletcher, J. M., Fuchs, D., & Hamlett, C. L. (2010). The effects of strategic counting instruction, with and without deliberate practice, on number combination skill among students with mathematics difficulties. *Learning and Individual Differences*, *20*(2), 89-100. f

Fulmer, S. M., & Turner, J. C. (2014). The perception and implementation of challenging instruction by middle school teachers. *Elementary School Journal*, *114*(3), 303-326.

Furner, J. M., & Gonzalez-DeHass, A. (2011). How do students' mastery and performance goals relate to math anxiety? *EURASIA Journal of Mathematics, Science & Technology Education*, *7*(4), 227-242.

Georgia Department of Education. (2014). College and career ready performance index. Retrieved from http://www.gadoe.org/CCRPI/Pages/default.aspx

Georgia Department of Education (2014). *Remedial Education Program.* Retrieved from https://www.gadoe.org/Curriculum-Instruction-and-Assessment/Curriculum-and-Instruction/Pages/Remedial-Education-Program.aspx

Georgia Department of Education. (2011). *Title I: Part A supplemental educational services (SES)*. Retrieved from http://www.doe.k12.ga.us/School-Improvement/Federal-Programs/Pages/Supplemental-Educational-Services.aspx

Georgia Department of Education. (2010). *What is the purpose of the CRCT?* Retrieved from http://www.doe.k12.ga.us/Curriculum-Instruction-and-Assessment/Assessment/Pages/CRCT.

Gillham, B. (2010). *Continuum research methods: Case study research methods (1*). London, GB: Continuum. Retrieved from http://www.ebrary.com.

Glesne, C. (2011). *Becoming qualitative researchers: An introduction*. Boston, MA: Pearson Education, Inc.

Goodson-Espy, T., Cifarelli, V., Pugalee, D., Lynch-Davis, K., Morge, S., & Salinas, T. (2014). Applying NAEP to improve mathematics content and methods courses for preservice elementary and middle school teachers. *School Science & Mathematics*, *114*(8), 392-404. doi:10.1111/ssm.12093

Goodman, C. (2014). Now children learn better: revising NCLB to promote teacher effectiveness in student development. *University of Maryland Law Journal of Race, Religion, Gender & Class, 14(1),* 84-123.

Gottfried, A. E., Marcoulides, G. A., Gottfried, A. W., & Oliver, P. H. (2013). Longitudinal pathways from math intrinsic motivation and achievement to math course accomplishments and educational attainment. *Journal of Research on Educational Effectiveness*, *6*(1), 68-92. doi:10.1080/19345747.2012.698376

Governor's Office of Student Achievement. (2011). *2009-2010 Report Card*. Retrieved from http://reportcard2010.gaosa.org/(S(wagclizdsnmxanep4c5w0t45))/k12/demographics.aspX?ID=611:505&TestKey=EnR&TestType=demographics

Gravetter, F., & Forzano, L. (2012). *Research methods for the behavioral sciences*. Belmont, CA: Wadsworth.

Hancock, D.R., & Algozzine, R. (2006) *Doing case study research: A practical guide for beginning researchers.* New York: Teachers College Press.

Hansen, M., & Gonzalez, T. (2014). Investigating the relationship between STEM learning principles and student achievement in math and science. *American Journal of Education*, *120*(2), 139-171.

Higgins, K., Huscroft-D'Angelo, J., & Crawford, L. (2017). Effects of technology in mathematics on achievement, motivation, and attitude: A meta-analysis. *Journal of Educational Computing Research*, 0(0), 1-37. doi:10.1177/0735633117748416

Hines, I. T., & Kritsonis, W. A. (2011). The interactive effects of race and teacher self efficacy on the achievement gap in school. *National Forum of Multicultural Issues Journal*, *9*(1), 1-14.

House, J. (2013). NCLB waivers: Good news and bad news. *T.H.E. Journal*, *40*(2), 8-10.

Howell, J. S. (2011). What influences students' need for remediation in college? Evidence from California. *Journal of Higher Education*, *82*(3), 292-318.

Hoyt, J., & Sorensen, C. (2001). High school preparation, placement testing, and college remediation. *Journal of Developmental Education*, *25*(2), 26.

