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Middle School Mathematics Students' Perspectives on the Study of Mathematics

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COLLEGE OF EDUCATION

This is to certify that the doctoral study by

Christy Vaughn

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.

Walden University
January 2012

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Christy H. Vaughn

MSM, Mercer University, 1995

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Doctoral Study Submitted in Partial Fulfillment

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Abstract

This qualitative study addressed the perceptions toward the study of mathematics by middle school students who had formerly been in a remedial mathematics program. The purpose of the study was to explore the past experiences of nine students in order to determine what is needed for them to feel successful in mathematics. The conceptual framework of the study was grounded in philosophies of motivation, including achievement goal theory, self-worth theory, self-efficacy theory, expectancy-value theory, and attribution theory. The study used a phenomenological research design to answer the key research question, which focused upon the experiences of students and the meaning that was given to these experiences. Data were collected and analyzed from individual interviews with 9 students and a focus group session. The findings of the study revealed that participants' past experiences influenced their current attitudes about the study of mathematics. Perceptions of mathematical ability, history of success or failure with grades, and the influence of the teacher and peers in the learning environment most influenced a student's attitude about mathematics. Moreover, current feelings impact the degree to which a student puts forth effort in the study of mathematics, and the relationship with the mathematics teacher had the greatest impact on student attitudes. To improve the perceptions that students have about the study of mathematics, expanded professional development opportunities may bring increased awareness of students' perceptions of the study of mathematics, and develop remedial mathematics programs that remove the negative stigma associated with them. The research study could lead to social change as its purpose is to improve student achievement in mathematics through changes in the remedial mathematics program.

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Dedication

"Whatever you do, work at it with all your heart, as working for the Lord, not for men, since you know that you will receive an inheritance from the Lord as a reward. It is the Lord Christ you are serving." (Colossians 3:23, 24)

To God be the glory!

Acknowledgments

Over 4 years of my life have been dedicated to the pursuit of this goal. There are many who helped make this goal a reality and are owed a great measure of thanks.

For the countless sacrifices that my dear family has made, I sincerely thank you. There are no words to express my sincere gratefulness for the constant support of my husband, Jesse. It is through his love and encouragement that I was able to persevere in the midst of many stormy places throughout this doctoral journey. We have reached this milestone together. As I sang some 16 years ago to you on our wedding day, you have echoed those words back to me as you have *walked hand in hand* with me.

To my precious daughter, Sarah Beth. Can you believe you were just in kindergarten when I began this long journey? For the many times that you have watched me work long hours at the computer, not really understanding why I must do so, I could never thank you enough. I hope that you will see from my work that we are all life-long learners. I pray that one day you, like your daddy and me, will persevere to achieve your own dreams.

To Hudson. What joy you have brought to my life as I have worked to achieve this goal! I hope one day you will understand that this was done to help give you the very best.

To my parents, Billy and Youvette, Bert and Anne. Thank you all for your prayers, love, and encouragement as I sought to achieve this goal. Each of you is wonderful examples of God's great love. Truly, you have been *the salt and the light* to me.

A special acknowledgement is given to my committee members who helped me along this road. Particularly to Dr. David Hernandez, you have helped me in countless ways, and for that, I am very grateful. You graciously agreed to serve as chair to this doctoral study when circumstances where less than ideal. Since that time, you continually worked to push me to be the best that I could be. Your dedication to helping me achieve this goal means so much to me. Thank you for always demonstrating what it means to be a scholar.

Thanks be to God. “Being confident of this, that He who began a good work in you will carry it on to completion until the day of Christ Jesus.” (Philippians 1:6)

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Section 1: Introduction to the Study

Background to the Study

History has shown that the success of a country is directly related in large part to its quantity of skilled workers and the quality of these workers' mathematical education. The United States has been included among these successful countries, but recent research gives rise to a concern over its future abilities to remain an international leader (U.S. Department of Education, 2008). The decline of our mathematical competency is seen on many levels. According to the 2008 Report of the National Mathematics Advisory Panel, success in the areas of mathematics and science not only affects the well-being of individuals but the security of our nation as a whole (U.S. Department of Education, 2008). Significant increases in the United States' research and development expenditures in other countries, the lack of availability of skilled workers from abroad due to the success of their own countries, and the increased demand for remedial mathematics education among college students are a few examples of the impact of the declining mathematical ability of the United States (U.S. Department of Eduation, 2008). With Americans competing globally for quality jobs, the economy demands a workforce that is proficient in mathematics and has the ability to think creatively and critically.

To further support the claim that the United States is losing its leadership standing among educated, technically advanced countries, consider the trends in the American workforce. The increasing number of retirees in mathematics-related science and engineering fields was expected to leave a substanital void in spite of the growth rate for jobs in these fields increasing at a faster pace than the overall job growth rate (U.S. Department of Education, 2008).

Not only does a nation's success in science and mathematics have social importance, but there are implications for individual citizens, as well. A solid mathematical foundation provides increased postsecondary options and a possible increase in future income. However, in comparison to other countries, recent Trends in International Mathematics and Science Study (TIMMS) results revealed a decline in American students' mathematical abilities as they progress through school (National Science Board, 2008). While elementary and middle grades results were encouraging, the mathematical literacy scores of students near graduation revealed that the United States lagged considerably behind other countries (National Educators Association, 2008), which supports the conclusion by the National Mathematics Advisory Panel. After hearing testimony and reviewing over 16,000 research publications over a 2-year period, the Advisory Panel noted an increased request for remedial mathematics education in colleges and universities throughout our nation (U.S. Department of Education, 2008).

A study regarding how students value mathematics revealed that mathematics is rarely associated with fun or enjoyment (Keitel, 2003). Sedig (2008) supported this finding with negative comments about mathematics that were collected from middle school students. Therefore, teachers face the two-fold challenge of motivating students to study mathematics and relaying its importance to their future lives. Because learning is about connections to prior experiences (Armstrong, 2008; Kim, 2005), mathematics instructors should become more cognizant of the power of their influence upon a student (Marzano, 2007; Sullo, 2007). Experiences with learning mathematics in elementary school will impact students' motivation to excel in this subject throughout school. Having anxious feelings about mathematics causes students to dislike it or become highly unmotivated to learn (Burks, Heidenberg, Leoni, & Ratliff, 2009; Ruffins, 2007).

This research study contributes to the current literature base on the problem by exploring what motivates students to learn, particularly students in a remedial mathematics program, and uncover research-based strategies that have demonstrated effectiveness in motivating middle grades mathematics students. I used a qualitative approach to analyze the phenomenon of studying mathematics through the eyes of those students who, in the past, have been enrolled in a remedial mathematics program due to repeated failure in mathematics, as determined by poor performance on standardized tests, on benchmark test, and in mathematics classes. Students' experiences studying and learning mathematics in a remedial program, particularly those of younger children, was lacking in the literature base. This study sought to reveal, through the experiences of students, how remedial mathematics students feel about the study of mathematics and the basis for these feelings. From this phenomenological study, a potential outcome might be changes in the remedial mathematics program that will help motivate and engage students in ways that will lead to academic achievement.

Academic performance in a particular subject and student perceptions about that subject are often seen in cycles. For instance, poor mathematical performance often leads to negative feelings towards things related to mathematics. In turn, if a student thinks negatively about the study of mathematics, it will often lead to poor academic performance (Kim, 2005; Seifert, 2004; Stuart, 2000; Wilkins, 2004; Zaslavsky, 1994). It was expected that the participants of the study would recall evidence of poor academic performance or frustrations with some aspect of the study of mathematics. A tentative connection between remedial mathematics students and the presence of negative, anxious feelings toward the study of mathematics warrants a comprehensive literature review on mathematics anxiety. Through this literature review, indicators of mathematics anxiety are recognized. However, in seeking to understand the perceptions that middle school mathematics students may have about their mathematical ability or lack thereof, no assumptions were made that all remedial mathematics students suffer from forms of mathematics anxiety. This phenomenological research study focused on both positive and negative experiences and the interpretation of those experiences, of middle school students to reveal some essence or shared beliefs about the study of mathematics. More detailed discussions of factors that influence student perceptions and behaviors will be provided in Section 2.

Problem Statement

The problem that this qualitative study addressed is the perceptions that middle school mathematics students may have in regard to the study of mathematics. Current perceptions may have been formed partly as a result of years of repeated academic failures and the lack of proficiency in mathematics. At the local level, this problem was evidenced through the number of students who met the criterion for placement in the remedial mathematics program of a middle school in northwest Georgia. Students in the program are chosen as candidates for remedial mathematics primarily based upon their past standardized testing data. In addition to considering a student's overall score, the level of success in each of the grade-specific categories, or domains, is also an indicator that the individual is a candidate for the remedial mathematics program. Other examples of placement measures include past performance on benchmark tests, academic performance and efforts in regular mathematics courses, and teacher recommendation. Furthermore, as the only remedial mathematics instructor at the school, my experiences with students and other mathematics instructors reveal that a lack of motivation among remedial mathematics students exist.