In'am, A., & Hajar, S. (2017). Learning geometry through discovery learning using a scientific approach. *International Journal of Instruction*, *10*(1), 55-70.

Jansen, A., Bartell, T. (2013). Caring mathematics instruction: Middle school students' and teachers' perspectives. *Middle Grades Research Journal, 8*(1), 2013, 33–49

Janssen, F., Westbroek, H., & van Driel, J. (2014). How to make guided discovery learning practical for student teachers. *Instructional Science: An International Journal of the Learning Sciences*, *42*(1), 67-90.

Kaufman, A., & Blewett, E. (2012). When good enough is no longer good enough: How the high stakes nature of the no child left behind act supplanted the Rowley definition of a free appropriate public education. *Journal of Law & Education*, *41*(1), 5-23.

Kiger, D., Herro, D., & Prunty, D. (2012). Examining the influence of a mobile learning intervention on third grade math achievement. *Journal of Research on Technology in Education*, *45*(1), 61-82.

Kritzer, K., & Pagliaro, C. M. (2013). An intervention for early mathematical success: Outcomes from the hybrid version of the building math readiness parents as partners (MRPP) project. *Journal of Deaf Studies & Deaf Education*, *18*(1), 30-46. doi:10.1093/deafed/ens033

Kroeger, L., Brown, R., & O'Brien, B. (2012). Connecting neuroscience, cognitive, and educational theories and research to practice: A review of mathematics intervention programs. *Early Education & Development, 23*(1), 37-58. doi:10.1080/10409289.2012.617289

Lambright, K. T. (2010). An update of a classic: Applying expectancy theory to understand contracted provider motivation. *Administration & Society*, *42*(4) 375 – 403. doi:10.1177/0095399710362714

Lee, J., & Wu, Y. (2017). Is the Common Core racing America to the top? Tracking changes in state standards, school practices, and student achievement. *Education Policy Analysis Archives*, *25*(35), 1-23.

Legewie, J., & DiPrete, T. (2012). School context and the gender gap in educational achievement. *American Sociological Review, 77*(3), 463-485. doi:10.1177/0003122412440802

Lindenberg, A., Henderson, K., & Durán, L. (2016). Using technology and mentorship to improve teacher pedagogy and educational opportunities in rural Nicaragua. *Global Education Review, 3*(1), 66-87.

Lodico, M., Spaulding, D., and Voegtle, K. (2010). *Research methods for the social sciences: Methods in educational research: from theory to practice (2*). Hoboken, US: Jossey-Bass.

Lopez, S., & Patron, H. (2012). Multiple intelligences in online, hybrid, and traditional business statistics courses. *Journal of Educators Online*, *9*(2).

Malik, S. (2017). Revisiting and re-representing scaffolding: The two gradient model. *Cogent Education*, *4*(1), 1-13. doi:10.1080/2331186X.2017.1331533

Mansour, N. (2013). Modelling the sociocultural contexts of science education: The teachers' perspective. *Research in Science Education*, *43*(1), 347-369.

May, T. (Ed.). (2002). *Qualitative research in action*. London: SAGE. Retrieved from http://www.ebrary.com

McBride, D. (2011). Sociocultural theory: Providing more structure to culturally responsive evaluation. *New Directions for Evaluation*, (131), 7-13. doi:10.1002/ev.371

McNeil, M. (2012). States punch reset button under NCLB. *Education Week*, *32*(8), 1.

McNeil, M. (2012). Waiver hopefuls put through paces by review process. *Education Week*, m*31*(21), 1.

Merriam S. (2002). Qualitative research in practice. Examples for discussion and analysis. San Francisco: Jossey-Bass Publishers.

Meyer, R. J. (2013). The truth behind manufactured malpractice: The impacts of NCLB upon literacy teaching and learning. *New England Reading Association Journal*, *49*(1), 1-6.

Moller, S., Mickelson, R., Stearns, E., Banerjee, N., & Bottia, M. (2013). Collective pedagogical teacher culture and mathematics achievement: Differences by race, ethnicity, and socioeconomic status. *Sociology of Education 86*(2), 174–194.

Mönks, F. (2014). No Child Left Behind and the impact of Kurt Heller's work. *Journal for the Education of The Young Scientist & Giftedness*, *2*(1), 33-39.

Mukherjee, A. (2015). Effective use of discovery learning to improve understanding of factors that affect quality. *Journal of Education for Business*, *90*(8), 413-419. doi:10.1080/08832323.2015.1081866

Naizer, G., Hawthorne, M. J., & Henley, T. B. (2014). Narrowing the gender gap: enduring changes in middle school students' attitude toward math, science and technology. *Journal of STEM Education: Innovations & Research*, *15*(3), 29-34.

National Assessment of Educational Progress. (1988). *The mathematics report card: Are we measuring up?* Princeton, NJ: Educational Testing Service.

National Assessment of Educational Progress. (2013). *The nation's report card*. http://www.nationsreportcard.gov/reading_math_2013/#/

National Center for Education Statistics. (2007). *Trends in international mathematics and science study: 2007 results*. [Online] Available: http://nces.ed.gov/ Timss/results07.asp

National Center for Education Statistics (2013). The nation's report card: Trends in academic progress 2012. NCES 2013-456. *National Center for Education Statistics*

National Center for Education Statistics (2014). *Mathematics assessment.* Retrieved from http://nces.ed.gov/nationsreportcard/mathematics

National Governors Association Center for Best Practices (2014). *Closing the achievement gap.* Retrieved from http://www.subnet.nga.org/educlear/achievement/

National Governors Association Center for Best practices. (2013). *A governor's guide to early literacy: Getting all students reading by third grade*. Retrieved from http://www.nga.org/files/live/sites/NGA/files/pdf/2013/1310NGALiteracyReportWeb.pdf

Neill, M., & Mathews, J. (2009). Does the use of technological interventions improve student academic achievement in mathematics and language arts for an identified group of at-risk middle school students? *Southeastern Teacher Education Journal*, *2*(1), 57-65.

Nidich, S., Mjasiri, S., Nidich, R., Rainforth, M., Grant, J., Valosek, L., & ... Zigler, R. L. (2011). Academic achievement and transcendental meditation: A study with at-risk urban middle school students. *Education*, *131*(3), 556-564.

Niederle, M., & Vesterlund, L. (2010). Explaining the gender gap in math test scores: The role of competition. *The Journal of Economic Perspectives, 24*(2), 129-144. doi:http://dx.doi.org/10.1257/jep.24.2.129

Ottmar, E., Konold, T., Berry, R., Grissmer, D., & Cameron, C. (2013). Increasing equity and achievement in fifth grade mathematics: The contribution of content exposure. *School Science & Mathematics*, *113*(7), 345-355.

Orange, C., & Murakami-Ramalho, E. (2013). Reducing the need for postsecondary remediation using self-efficacy to identify underprepared African-American and

Hispanic adolescents. *Electronic Journal of Research in Educational Psychology*, *11*(1), 51-74.

Ornstein, A. (2010, September). Achievement gaps in education. *Society*. pp. 424-429. doi:10.1007/s12115-010-9354-y.

Opitz, E., Freesemann, O., Prediger, S., Grob, U., Matull, I., & Hubmann, S. (2017) Remediation for students with mathematics difficulties: An intervention study in middle schools. *Journal of Learning Disabilities, 50*(6), 724-736.

Pearson Education Inc. (2013). SuccessMaker. Retrieved from http://www.pearsonschool.com/index.cfm?locator=PSZkAe

Peterson, P. E., & Kaplan, P. (2013). Despite common core, states still lack common standards. *Education Next*, *13*(4), 44-49.

Peterson, P. E., Woessmann, L., Hanushek, E. A., Lastra-Anadon, C. X., & Harvard University, P. (2011). Globally challenged: Are U.S. students ready to compete? the latest on each state's international standing in math and reading. PEPG 11-03. *Program on Education Policy & Governance,* Harvard University

Petrová, Z. (2013). On the relevancy of using Vygotsky's theoretical framework to legitimize dialogic teaching/learning. *Journal of Pedagogy, 4*(2), 237-252.