This research study is phenomenological because it focused upon the experiences, and the interpretation of the experiences, of middle school students in regards to affective factors such as attitudes about success, motivation, and the subject of mathematics. What students say and share about their self-perceptions is the foundation for the study.

Rationale of the Study

The need for an increased understanding of this problem has been seen at the local level of a middle school in northwest Georgia. Accountability for both the student and teacher is becoming increasingly evident as an emphasis is placed upon results of high stakes standardized test results. This increased demand for accountability of academic performance, as a product of the No Child Left Behind Act (2001), places additional pressures on classroom teachers who, in turn, must continually prepare and motivate students to meet the expectations as set forth by the state (Hoffman & Nottis, 2008).

This criterion of performance on high-stakes tests primarily determines placement in the remedial mathematics program in the school system where the study took place. As the only remedial mathematics instructor for my school, I could teach the same child each of their 3 years in middle school. In fact, a core group of students have had a remedial mathematics class, in addition to their regular mathematics class, throughout each of their years in middle school. For any given term, or 9 week period, the remedial mathematics program could include, at most, 90 students. There are two sections taught for each grade level, with each section having a maximum of 15 students, or 30 per grade level. Considering the seventh grade roster for the current term, I have taught 15 of the 23 students in some previous term. Eleven of 15 students on the current eighth grade roster had been a part of the remedial program at some point in their sixth or seventh grade years.

Seeing this repetition of students in the remedial mathematics program, and hearing their concerns, has prompted the need for this phenomenological study. Commenting on their feelings toward learning mathematics, students have made statements such as “Why did you put me in this stupid class?” and “I’ve never been good at math. I hate it!” and “Teachers talk in such a complicated way that it makes it difficult to understand the math” (Student A, Student B, and Student C, personal communications, August 11, 2009). Evidence of frustration has been observed in the remedial mathematics classroom. Nervousness, feelings of hopelessness, outbursts as an avoidance mechanism, behavioral defiance, tears, and in an extreme case, repeated physical illness during standardized test taking time have been manifestations of students' feelings that I have observed as the remedial mathematics instructor. These displays and comments corroborate students' frustration, apathy, lack of understanding, and a general disregard for the subject of mathematics, all of which further supports the need for this study (Jensen, 2006; Sullo, 2007; Wilkins, 2004).

Furthermore, teachers of these students need a greater understanding of the problem and the feelings that students have in regards to the study of mathematics. In the classroom, repeated failures produce high levels of frustration for the students, which impedes the learning process. Consequently, teachers often view the students as not caring enough or simply not trying to learn the mathematical concepts (A. Albrecht, J. Guider, J. Mead, personal communication, December 11, 2009). In my role as the remediation instructor, I work closely with all regular education mathematics teachers. Because we share many of the same students, the lines of communication must remain open, as I am interested in student performance and progress in both mathematics classes, the remedial class as well as the regular mathematics class. I often hear disappointment, frustration, and even aggravation at times from teachers as they attempt to teach the same curriculum to all students (A. Jackson, personal communication, September 7, 2009). In her former role as a remedial mathematics teacher, the school's mathematics specialist expressed that she was often discouraged as she would frequently hear comments from students about their abilities, the remedial mathematics class, and their future potential (I. Keith, personal communication, August 25, 2009). Raising awareness among mathematics teachers of the prevalence, possible causes, and strategies for helping frustrated students will improve the response to the problem.

The administration of the school district took an in-depth look at achievement gaps and found that there was a strong need for reform in mathematics education at the local level. The administration began to focus concerted efforts upon determining what measures should be put in place to increase mathematics achievement. Due to poor performance across all grade levels on standardized tests, district administrators held a Math Summit in April 2006 to investigate how well the district's curriculum, materials, and instructional strategies were combining throughout grade levels so that academic achievement in mathematics could be ensured (A. Vaughn, personal communication, December 18, 2009). Coordinating the efforts of elementary and middle school administration and mathematics teachers was deemed essential.

The initial problem, as it exists within the context of my local school district, is concerned with the academic performance of mathematics students; more specifically, the high percentage of elementary and middle school students who had basic performance (i.e., scores of less than 800) on the Georgia Criterion Referenced Competency Test (CRCT) in mathematics. For example, results from the April 2009 administration of the test revealed that 37.4% of sixth through eighth grade students at this middle school did not meet standards (Georgia Department of Education, 2009). Also, the data showed that the percentage of students who met or exceeded proficiency levels on the CRCT decreased significantly when comparing elementary to middle school grades (A. Vaughn, personal communication, December 18, 2009). In addition, the problem presents itself in the perceptions that these students have about themselves in relation to their struggles in mathematics. These problems impact the school because, despite using the expertise of mathematics coaches and the use of data to drive instruction, results show that some students are still not successful on high-stakes standardized tests. When using the NCLB standards as a benchmark, these lower scores jeopardize the local school district's status when compared to similar districts.

Nature of the Study

A close examination of different research approaches and practices used in each helped determine the most appropriate design for this study. Quantitative studies tend to use post-positivist claims, testing a theory with pre- and post-test measures using independent and dependent variables (Creswell, 2003). Qualitative studies are typically grounded in constructivist perspectives, using open-ended questioning with data emerging throughout the study (Creswell, 2003). To establish the meaning of the phenomenon *experiences of studying mathematics* through the participants of the study, conducting the research study alongside them was necessary. For this reason, a qualitative study was chosen as the most appropriate. Furthermore, an understanding of the lived experiences of participants to develop patterns of meaning (Moustakas, 1994; Sanders, 1982) deemed a phenomenological approach appropriate for the study. The purpose of the research does not seek to capture detailed stories of an individual or a few individuals (i.e., narrative research), generate a theory (i.e., grounded theory), study a cultural group (i.e., ethnography), or understand a particular case over time (i.e., case study). Because these methods do not focus on the perspective of a small group of students and their constructed realities pertaining to the learning of mathematics, they would be less effective.

With the constructivist foundation, the research study is classified as a hermeneutic phenomenological qualitative study. "Phenomenology describes how one orients to lived experience; hermeneutics describes how one interprets the *texts* of life" (Van Manen, 1990, p. 4). Sanders (1982) explained how "certain types of phenomena elude quantification and statistical inference" (p. 358). To characterize all of the participants to a statistical analysis fails to recognize the unique nature of each individual. By definition, in this study I sought to understand the essence of the experience of studying mathematics from the perspective of sixth through eighth grade students placed in a remedial mathematics program. Since together we constructed meaning of these lived experiences, my being distant from the participants was undesirable (Hatch, 2002). On the other hand, bracketing my own biases and preconceptions of studying mathematics (Creswell, 2007; Hatch, 2002; Moustakas, 1994) was important. Qualitative research requires a recognition that my interpretations would flow from my personal and historical experiences. However, these did not interfere with the desire to understand the experiences of the participants in the study. As such, hermeneutic principles guided my interpretative construction of participant perspectives. In conclusion, this design was chosen as it most appropriately fits the nature of the study.

Illustrating the relevance of phenomenology, Sanders (1982) posited that "researchers are urged to consider phenomenological analysis to study traditional research problems" (p. 353), which indicates that phenomenology can be appropriately used in problem-driven research studies such as this one. Further, Sanders described phenomenology as a new way of viewing problems and a methodology used to capture what may be potentially overlooked in other research methods.

According to Hatch (2002), the methodological and substantive theoretical orientations help frame the research questions of the study. Initially establishing the metaphysical assumptions and the research design helped ensure that the qualitative research questions would fit within the paradigm. Although research questions vary depending upon the philosophical assumption, they should be answerable through detailed description and analysis of a phenomenon in a specific context. The overarching research objective of this phenomenological study, through individual and focus group interviews, was to explore the lived experiences of the participants regarding the study of mathematics. This was achieved by answering the overarching research question, "What are the experiences of a select group of middle school students in studying mathematics, and what meaning do these students give to their experiences?"

Research Question

The problem that this qualitative study addressed is the perceptions that middle school mathematics students may have about themselves in regards to the study of mathematics. Current perceptions may have been formed partly as a result of years of repeated academic failures and the lack of proficiency in mathematics. There is a wealth of knowledge to be gained from literature regarding underachievement in mathematics. However, limitations exist in that there appears to be a need for a phenomenological study that serves as the voice of younger students who share the common experience of the study of mathematics. I attempted to fill the gap in the literature that exists by hearing and addressing the needs of middle school mathematics students in regards to their perceptions about mathematics. As well, research is needed to address the needs of mathematics teachers who attempt to help these struggling students. One planned outcome of this study was to provide teachers with a resource to help motivate students, thereby increasing academic achievement.

As a foundation of this doctoral study, understanding the essence of shared experiences in the study of mathematics from the perspective of the student is critical. This phenomenological study used individual and focus group interviews to answer the overarching research question, “What are the experiences of a select group of middle school students in studying mathematics, and what meaning do these students give to their experiences?” Answers to this question at the local level may be applicable to a larger population of similar demographics therefore, creating social change, at least at the local level.

Purpose of the Study

The purpose of this study was to examine the various, particular mathematical experiences of middle school students as expressed through their attitudes and feelings. One goal of this study is to understand the perspectives of individuals and how these perspectives shape future experiences in mathematics. By capturing the essence of these experiences, this study should benefit mathematics students and teachers alike. Generalizing the meaning of these experiences provided a greater understanding of the research problem. The findings of the study are to be shared with mathematics instructors throughout the school district. The purpose was to conduct the study in such a way that students revealed what is needed for them to feel successful in the study of mathematics. Understanding how past experiences have affected middle school students' learning of mathematics provided a basis for concrete, tangible recommendations for teachers seeking to help students make gains in mathematics performance through improved instruction.

Conceptual Framework

A review of the literature, as it relates to achievement and the study of mathematics, revealed an underlying theme of student engagement in learning this important subject. Once inspired by a curious and exploratory spirit, children seem to lose their joy for learning as they grow older. This inquisitive zeal for learning is often replaced with the idea that learning is a necessary evil (Burks et al., 2009). One key psychological concept for examining the mindset toward learning is motivation, which is prompted by many factors (Schunk, 2003). Many of these originate from the students' own attitudes about mathematics, that is, their confidence in their ability levels, how they view the relevance of mathematics and its implications for future endeavors. Other factors that may lead to the degree of student engagement and motivation are external factors, primarily the learning environment.

The research is grounded in theories that helped explain the phenomena *the study of mathematics.* The literature review examines factors that serve as possible obstacles to effective learning. Serving as the conceptual framework related to the problem of perceptions of the study of mathematics by remedial mathematics students, the prominent motivation theories in educational psychology were studied. Included were Dweck and

Leggett's achievement goal theory (1988),Covington's self-worth theory (1984), Bandura's self-efficacy theory (1977, 1989, 2005, 2006, 2008), Wigfield and Eccles'expectancy-value theory (2000), and Weiner's attribution theory (1984, 1984). These were combined with a review of empirical research studies to determine how this research study related to the existing knowledge.

Definitions of Terms

The following terms and corresponding definitions are important for focus and understanding of this study.

Adequate yearly progress (AYP): A foundation of the No Child Left Behind Act of 2001 (NCLB), AYP measures the level of student participation and academic achievement on statewide assessments and attendance (graduation rate for high schools) for each school, school district, and state.

Attribution: What is believed to be the cause of an outcome; an explanation as to why something turned out the way that it did (Weiner, 1984).

Basic: Scores below 800 on Georgia's Criterion Referenced Competency Test (CRCT), indicating a student does not meet standards (Georgia Department of Education, 2008).

Bubble student: Those students who may be considered at risk because of scores on standardized testing. Bubble students are those whose standardized test scores range from 790 to 810 on state tests.

Highly qualified teacher: One who holds a bachelors degree or higher, has a major in the subject area or has passed the state teacher content assessment, and is assigned to teacher his/her major subject(s).

Mathematical ability: The ability to comprehend and transform quantitative data; includes conceptual understanding, procedural fluency, strategic competence, and numeracy (Kilpatrick, 2001; Steen, 1998).

*Mathematics anxiety: "*A feeling of tension and anxiety that interferes with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations". (Richardson & Suinn, 1972, p. 551)

Participation: AYP status requires 95% participation rate; calculated as the number of students who tested divided by the number of students continuously enrolled in the state's testing window (Georgia Department of Education, 2008).

Proficient: Scores of 800 – 849 on Georgia's CRCT, indicating a student meets standards (Georgia Department of Education, 2008).

Remedial mathematics: Course used as mathematics support. This course is in addition to a student's regular grade level mathematics course. The remedial mathematics course is offered on a 9 week term basis. A student may be enrolled in the course for any of the four 9 weeks of the academic year.

Same subject: When a school, school district, or state do not meet the participation or academic achievement requirements for reading/English language arts or mathematics, or the second indicator requirements (attendance/graduation rate) for 2 consecutive years (Georgia Department of Education, 2008).

Self-efficacy: Certain ideas we have about ourselves and our capabilities and predictions we make based upon those beliefs (Bandura, 1977, 2005, 2006, 2008).

Subgroup: As required by law, the state of Georgia must report its performance as a whole and by the following four subgroups—students within racial/ethnic groups, those with disabilities and served through special education services, those possessing *Limited English Proficiency*, and those students that are considered *Economically Disadvantaged* (Georgia Department of Education, 2008).

Assumptions, Limitations, Scope, and Delimitations

Assumptions

Two assumptions were made throughout this study. First, the participants would provide open and honest feedback in regard to their past experiences with the study of mathematics. In no way were responses verified, but they were assumed to be a true representation of past experiences. Collectively, they made the essence of the phenomenon. Second, it was assumed that these mathematics students would be representative of the total remedial mathematics student population.

Limitations

A potential weakness of the study was that the data collection and analysis relied solely upon the perceptions of individuals. These perceptions may not be an accurate reflection of what occurred. Also, this study was limited to nine students who had previously been involved in a remedial mathematics program and were willing to share their experiences. Another limitation was my familiarity with participants, each of whom was a former student. To reach an unbiased perspective of the phenomenon under study, epoche (Creswell, 2007), or setting aside personal feelings, was critical.

Scope and Delimitations

This phenomenological qualitative study was conducted in a middle school in northwest Georgia. It included nine students who had previously been involved in a remedial mathematics program. The study included three sixth grade, three seventh grade, and three eighth grade students. Five females and four males participated. No student who had not formerly participated in a remedial mathematics program in middle school was asked to participate. The scope of this doctoral study included individual interviews and one focus group session with all participants. A purposeful sampling strategy was used in the selection criteria process in order to invite students that would be able to add value to this research study and be a source of quality information.

Significance of the Study

Significance at the Local Level

With the January 8, 2002, signing of the No Child Left Behind (NCLB) Act by former President George W. Bush, all students were required to meet state-established standards in reading and mathematics during their 12 years of school. The NCLB requirements dramatically changed expectations for student achievement in public schools. All states were required to articulate and classify academic standards and to develop a state testing system to measure achievement. States and respective school districts and individual schools are held accountable for all students' academic success, which is a critical component of NCLB (NCLB Act, 2001).

Based upon the 2009 results of standardized tests for the local school system, the significance of this study, as it relates to academic achievement, is evident. Two of the nine schools within the district did not meet the state requirements on standardized tests according to the AYP regulations (Georgia Department of Education, 2009). Furthermore, neither of these two schools made AYP in the previous year. As a result, these schools were considered to have a *Needs Improvement* status, meaning that AYP was not met in the participation, academic performance, or school attendance rate requirements in the same subject for two consecutive years. This repeated failure to meet federal regulations further justifies the need for this study.

This study was prompted by several factors. With the demands for higher accountability of both the student and mathematics teacher, there is a greater need for mathematical literacy. Rather than focusing upon *getting the right answer*, mathematical literacy stresses not only the ability to calculate, but competence in areas such as problem solving and estimating how reasonable a result may be. While there may be a greater appreciation for literacy in mathematics, there is an apparent decline in the performance of mathematics students in the school system in which this study was conducted.

Repeated failures in the mathematics classroom produce a high level of frustration about this important subject. Oftentimes, poor performance in mathematics is assumed to be a result of some type of learner deficiency, or that students should just *work harder* or *care a little more*. As the only remedial mathematics instructor in the middle school in which this study took place, I was inspired to learn as much as I could about the way in which students learn mathematics. This decline in student mathematics performance or failure to learn mathematics may be related to inferior teaching methods and, as a result, there is a need to understand the source of students' poor perceptions of the study of mathematics from the students' point of view.

Professional Application

The problem that this qualitative study addressed is the perceptions that middle school mathematics students have about themselves in regards to the study of mathematics. Current perceptions may have been formed partly as a result of years of repeated academic failure and lack of proficiency in mathematics. The research revealed both theoretical and empirical evidence of the importance of mathematics educators' understanding of motivation and student engagement.

Based on experiences gained as the remedial mathematics instructor for a Title I middle school in northwest Georgia and the results of this study, there are applications that could be made to mathematics education. Teachers express challenges as they are held accountable for helping all students reach proficiency levels in mathematics according to No Child Left Behind standards. A crucial element of the phenomenological study was the perception of studying mathematics among the middle school students and how the study of mathematics relates to their future endeavors. Mathematics educators need to recognize the factors that influence student attitudes and behaviors. Specifically, they should be aware of the potential impact of the learning environment of classrooms on future perspectives of the study of mathematics.

Positive Social Change

When disclosing the 2008 findings from the National Mathematics Advisory Panel, former U.S. Secretary of Education Margaret Spellings placed an emphasis upon the importance of algebra in education, particularly in the earlier grades (Vogel, 2008). Research from this panel indicated that college success can often be linked to above average skills in algebra. Algebra skills were also linked to global career opportunities (U.S. Department of Education, National Mathematics Advisory Panel Report, 2008). For many, algebra is the first course that requires the invaluable skills of abstract thinking and problem solving. Precisely this area of mathematics was the focus of President Bush's Advisory Panel because it is a stumbling block for many students.