Pole, K. (2007). Mixed method designs: A review of strategies for blending quantitative and qualitative methodologies. *Mid-Western Educational Researcher*, *20*(4), 35-38.

Poole, J., Carter, G., Johnson, E., & Carter, D. (2012). The use and effectiveness of a targeted math instruction for third graders. *Intervention in School and Clinic, 48*(4), 210-217.

Posey, L. (2014). No waiver left behind. *State Legislatures*, *40*(6), 25-27.

Ramirez, G., Gunderson, E. A., Levine, S. C., & Beilock, S. L. (2013). Math anxiety, working memory, and math achievement in early elementary school. *Journal of Cognition and Development*, *14*(2), 187-202.

Rave, K., & Golightly, A. (2014). The effectiveness of the rocket math program for improving basic multiplication fact fluency in fifth grade students: A case study. *Education*, *134*(4), 537-547.

Reardon, S. F., Greenberg, E., Kalogrides, D., Shores, K. A., & Valentino, R. A. (2012). *Trends in academic achievement gaps in the era of No Child Left Behind*. Evanston, Illinois: Society for Research on Educational Effectiveness.

Renaissance Learning. (2010). The research foundation for accelerated math. Wisconsin Rapids, WI: Author. Available online from http://doc.renlearn.com/KMNet/R004106411GH22F8.pdf

Riegle-Crumb, C., & Grodsky, E. (2010). Racial-ethnic differences at the intersection of math course-taking and achievement. *Sociology of Education, 83*(3), 248-270. doi:10.1177/0038040710375689

Riordan, R., Hine, M., & Smith, T. (2017). An integrated learning approach to teaching an undergraduate information systems course. *Journal of Information Systems Education, 28*(1), 59-69.

Robinson-Cimpian, J., Lubienski, S., Ganley, C., & Copur-Gencturk, Y. (2014). Teachers' perceptions of students' mathematics proficiency may exacerbate early gender gaps in achievement. *Developmental Psychology*, *50*(4), 1262-1281. doi:10.1037/s0035073

Ronau, R., Rakes, C., Bush, S., Driskell, S., Niess, M., & Pugalee, D. (2015). The quality of mathematics education technology literature. *Journal of Multidisplinary Evaluation, 11*(24), 12-36.

Rosas, C., & Campbell, L. (2010). Who’s teaching math to our most needy students? A descriptive study. *Teacher Education & Special Education, 33*(2), 102-113. doi:10.1177/0888406409357537

Roschelle, J., Feng, M., Murphy, R., Mason, C. (2016). Online mathematics homework increases student achievement. *AERA Open, 2*(4), 1–12. doi:10.1177/2332858416673968

Ross, J. A., Scott, G., & Bruce, C. D. (2012). The gender confidence gap in fractions knowledge: gender differences in student belief-achievement relationships. *School Science & Mathematics*, *112*(5), 278-288. doi:10.1111/j.1949-8594.2012.00144.x

Ross, J., Scott, G., & Sibbald, T. (2012). Student achievement outcomes comprehensive school reform: a Canadian case study. *Journal of Educational Research*, *105*(2), 123-133.

Rowley, R. L., & Wright, D. W. (2011). No "white" child left behind: The academic achievement gap between black and white students. *Journal of Negro Education*, *80*(2), 93-107.

Rugutt, J., Ellett, C. D., & Kennedy, E. (2002). A study of students' academic change in mathematics achievement: A case for African American students. Retrieved from http://eric.ed.gov/?id=ED468687

Schreiber, L., Valle, B. (2013). Social constructivist teaching strategies in the small group classroom. *Small Group Research, 44*(4), 395-411.

Schwery, D., Hulac, D. d., & Schweinle, A. (2016). Understanding the gender gap in mathematics achievement: the role of self-efficacy and stereotype threat. *School Psychology Forum, 10*(4), 386-396.

Senko, C., & Hulleman, C. S. (2013). The role of goal attainment expectancies in achievement goal pursuit. *Journal of Educational Psychology*, *105*(2), 504-521.

Shirvani, H (2009). Does the No Child Left Behind Act leave some children behind? *International Journal of Learning*, *16*(3), 49-57.