The consequences from frustration with mathematics are manifested in a variety of ways. With more than three quarters of all graduating high school students scoring below proficient levels on the NAEP and the growing demand for mathematics remediation by students entering 4-year colleges and universities, an understanding of how to address mathematics education is necessary (U.S. Department of Education, 2008).

With the concern over algebra comes its relationship to the high school dropout rate. Algebra has been linked to the dropout rate more than any other subject, with failure to pass this course creating a four times greater possibility that a student will fail to complete high school compared to someone who passed algebra (Vogel, 2008). Perceived problems with education in today's economy have attracted national attention to the dropout rate. According to *The Silent Epidemic*, a Bill and Melinda Gates

Foundation Report, at least one third of those surveyed claimed that dropping out of school was attributed to failing grades (Bridgeland, Dilulio, & Morison, 2006). Just as discouraging was the 69% that reported they had no incentive to work hard in school (Bridgeland et al., 2006).

Restructuring instruction in algebra can help more students intellectually take the step from concrete arithmetical concepts to more abstract thinking. With the use of manipulatives and improved problem-solving skills in the younger elementary grades, the hope is that students will not find algebra nearly as big a step in the middle and high school years (Vogel, 2008). According to the Final Report of the National Mathematics Advisory Panel,

> No longer can we accept that a rigorous mathematics education is reserved for the few who will go on to be engineers or scientists. Mathematics may indeed be 'the new literacy;' at the least, it is essential for any citizen who is to be prepared for the future. (U.S. Department of Education, 2008, p. 5)

Educational leaders must have a clear understanding of what must be done for incremental gains in student achievement. This process could begin with a better awareness and appreciation of what methods help students in the learning process and provide a more solid foundation in mathematics.

Summary

This section introduced this qualitative study, which explored the lived experiences of a select group of middle school students who had previously been involved in a remedial mathematics program. Seeing students repeatedly enrolled in the remedial mathematics program and hearing their concerns and perceptions of their mathematical ability prompted the need for this study. This study contributes to the current body of knowledge as it not only deals with underachievement in mathematics performance, but it relates the study of mathematics from the perspective of the student. The methodology and research design of this study employed a qualitative phenomenological approach. New understandings of this phenomenon could be helpful to mathematics educators as they attempt to relate to all students in their classroom, particularly those who struggle with mathematical concepts and lack proficiency in mathematic academics.

Section 2 of the study includes a literature review related to the study of mathematics. It includes factors that contribute to learning and the study of mathematics. The literature review explores motivational theories, a review of math anxiety of the student and the educator, perceived relevance of the importance of mathematics, and the impact of the learning environment. Section 3 describes the research design of the study, justifying the choice of a qualitative phenomenological approach. The research question will also be described in this section, along with a description of the context of the study, ethical considerations in participant selection, data collection and analysis procedures, and validation methods that were employed. Section 4 will provide the findings of this study. An interpretation of these findings and the implications for social changes will be provided in Section 5.

Section 2: Literature Review

Introduction

A review of the literature, as it relates to achievement and the study of mathematics, revealed an underlying theme of student engagement in learning this important subject. One key psychological concept for examining the mindset toward learning is motivation, which is prompted by many factors (Schunk, 2003). These factors comprise the content of Section 2. The factors that impact learning originate from the students' own attitudes about mathematics, that is, their confidence in their ability levels, how they view the relevance of mathematics, and its implications for future endeavors. Other factors that may lead to the degree of student engagement and motivation are external factors, primarily the learning environment.

The literature review seeks to examine these factors as possible obstacles to effective learning. Section 2 is organized into two main divisions—theoretical research and empirical research. Serving as the theoretical framework related to the problem of perceptions of the study of mathematics by remedial mathematics students, the prominent motivation theories in educational psychology will be presented. Then, a review of empirical research studies related to student engagement and motivation will be presented.

According to Burks et al. (2009), lack of motivation occurs with greater frequency in mathematics students compared to students of other subjects. Society's acceptance of being innumerate and having a disregard for the study of mathematics is clearly a problem that we now face, signifying the importance of this study. One must wonder why individuals would be reluctant to admit being illiterate but claiming not to be knowledgeable in the area of mathematics is commonplace. Therefore, mathematics educators must go beyond merely teaching content to conveying their passion for mathematics to all of their students. In light of the prevalence of this problem, the goal of educators should be to create learning experiences that help students become more active, engaged, and motivated learners.

An attempt to saturate the literature was made by looking for criteria that fit descriptors of the study. To do so, searches were made of periodicals, books, journal articles, websites, proceedings of national meetings, and other doctoral dissertations works that were related to this research problem and related topics. Descriptors, or key words, used in Boolean searches include *academic achievement, attribution, elementary education, expectancy-value, mathematics anxiety, mathematics education, motivation, parental influence and mathematics, phenomenology, pre-service teachers, self-concept, self-efficacy,* and *self-worth.*

The research question of this qualitative study was, "What are the experiences of a select group of middle school students in studying mathematics, and what meaning do these students give to their experiences?" In considering this question and the purpose of the study, the literature review examined characteristics of students who struggle with the subject of mathematics. While the study was grounded in a literature review of themes dealing with mathematics students, I was fully open to new ideas or themes that could possibly emerge from the data. As the instructor of a remedial mathematics program for many years, I used professional experiences to explore potential themes and perceptions of the mathematics students. The potential themes of the study, in turn, formed the basis of the theoretical and empirical review. The potential themes discovered through the theoretical literature are performance goals, self-worth, self-efficacy, personal expectations, and attributions. The potential themes derived from the empirical research are self constructs, mathematic anxiety, learning environment and the perception of the relevance of mathematics. The main concepts from the literature review ground the research study being conducted by relating classic literature to the present study involving student perceptions toward the study of mathematics.

Theoretical Literature

Theories of academic motivation explain student attitudes and behaviors best when seen as woven together and overlaid by emotion. While these theories are often presented separately, considering how each is related to the others produces a clearer idea of student motivation than if each is presented alone. The following theories are reviewed and connected with the potential themes of the study: achievement goal theory, self-worth theory, self-efficacy theory, expectancy-value theory, and attribution theory.

Achievement Goal Theory

This theory states that a student's motivation is seen as an attempt to achieve some goal. Behavior is hypothesized to result from one of two predominate goal orientations, either mastery/learning goals or performance goals. Individuals inspired by mastery goals are described as displaying initiative and are driven from within. They view their success or failure as products of their own effort more so than of their intelligence alone (Dweck & Leggett, 1988). They want interesting challenges which engage their problem-solving skills, have deep levels of engagement, and persevere in the face of setbacks (Seifert, 1995). The mastery oriented student receives satisfaction from learning for the sake of learning rather than being influenced by external factors (e.g., grades).

However, those students with performance goal orientations often concern themselves comparing their performance to that of others. That is, they are more concerned with how others *perceive* them to be. Unlike mastery oriented students, these students base outcomes upon innate ability and intelligence (Dweck & Leggett, 1988). They make more negative self-comments, engage in less sophisticated strategies, and think that their success is due to uncontrollable factors (Seifert, 1995). The performance goal students are likely to compare their achievement to that of other students rather than to a set standard. Their wish to achieve is motivated by external factors such as grades (Pintrich & Schunk, 2002). Discouraged by the possibility of low grades and unfavorable judgments, these students experience higher levels of anxiety.

Research has suggested work avoidance as an attribute of achievement goal theory (Jarvis & Seifert, 2002; Nicholls, Cobb, Wood, Yackel, & Patashnick, 1990; Seifert & O'Keefe, 2001). Students who try to avoid work exert only the amount of effort needed for a task, and no more. They consider their work to lack meaning, and they feel inferior to those who pursue learning goals (Seifert & O’Keefe, 2001). Several reasons have been presented why a student may become work avoidant. One such explanation is that they are either failure-avoidant, thinking that their ability to do the work reveals something about their self-worth, or they are what are considered “learned-helplessness students" (Seifert, 2004, p. 143). This learned helplessness causes students to avoid work or to refuse to do work simply because they do not think they have the ability to do the task. Still, other students display passive-aggressive behaviors, withholding efforts in order to get revenge on a teacher they resent. Their hostility could result from feeling embarrassed by the teacher, being treated unfairly, or simply not liking the teacher.