Showalter, D. A. (2013). Place-based mathematics education: A conflated pedagogy? *Journal of Research in Rural Education*, *28*(6), 1-13. Retrieved from http://jrre.psu.edu/articles/28-6.

Simms, K. (2012). Is the black-white achievement gap a public sector effect? An examination of student achievement in the third grade. *Journal of At-Risk Issues*, *17*(1), 23-29.

Smith, T., Cobb, P., Farran, D., Cordray, D., Munter, C., Dunn, A., & Society for Research on Educational Effectiveness. (2010). Evaluating math recovery: Assessing the causal impact of math recovery on student achievement. *Society or Research on Educational Effectiveness*

Stake, R. *Qualitative research: Studying how things work.* New York, NY,: Guilford Press, 2010.

Stearns, S. (2017). Student responsible learning: getting students to read online discussions. *College Teaching,* 65(2), 69-78.

Strayhorn, T. (2015). Factors influencing black males' preparation for college and success in stem majors: A mixed methods study. *Western Journal Of Black Studies*, *39*(1), 45-63.

Sun, M., Saultz, A., & Ye, Y. (2017). Federal policy and the teacher labor market: exploring the effects of NCLB school accountability on teacher turnover. *School Effectiveness & School Improvement, 28*(1), 102-122. doi:10.1080/09243453.2016.1242506

Tanner, D. (2013). Race to the Top and leave the children behind. *Journal of Curriculum Studies*, *45*(1), 4-15. doi:10.1080/00220272.2012.754946

Taylor, S., Bogdan, R., & DeVault, M. (2016). *Introduction to qualitative research methods: A guidebook and resource*. Hoboken, New Jersey: Wiley

Topkaya, N. (2015). Factors influencing psychological help seeking in adults: A qualitative study. *Educational Sciences: Theory and Practice*, *15*(1), 21-31.

Trolian, T. L., & Fouts, K. S. (2011). No Child Left Behind: Implications for college student learning. *About Campus*, *16*(3), 2-7. doi:10.1002/abc.20061

U.S. Department of Education. (2001). *The No Child Left Behind Act of 2001.* Retrieved from http://www2.ed.gov/nclb/overview/intro/execsumm.html

U.S. Department of Education. (2003). *No Child Left Behind Act*. Retrieved from http://www2.ed.gov/nclb/landing.jhtml

U.S. Department of Education. (2014). *K-12 reforms: Strategic initiatives to foster real change*. Retrieved from http://www.ed.gov/k-12reforms

Vigdor, J. (2013). Solving America's math problem. *Education Next*, *13*(1), 42-49.

Voyager Sopris Learning Inc. (2014). Voyager Math. Retrieved from http://www.voyagersopris.com/curriculum/subject/math/VM-second-edition/research-results

Voyer, D., & Voyer, S. (2014). Gender differences in scholastic achievement: A meta-analysis. *Psychological Bulletin, 140*(4), 1174-1204. doi:10.1037/a0036620

Wang, M. (2012). Educational and career interests in math: A longitudinal examination of the links between classroom environment, motivational beliefs, and interests. *Developmental Psychology*, *48*(6), 1643-1657. doi:10.1037/a0027247

Wang, X., Sun, N., & Wickersham, K. (2017). Turning math remediation into "homeroom:" Contextualization as a motivational environment for community college students in remedial math. *Review of Higher Education, 40(3),* 427-464. doi:10.1353/rhe.2017.0014

Wass, R., & Golding, C. (2014). Sharpening a tool for teaching: the zone of proximal development. *Teaching in Higher Education*, *19*(6), 671-684. doi:10.1080/13562517.2014.901958

White, T., Loker, T., March, A., & Sockslager, K. (2009). Is NCLB closing the minority-majority achievement gap? *Communique (0164775X)*, *37*(8), 1-17.

Young, J., & Young, J. (2016). Young, black, and anxious: Describing the black student mathematics anxiety research using confidence intervals. *Journal of Urban Mathematics Education*, *9*(1), 79-93.