Self-Worth Theory

The work of Covington (1984) is clearly linked to aspects of the achievement goal theory given that one foundation of his work is the description of the failure-avoidant student. Self-worth is generally linked to one's feelings of being loved, respected, and valued. Covington claimed that these feelings were directly related to performance. There are those who believe that the better the outcome (grades, performance, etc.), the more valuable the person performing the task. To the failure-avoidant student, ability enables one to perform well, and performance is the basis of self-worth. So, when this student is not proficient or able to meet standards, *perceived ability* and effort then become indicators of self-worth. For example, appearing to have ability becomes a mechanism to protect self-worth; these students see effort as a barometer of ability. When faced with the choice of feeling guilty because they did not put forth much effort or feeling shame and embarrassment because they worked hard and still failed, these students would rather feel guilty. As a means of protecting their self-worth, students will engage in a number of failure-avoiding strategies such as withdrawing effort, procrastinating, being disorganized, cheating, or seeking help from others to not be perceived as ignorant. Again, these behaviors are meant to hide the perception of failure and provide a convenient excuse to explain poor performance if necessary.

Self-Efficacy Theory

Self-efficacy refers to one's confidence level, or opinion about their ability to perform a particular task. The most frequently cited self-efficacy theorist, Bandura (1977, 1989, 2005, 2006, 2008) posited that individuals anticipate results based upon past experiences and develop certain judgments about their capability to deal with certain situations. Again, as previously described with other theories, noting the significance of perception is important. The dynamics of self-efficacy are not predictors of future behaviors; rather, individuals who are efficacious are more likely to "make things happen" (Bandura, 1989, p. 731). In other words, students with high self-efficacy will try adaptive strategies and persevere (Dweck & Leggett, 1988), much like students with learning/mastery orientation goals (Seifert, 1995). On the contrary, we might assume a negative spiral to exist for those who see themselves as incapable: low self-efficacy causes limited effort, which, in turn, leads to limited success, thereby causing even lower self-efficacy. The literature demonstrates the connection between self-efficacy and academic performance. Schunk (2000a, 2000b, 2003, 2005) particularly showed how efficacy significantly affected incremental achievement gains in mathematics. As it relates to this study, having efficacious traits enables students to control the conditions that may trigger anxiety (Bandura, 1977).

Expectancy-Value Theory

Expectant-value theory claims that the amount of effort expended by an individual is directly correlated to the amount of interest in the task, the perceived likelihood of success, and the meaning association with its completion (Wigfield & Eccles, 2000). Eccles (2007) applied his expectancy-value model of achievement initially to mathematics instruction. An expectation regarding success in school combines with the student's views about the value of school tasks and determines the amount of motivation to engage in school. The premise of this theory can be compared to the constructs of Bandura's (1977) theory that distinguished between efficacy expectations, that is, the belief that one can accomplish a task, "I can do this!", and outcome expectancies, that is, the belief that specific effort will produce a given result, "If I study, I will pass this test."

The work of Wigfield and Eccles (2000) primarily focused upon changes in children's expectations, values, and beliefs through their school years, influencing their performance and activity choices. Researchers have also discovered that teachers, through their communication of experiences and expectations, affect motivation of their students (Beilock, Gunderson, Ramirez, & Levine, 2010; Green, 2002; Ma, 1999; Malinsky, Ross, Pannells, & McJunkin, 2006; Uusimaki & Kidman, 2004). For example, the value that students placed on the subject of mathematics was positively correlated with their previous degree of achievement in the subject. As well, studies have revealed that the nature of the teacher-student relationship impacts both groups' expectations for future success in mathematics (Marzano, 2003, 2007; Seifert & O'Keefe, 2001; Sullo, 2007). Collectively, these findings suggest that an examination of how a teacher's contribution from an expectancy-value theory perspective may provide insight to student academic motivation.

Attribution Theory

An attribute refers to what one believes is the reason for an outcome or the cause for a result (e.g., passing or failing a test). According to Weiner (1984, 1985), these attributions could include effort, aptitude, ability, luck, or the mood of the teacher. Weiner described how attributions influence motivation: An outcome is followed by a positive or negative emotional response; it is then that the attributions occur—the perceived reason for something occurring as it did. Among these are a person's history of success or failure, circumstances surrounding the event, and comparisons to others. That is, a student who most often fails a test will likely react differently ("I can't do this") than the student who usually passes but, on occasion, fails a test ("I did not study enough"). Weiner goes on to describe attributions according to three aspects: (a) whether the individual is the cause of the result; (b) whether the cause is fixed or variable, with external circumstances possibly creating the outcome; and (c) the degree to which the cause can be controlled (e.g., amount of study). When the cause appears to be stable ("I'm stupid!"), the individual will continue to expect failure and feel hopeless to change. Conversely, those who believe their success or failure is within their control ("I earned this reward!") are more likely to be satisfied and proud of success. They will select more challenging tasks and persevere through challenges. These traits are closely aligned with Bandura's (1989) theory of self-efficacy.

The common thread is the student's belief system. Perception of these attributions actually influences motivation through emotion. For example, two different students may predict their success or failure because of their perceived ability level. One may say ability is fixed, while the other may claim that knowledge is ever-changing, constructs of Dweck and Leggett's (1988) goal theory.

Empirical Research

As noted in the theoretical review, students are influenced by a host of factors that affect their behaviors in an academic setting. Students' determination to learn might be attributed to established patterns of emotion and behavior (Seifert, 2004). Of particular interest to mathematics educators is the leading role that ability and control have on these patterns of behavior. The theories that have been reviewed may be characterized in terms of these feelings, or the lack thereof. Although behavior is affected by other emotions, control and competence are critical elements for the development of healthy, adaptive, and constructive individuals (Seifert, 2004).

Since the focus of this proposed research is how to increase student engagement and motivation in the learning of mathematics, the review of the empirical research that follows will focus upon studies that relate to the potential themes of the study. These themes are the self-constructs (i.e. self-concept, self-efficacy, and anxiety) to the study of mathematics. Also presented will be a review of the studies that address common barriers facing students and educators in the pursuit of academic achievement.

Cross-Cultural View of Self-Constructs

Lee (2009) sought to examine if distinctions exist between the theories of self-concept, self-efficacy, and mathematics anxiety when they were employed to measure mathematical performance. As a means to validate the constructs' existence and to generalize the findings, Lee used data from a 2003 Program for International Student Assessment student questionnaire which included a culturally diverse sample. The relationship of these constructs to mathematics performance was examined with between- and within-countries analysis.

According to Lee (2009), the theoretical base indicated overlapping dimensions among these theories of self-constructs. For example, cognitive aspects are woven in self-concept and self-efficacy theories because each of these measures the way in which an individual assesses his or her own worth or ability to perform a task. Similarly, self-concept and mathematics anxiety are influenced by emotional aspects. An appraisal of an individual's self-worth shapes his or her behavior (Pintrich & Schunk, 2002), and affective responses such as worries and fear produce greater levels of mathematics anxiety (Ghee & Khoury, 2008). Also, Bandura's theory (1977, 1989, 2005) suggested a link between low self-efficacy and anxiety, depression, and helplessness (Scholz, Dona, Sud, & Schwarzer, 2006).

While the Lee (2009) study found there was empirical evidence for the separation of these self-constructs, interesting information was revealed about specific countries in regards to these self-constructs. The conclusions replicated a 2004 study by Wilkins which revealed that Asian (e.g., Hong Kong, Japan, and Korea) countries, where scholastic achievement is highly regarded and students are accustomed to academic competition, demonstrated the lowest levels of self-concept and self-efficacy when compared to other countries of the study. Higher levels of anxiety and lower levels of self-efficacy could be attributable to the strict standards and lofty goals to which these Asian cultures set for their students. Conversely, as revealed in the 2009 study by Lee, students in Western European countries, where academia does not necessarily shape cultural values, are not as apt to be as critical of their academic performance. Comparable findings were revealed for students of the United States. Among the 41 countries included in the study, the U.S. ranked at the mid-point when anxiety was assessed, but revealed much higher levels of self-efficacy and mathematics self-concept.

In general, higher levels of self-efficacy and self-concepts and lower levels of anxiety are related to activities that lead to better cognitive performance (Bandura, 2005, 2006, 2008; Gresham, 2004, 2007; Pintrich & Schunk, 2002; Tobias, 1993; Wigfield & Eccles, 2001). Further review of the literature will relate the motivational theories to other factors that influence academic achievement. Three such factors will be (a) the effects of mathematics anxiety, (b) the learning environment, and (c) student's perceptions of the relevance of mathematics.

Mathematics Anxiety of the Student

Early works defined the phenomenon known as mathematics anxiety as "a feeling of tension and anxiety that interferes with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations" (Richardson & Suinn, 1972, p. 551). A pioneering moment in mathematics anxiety research came when Richardson and Suinn (1972) introduced the Mathematics Anxiety Rating Scale, MARS, as a means to quantify a previously subjective concept. They discovered that there are those who, despite the absence of other types of anxiety, experienced anxious feelings related solely to dealing with mathematical situations. Although this discovery was made in an academic setting, the MARS test presented a wide variety of situations geared to students and non-students. This 98-item test allowed respondents to rank their level of anxiety when faced with particular mathematic situations (Richardson & Suinn, 1972). The creation of the MARS would be useful not only as a diagnostic tool, but also in determining the effectiveness of different treatments to anxiety problems.

Richardson and Suinn's early work (1972), as well as the development of the MARS test, stimulated a burst of research on mathematics anxiety which has been heavily documented in the literature (Ashcraft & Faust, 1994; Cemen, 1987; Hembree, 1990; Martinez & Martinez, 1996; Raymond, 1997; Richardson & Suinn, 1972; Schoenfield, 1985; Trujillo & Hadfield, 1999). However, there seems to be a dearth of evidence in the current literature regarding specific aspects of mathematics anxiety, despite its continued prevalence among individuals.

Since these original efforts, mathematics anxiety has been recognized for its complexity as it has many causes and effects; manifests itself in a variety of physical, physiological, and psychological consequences; and cannot be alleviated with simple, diagnostic measures (Ashcraft & Moore, 2009; Feifer & DeFina, 2005; Hopko, 2003; Hopko, Crittendon, Grant, & Wilson, 2005; Martinez & Martinez, 1996). Mathematics anxiety is commonly recognized as "a person's negative affective reaction to situations involving numbers, math, or mathematical calculations" (Ashcraft & Moore, 2009, p. 197). These reactions may range in their severity and are experienced in academic, private, and social settings. Physical symptoms include rapid heart rate, sweaty palms, inability to eat or sleep, tense muscles, irregular breathing patterns, feelings of nausea, and headaches. Physiological effects are seen in increased adrenaline and cortisol levels throughout the body. As an individual becomes more and more anxious, the more prevalent these physiological changes become (Ashcraft & Kirk, 2001; Ashcraft & Moore, 2009; Cemen, 1987; Richardson & Suinn, 1972; Tobias, 1978, 1993).

In regard to cognitive outcomes, Ashcraft and Moore (2009) outlined how mathematics anxiety related to performance measures such as achievement tests and mathematical processing. The results showed that performance declines in high-stakes, timed situations. Therefore, the existence of mathematical anxiety masks one's true ability because proficiency scores are affected by the condition itself.

Whether its effects are seen in the cognitive or affective domains, mathematics anxiety is clearly a threat to a student's self-esteem, causing frustration and discouragement about one's mathematical abilities (Cemen, 1987; Hembree, 1990; Martinez & Martinez, 1996). Known as a learned emotional response, mathematics anxiety adversely affects the cognitive skill of working memory (Ashcraft & Krause, 2007; Ashcraft & Moore, 2009; Ashcraft, Krause, & Hopko, 2007; Hopko et al, 2005). A necessary skill which can significantly predict mathematical achievement, working memory can be reduced by anxiety, especially when students begin to understand that their aptitude is often associated with a standardized test score (Chinn, 2009, Keeler & Swanson, 2001).

The initial symptoms of mathematical anxiety can be seen to some degree as early as fourth and fifth grade in some students (Ashcraft & Moore, 2009; Uusimaki & Nason, 2004). Thereafter, individuals come to erroneously believe they cannot excel in mathematics, developing negative attitudes toward their abilities (Ashcraft & Kirk, 2001). Lower scores on mathematics achievement tests, poorer attitudes about mathematics, avoidance of elective math coursework, and college major and career paths that involve mathematics are often related to high levels of mathematics anxiety (Ashcraft & Moore, 2009).

Negative emotions such as worry, fright, or dread relate to mathematics anxiety. These emotions manifest themselves by interfering with a student's confidence in his ability to manipulate numbers and solve problems (Tobias, 1993). With increasing reliance on standardized testing, knowing how mathematics anxiety affects performance during the test is critical.

According to Ashcraft and Moore (2009), many questions arise when considering how mathematics anxiety and student achievement are related. Most important of those questions is how to discern whether poor test scores are the result of a lack of content knowledge or the effects of mathematics anxiety. In a timed setting where college adults had dual tasks (Ashcraft & Kirk, 2001), the effects of working memory were examined. Students had to verbally provide answers to mathematical problems while recalling a series of unrelated letters in their working memory. This test stressed the working memory capacity, especially when the mathematical problems became more difficult, as evidenced by the higher rate of errors in the letter recall task. This was especially noticeable among the high math-anxious participants. This finding was important to the research as it revealed that individuals tapped into their limited working memory resources when they were worrying about their anxiety while performing a mathematical task. When mathematical problems become more difficult, the tax on memory is even more intense. There seemed to be a competition for their memory resources—dealing with more difficult mathematic problems, letter retention and recall, and the mathematics anxiety itself. The result was so pronounced that performance levels, known as affective drop, deteriorated considerably.

Current education is rife with situations where students face pressure-packed situations. In testing situations, students must simultaneously manage difficult mathematical problems and the manifestations of their own mathematics anxiety, knowing that the results of the test may possibly impact their future (e.g., pass the test for promotion to the next grade level, obtain a high school diploma). According to Ashcraft and Moore (2009), using a student's score on a standardized test as the only measure of mathematical understanding is misguided. "Some portion of the math-anxious student's low scores is more appropriately attributable to math anxiety" (Ashcraft & Moore, 2009, p. 202).

Other studies have considered failure in mathematics due to high-stakes situations (Beilock & Carr, 2005; Beilock, Kulp, Holt, & Carr, 2004; Schmader & Johns, 2003). While the settings of these studies differed, the conclusions were similar concerning how performance may suffer as a result of the effects on working memory. Moreover, like similar studies by Ashcraft and Kirk (2001) and Ashcraft and Moore (2009), these research studies show cases in which anxiety makes mathematics achievement and proficiency scores underestimates of true ability.

The relationship between working memory and the phenomenon known as *choking under pressure,* defined by Beilock and Carr (2005) as “performing more poorly than expected given one’s skills” (p. 101), has been examined. Schmader and Johns (2003) described this pressure-induced performance decrease as a result of the awareness of what is known as stereotype threat, the belief that individuals conform to stereotypes attributed to groups to which they belong. For example, Caucasian males scored more poorly than Asian males on mathematics tests, not because of ability level, but due to the stereotype that Caucasians perform more poorly at mathematics than Asians. However, if compared to Caucasian women, these Caucasian men may perform better due to the stereotypes associated with gender (Bosson, Haymovitz, & Pinel, 2004).

On the other hand, a stereotype lift is described when confidence levels, expectations for success, and performance measures are increased due to membership in some stereotyped group (Cheryan & Bodenhausen, 2000). However, even these positive expectations may lead to choking under pressure when, instead of doing well, individuals in a positively stereotyped group do more poorly when made aware of their membership in this group. For instance, Asian women performed more poorly on a mathematics test when their ethnicity was indicated compared to indications of their gender (Cheryan & Bodenhausen, 2000). Therefore, the conclusion was that positive expectations related to certain ethnic groups can prompt underperformance by members of these groups. Regardless of negative or positive labels associated with certain groups, stereotype threat hinders the working memory from performing successfully (Rosenthal & Crisp, 2007; Schmader & Johns, 2003).

Tobias (1978) brought suspected stereotype generalities regarding mathematics anxiety into more specific focus. She found that female's lack of performance related to how they were treated as students by mathematics teachers, as well as self-fulfilling cultural mores. Teachers were likely to have more interaction with male students, resulting in a better mathematics learning ethic in boys than in girls. Ultimately, when this ethic was coupled with societal views that mathematics is a male-only discipline, females perceived that doorways to careers in mathematics and science were closed to them. These societal myths that women are less capable of excelling in mathematics have led some women to avoid the study of mathematics (Zaslavsky, 1994).

In a similar study to that of Cheryan and Bodenhausen (2000), Beilock and Carr (2005) explored the relationship between memory capacity, choking under pressure, and high-stakes mathematical problem-solving situations. Among 93 Michigan State University participants, those with low working memory (LWM) were more apt to choke under pressure because they had a limited capacity in the first place. The added pressure of the situation may lessen the available working memory, making them less likely to perform successfully.

On the other hand, results from the study also revealed individuals with the capacity for high working memory (HWM) showed a decrease in their ability to do mathematics successfully (Beilock & Carr, 2005, p. 104). Normally, they would perform better on difficult mathematical tasks because of their recall ability. Yet, precisely this working memory advantage was hypothesized to cripple the HWM students (Beilock & Carr, 2005). When there was pressure from high-stakes situations, they were denied the working memory capacity that usually led to superior performances. The advantage that would be seen under normal conditions disappears because their attention capacity is affected (Beilock & Carr, 2005).

This carries significant implications for interpreting scores on standardized tests, college entrance exams, and the like. If anxiety targets those with higher memory capacity or those best equipped to deal with difficult, memory-intensive situations, then these individuals are more likely to fail when placed in anxiety-laden situations. Beilock and Carr's study (2005) brings to question the ability of standardized tests to represent true ability levels or future academic performance. Ironically, results of the study indicated that those who would succeed in normal conditions were those who were most likely to fail in high-stakes situations.