Young, R., Hodge, A., Edwards, M., & Leising, J. G. (2012). Learning mathematics in high school courses beyond mathematics: Combating the need for post-secondary remediation in mathematics. *Career & Technical Education Research*, *37*(1), 21-33. doi:10.5328/cter37.1.21

Ysseldyke, J., & Tardew, S. (2007). Use of a progress monitoring system to enable teachers to differentiate mathematics instruction. *Journal of Applied School Psychology, 24*(1), 1-28. doi:10.1300/J370v24n01_01

Ysseldyke, J., Thrill, T., Pohl, J., & Bolt, D. (2005). Using math facts in a flash to enhance computational fluency. *Journal of Evidence-Based Practices for Schools, 6*, 59–89.

Zhang, M., Trussell, R., Gallegos, B., & Asam, R. (2015). Using math apps for improving student learning: An exploratory study in an inclusive fourth grade classroom. *Techtrends: Linking Research & Practice to Improve Learning*, *59*(2), 32-39. doi:10.1007/s11528-015-0837-y

Zwiep, S. G., & Benken, B. M. (2013). Exploring teachers' knowledge and perceptions across mathematics and science through content-rich learning experiences in a professional development setting. *International Journal of Science and Mathematics Education*, *11*(2), 299-324.

Appendix A: Discussion Questions for Teachers

1. What are your perceptions about the VM program and the way it is implemented?
2. What are your overall perceptions about the math remediation program's impact on student success?
3. How do you view the benefits of the VM program on student success related to student differences such as gender and racial differences?
4. What are your views on the challenges for students when using the VM program?
5. What evidence have you seen in student achievement with students using the VM program??
6. How does VM impact student achievement from students who have been promoted from sixth to seventh grade?
7. How does VM impact student achievement from students who have been promoted from seventh to eighth grade?

Appendix B: Observation Protocol

Time of observation __________ Length of observation _____
Date _____
Teacher Number _______

Descriptive Notes	Reflective Notes
Student engagement: How does the teacher create a student-centered environment? How does the teacher create autonomy and goal setting in the classroom? How does the teacher create a collaborative work environment? How does the teacher encourage the use of critical thinking skills?	
Implementation of the VM program Strengthens and weakness of the program In what way does the teacher implement the VM program by using applications in relevant ways? What strategies are used to implement the VM program? In what way does the teacher use data and progress monitor to give feedback and deliver the daily lesson?	
Teacher implementation of VM Teacher delivery of VM Resources and strategies Feedback and remediation to students	

Appendix C: Interview Protocol: Teacher Perspectives on VM

Time of Interview:

Date:

Place:

Interviewer:

Interviewee:

Position of Interviewee:

(Briefly describe the project)

Questions

1. What are your perceptions about the VM program and the way it is implemented?

    a. Placeholder question: When I observed your classroom earlier I noticed that you have How are the strategies and curricula addressing the needs of all students?

2. What are your overall perceptions about the math remediation program's impact on student success?

a. Placeholder question: when I observed you earlier I noticed…..You use the scaffold strategy to help facilitate the program, explain how this strategy helps students work independently to use critical thinking skills and communicate with math language.

3. What are your views on the challenges for students when using the VM program? Placeholder question: When I observed your classroom earlier I noticed……What do you think can be done to prevent or improve these challenges?

4. What are your perceptions of the problems and issues of the VM program on student achievement related to gender and race?

a. Placeholder question: When I observed your classroom earlier I noticed……How do you know that students are having difficulty on a level or module before they finish the assignment?

5. What evidence have you seen in student achievement with students using the

   VM program? Probe: What do you think contributed to this success?

a. Placeholder question: When I observed your classroom earlier I noticed..... With regards to the online modules, many students use the help buttons to help with a skill, how well is the program helping with the fluency and development of math skills?

6. How does VM impact student achievement from students who have been promoted from sixth to seventh grade? Probe: How has VM prepared the students for the next grade?

a. Placeholder question: When I observed your classroom earlier I noticed……With regards to mathematic skill how often are students completing their levels and moving on to a higher grade level?

7. How does VM impact student achievement from students who have been promoted from seventh to eighth grade?

a. Placeholder question: When I observed your classroom earlier I noticed……With regards to mathematic skill how are the students using the program to master the concepts and skills?

(Thank you for participating in this interview. I assure your responses to the questions will remain confidential.)