Much of the literature as it relates to mathematics education and mathematics anxiety also focuses upon university or college students. The female students of Tobias' 1970's study are the female elementary teachers of today. The trends that she identified have come to fruition in mathematics education. A recent study suggested that when elementary teachers, whose population is greater than 90% female, displayed a high level of anxiety about mathematics, this anxiety was transmitted to their female learners (Beilock et al., 2010). Beilock et al. (2010) also revealed that after spending 1 year with a math-phobic elementary teacher, females displayed an increased belief in stereotypes about female mathematical ability. A significantly larger percentage of student teachers have shown poorer mathematical knowledge and higher levels of mathematics anxiety or strong negative feelings toward mathematics than other undergraduate students (Bursal & Paznokas, 2006; Malinsky et al., 2006). This prevalence causes concern for their effectiveness and the potential for passing anxieties on to their students (Beilock et al., 2010; Ma, 1999; Malinsky et al., 2006; Uusimaki & Kidman, 2004).

Mathematics anxiety often starts at a young age (Perry, 2004). In his work, Perry (2004) discovered that teachers who ignore the reality of mathematics anxiety are destined to create this problem in some of their students. He chronicled many incidences of college students vividly remembering teachers' insensitivity to those who lacked some mathematical ability. Many adults attributed the beginning of their mathematics anxiety to childhood experiences in which they were embarrassed in front of peers. Others recognized inadequacies of the teachers' instructional strategies. While Perry recognized that these remembrances of childhood experiences are very real, he also acknowledged it is often natural to blame poor achievement on teachers. Further, teachers who are afraid of mathematics are not as likely to use instruction that involves tasks which allow students to create their own ideas and strategies to solve problems. Student-centered lessons that relay mathematical concepts and higher-order thinking are replaced with more traditional, rote teaching practices (Gresham, 2008).

Mathematics Anxiety of the Educator

Studies have shown that the majority of elementary education majors are predominantly female and have the highest degree of mathematics anxiety compared to any other college major (Hembree, 1990). Because most colleges and universities require few mathematics courses for these future teachers, an individual can complete their education degree even if they are prone to shy away from mathematics. Having an impact on mathematics achievement, mathematics anxiety has been recognized for the consequences that it brings to the individual who experiences it. Even more concerning is the effect that mathematics anxiety may have upon impressionable young children who are influenced by their teacher (Beilock et al., 2010).

Several factors contribute to the idea that young girls are more likely than boys to notice their teacher's negative feelings toward mathematics. In general, children are more likely to imitate the behavior, attitudes, and beliefs of an adult of the same gender (Beilock et al., 2010). Because they are exposed to many more female teachers than male, young girls notice any negative feelings or attitudes that their teacher may have regarding mathematics (National Educators Association, 2008). Results from a recent study (Beloick et al., 2010) showed how female elementary teachers' mathematics anxiety and negative attitudes toward mathematics affect achievement. Beyond just recognizing the teachers' attitudes about mathematics, this study revealed that even at a young elementary school age, children are aware of and begin to believe stereotypical beliefs pertaining to gender (Steele, 2003; Steele, Reisz, Williams, & Kawakami, 2007).

In fact, precisely these gender ability beliefs most negatively relate female teachers' anxiety and girls' mathematic achievement.

In Beilock and colleagues' study (2010), 117 first- and second-grade students and their teachers were the subjects. Not only was mathematical achievement assessed, but so too were the students' beliefs about success as it relates to gender. While teacher anxiety apparently seemed to have little effect at the beginning of the school year, significant differences were recognized by the year's end. The more math-anxious the teacher seemed to be, the more likely the young girls came to believe the stereotypical belief that they are not expected to excel in mathematics; boys do well in mathematics and they do well in reading. Results showed that the more a young girl endorsed the *girls are not as good at math* philosophy, the lower their mathematics achievement. The assumption was that having a math-anxious female teacher confirms gender ability beliefs about mathematics. This belief, in turn, affects girls' mathematic achievement. Surprisingly, this correlation was not made for boys in the classroom, or for girls who did not hold this stereotypical belief (Beilock et al., 2010).

Negative beliefs about mathematics derive from students' frustration because of the inability to learn mathematics, which they attribute to non-supportive teachers who erroneously assumed that basic mathematical processes were not difficult to comprehend. A teacher's own school experiences, especially in high school, may have influenced the formation of any negative belief and fears about mathematics (Gresham, 2007; Trujillo & Hadfield, 1999; Uusimaki & Nason, 2004).

These attitudes consequently affect teaching practices. Using more traditional teaching methods, these math-anxious teachers use strategies that are contrary to those prescribed by the National Council of Teachers of Mathematics (NCTM) for rigorous, high quality instruction (Charalambos, Philippou, & Kyriakides, 2002; Gresham, 2008; Hembree, 1990; Martinez & Martinez, 1996; Mathews & Seaman, 2007). The NCTM (2000), in *Principles and Standards for School Mathematics*, provided a comprehensive set of standards for school mathematics which "describe the mathematical understanding, knowledge, and skills that students should acquire from pre-kindergarten through grade 12" (para. 1). These standards are described in five "content areas of numbers and operations, algebra, geometry, measurement, and data analysis/probability" (NCTM, 2000, para. 8). The five process standards describe goals in "problem solving, reasoning and proof, connections, communication, and representation. Together, the standards describe the basic skills and understandings that students will need to function effectively in the twenty-first century" (NCTM, 2000, para. 8).

The Learning Environment

In addition to anxiety as a factor that affects student achievement, a second indicator of student learning is the environment in which instruction takes place. Much more than the physical setting, the environment includes the teacher-student relationship based on both parties' attitudes and expectations for learning. Several environmental elements have a major influence on achievement and motivation in the classroom, no matter the age or grade level of the child (Armstrong, 2008; Ashman, 1997; Curran & Rose, 2006; Jensen, 2006; Sousa, 2006).

In their research on overcoming common barriers to student learning, Burks et al. (2009) noted that outlining clear expectations builds trust with the student. Students cease to be motivated if expectations are unclear or unreasonable. Years of learning mathematics through rote techniques (i.e., a problem with a fixed answer is presented and students practice a particular strategy until a procedure is mastered) do not prepare many students for the demands of a college mathematics course. In a typical classroom, students are often not taught *how* to approach the study of mathematics. When teachers explain problem-solving processes in ways students can understand, student motivation to learn increases (Burks et al., 2009).

Because the mathematics classroom is one place where instructors intentionally introduce moments of uncertainty and so-called struggle time, the mathematics teacher must be continually aware of the learning environment. A good balance between student-centered and teacher-focused approaches is a crucial instructional strategy. Those students who do not believe themselves capable of learning mathematics need individualized guidance and encouragement to produce small successes that lead to further gains. Although these strategies require greater effort on the part of the mathematics instructor than traditional methods, they are essential to low self-efficacy students.

Also, enthusiasm for learning affects a student's level of engagement and motivation, creating a cause-and-effect cycle (Burks et al., 2009). When students disengage, the instructor is sometimes tempted to stop motivating them. This, in turn, causes the student to become more unmotivated, causing the teacher to become resentful.

Professional development opportunities should be provided to offer mathematics instructors the support they need to differentiate and teach to all students, as oftentimes teachers tend to teach in the same manner in which they were taught years ago. While this way of teaching may have been successful for them at the time, they need guidance in ways to move away from what is familiar to reach struggling, unmotivated mathematics students.

Regarding engagement, interestingly, the phrase *pay attention* is often used. Attention requires the brain's resources to be expended, thus orienting, engaging, and then maintaining whichever neural network is appropriate. Further, the thinker must simultaneously lockout internal and external distractions (Jensen, 2005). Research confirms that when the brain is engaged in interesting tasks, more pleasure structures are activated than when the brain is simply memorizing or following a routine (Armstrong, 2008; Jensen, 2005, 2006; Sousa, 2006).

Ironically, the pressure associated with standards implementation and high-stakes testing may make it difficult for the mathematics instructor to support engagement and enthusiasm in ways that will also generate higher levels of student recall and attention. The brain places limitations on incoming information so that it will not experience overload (Posner, 2004). In fact, studies have shown that there is a correlation between working memory and age (e.g., Jensen, 2005; Linden, 2007; Wolfe & Bell, 2007). For teachers to decide how long they can keep the attention of students during an instructional task, Jensen (2005) suggested considering the student's age, then add or subtract two minutes. When considering the amount of information that the brain can process, as opposed to the amount of focused time, lessons ideally should be chunked into three or four sections (Cowan, 2001; Linden, 2007). If teachers choose to ignore these limitations, their students are apt to disengage so that their motivation decreases, and they forget what they have just been taught.

Almarode and Almarode (2008) suggested the use of energizers to maximize student input and attention levels. These quick activities, which may derive from content or be completely unrelated to instruction, give the brain what is needed for ideal learning conditions (Hannaford, 2005). Physical movement increases blood flow and oxygen to the brain, both of which are needed for brain functioning (Ratey & Hagerman, 2008). Through a process known as angiogenesis, this increased blood flow makes processing information more effective and clears the brain of toxins (Medina, 2008). A student being involved in activities as simple as walking to a new place in the classroom after one instructional chunk allows for better processing and readies the brain for the next instructional piece.

Other benefits of strategically placing energizers in a lesson are that they provide an increased level of dopamine in the brain. Repetitive movement, exercise, celebrations, and confirmations all contribute to the release of dopamine, a neurotransmitter that is implicated in the learning process (Jensen, 2005; Medina, 2008; Ratey & Hagerman, 2008). When dopamine is released in the brain, our ability to use information and then transfer and hold it in our long-term memory increases. Any content-based activities that allow for students to get up out of their desks, move around the room, and share what they have learned or explore new material will be more exciting than the *sit-and-get* teaching strategy. In turn, students could be more likely to pay attention and learn.

Whether it is allowing the brain a short rest break to prepare for more information, or having a very active classroom, these energizers are needed by the brain (Almarode & Almarode, 2008). Rather than taking away from instructional time, they are used as a part of the lesson. Using them not only capitalizes on what we know about how the brain learns best, but it would involve unmotivated students to become part of active, engaged lessons.

Perceptions of the Relevance of Mathematics

A final consideration for examining motivation of mathematics students is the way in which they understand the relevance of mathematics to real-world contexts and their future. The NCTM focuses on the importance of knowing mathematics for daily use, and for use in the workplace, especially the scientific and technical applications (NCTM, 2000). Despite the standards of the NCTM, research has suggested that students may not understand the connection between mathematics and its applications to their current and future lives (Sfard & Prusak, 2005; Sullivan, Tobias, & McDonough, 2006). Comparatively, the work of Fennema and Sherman (1976) revealed that students who scored high on mathematics achievement tests viewed the subject as more useful than students who scored low. Reporting on the views of 14- to 18-year-old students in England and their perceived relevance of mathematics, Onion (2004) found that many of the students thought that the mathematical concepts taught were only useful for exams. When considering the use of algebra in their daily lives, only a small minority of students spoke of the value of critical thinking, a skill taught in the study of mathematics. While there was a consensus among the students that basic mathematics is helpful in daily life, they could not relay the usefulness of mathematics in their anticipated future work environments.

Motivation and the significance that an individual attributes to a task are directly related. Those tasks with greater meaning and relevance to an individual will result in increased motivation. Even the students with mastery goal orientations, who are typically able to find value in their work, must have clear guidelines and understand the topic or else they will not completely understand the purpose of their work (Dweck, 2000).

Many strategies are available to mathematics educators that support what has been learned from theoretical and experimental research. Clearly communicating objectives of mathematics lessons will help boost student confidence and enhance self-efficacy (Ames, 1993; Bandura, 2005, 2006, 2008; Burks et al., 2009; Schunk, 2003, 2005). Classroom environments that promote appropriate independence and self-direction will lead to increased levels of competence among students. Ultimately, intrinsically motivated students will behave appropriately when they perceive that their interactions with teachers are helpful, supportive, and nurturing (Marzano, 2003, 2007; Seifert & O'Keefe, 2001; Sullo, 2007).

Qualitative Research Methodology

Hatch (2002) described the fundamental necessity of examining the belief systems that support a study at its onset. Researchers must determine their own worldviews, as they will guide and inform every aspect of their study. Whether called paradigms

(Lincoln & Guba, 2000), philosophical assumptions (Crotty, 1998), or knowledge claims (Creswell, 2003), considering these should be the starting point for research studies. The study was grounded in a constructivist approach. It was assumed that multiple and unique realities exist because individuals construct them as they experience the world in which they live. As individuals develop meaning for these experiences, recognizing that these meanings are subjective and vary greatly is important. The constructivist approach leads to more open-ended questioning as the goal is to rely upon the participants' viewpoints. Since meaning is derived from this social perspective, the researcher must understand the context in which individuals live their experiences. An interpretation is then made of what is found (Moustakas, 1994; Sanders, 1992).

Justification of Qualitative Methodology

A close examination of different research approaches and the practices used in each helped determine the most appropriate design for this study. Quantitative studies tend to use post-positivist claims, testing a theory with pre- and posttest measures using independent and dependent variables (Creswell, 2003). Qualitative studies are typically grounded in constructivist perspectives, using open-ended questioning with data emerging throughout the study (Creswell, 2003). To establish the meaning of the phenomenon experiences of studying mathematics through the participants of the study, conducting the research study alongside them was necessary. For this reason, a qualitative study was chosen as the most appropriate.

Summary

The literature review provided the conceptual framework for the qualitative study. The problem of this research study is the perceptions that middle school mathematics students may have about themselves in regards to the study of mathematics. Considering the problem at the local and national level, the need for the research was established in Section 1 and then grounded in the literature in Section 2. The themes of the review were related to the anticipated findings of the study. As such, the literature review explored classic motivation theories, cultural differences in self-constructs, mathematics anxiety, the learning environment, and perceptions of the relevance of the study of mathematics.

Section 3: Research Method

Introduction

The problem that this qualitative study addressed is the perceptions that middle school mathematics students may have about themselves in relation to the study of mathematics. The possible poor perceptions that students have about themselves may be due to their struggles in mathematics (Burks et al., 2009; Gresham, 2008; Seifert, 2004; Vogel, 2008). These problems impact the school because, despite using the expertise of mathematics specialists and the use of data to drive instruction, school data show that some students are still not successful on high-stakes standardized tests. Section 1 of this study related this local problem to the larger educational context, reaffirming the need for this study and its potential for social change.

This section describes the data collection and analysis methods used to address the problem in this phenomenological study. First, the research design will be described, justifying the use of a qualitative approach as the most appropriate for this particular study. Next, the context of the study will be described, along with the participant selection procedures and ethical considerations of the study. Further, the data collection, organization, and storage procedures will be explained along with the role that the researcher will play in the data collection process. Finally, a description of the data analysis procedures will be presented, including methods to address validity.

Phenomenological Research Design

Qualitative studies are typically grounded in constructivist perspectives, using open-ended questioning with data emerging throughout the study (Creswell, 2003). To establish the meaning of the phenomenon under study, experiences of studying mathematics, through the participants, conducting the research study alongside them was necessary. For this reason, a qualitative study was chosen as the most appropriate. Furthermore, an understanding of the lived experiences of participants to develop patterns of meaning (Moustakas, 1994; Sanders, 1982) deemed a phenomenological approach the most appropriate for the study. The purpose of the research does not seek to capture detailed stories of an individual or a few individuals (i.e., narrative research), generate a theory (i.e., grounded theory), study a cultural group (i.e., ethnography), or understand a particular case over time (i.e., case study). Because these methods do not focus on the perspective of a small group of students and their constructed realities pertaining to the learning of mathematics, they would be less effective.

With the constructivist foundation, the research study is classified as a hermeneutic phenomenological qualitative study. "Phenomenology describes how one orients to lived experience; hermeneutics describes how one interprets the *texts of life*" (Van Manen, 1990, p. 4). Sanders (1982) explained how "certain types of phenomena elude quantification and statistical inference" (p. 358). To characterize all of the participants to a statistical analysis fails to recognize the unique nature of each individual. By nature of its definition, this study seeks to understand the essence of the experience of studying mathematics from the perspective of sixth through eighth grade students placed in a remedial mathematics program. Since together we will construct meaning of these lived experiences, my being distant from the participants is undesirable (Hatch, 2002). On the other hand, bracketing my own biases and preconceptions of studying mathematics (Creswell, 2007; Hatch, 2002; Moustakas, 1994) was important. Qualitative research requires a recognition that my interpretations will flow from my personal and historical experiences. However, these will not interfere with the desire to understand the experiences of the participants in the study. As such, hermeneutic principles guided my interpretative construction of participant perspectives. In conclusion, this design was chosen as it most appropriately fits the nature of the study.

In her article to illustrate the relevance of phenomenology, Sanders (1982) posited that “researchers are urged to consider phenomenological analysis to study traditional research problems” (p. 353), which indicates that phenomenology can be appropriately used in problem-driven research studies such as this one. Further, Sanders described phenomenology as a new way of viewing problems and a methodology used to capture what may be potentially overlooked in other research methods.

According to Hatch (2002), the methodological and substantive theoretical orientations help frame the research questions of the study. Initially establishing the metaphysical assumptions and the research design will help ensure that the qualitative research questions will fit within the paradigm. Although research questions vary depending upon the philosophical assumption, they should be answerable through detailed description and analysis of a phenomenon in a specific context. This phenomenological study used individual and focus group interviews to answer the overarching research question, “What are the experiences of a select group of middle school students in studying mathematics, and what meaning do these students give to their experiences?”

Context of the Study

Since the research question guides the entire study, the context of the study in which this question is answered is a critical part of the design process (Creswell, 2003; Flood, 2010; Hatch, 2002; Nicholls, 2009). The context of the study not only includes the physical setting, but the participants and the activities in which they are involved (Hatch 2002). Unlike quantitative research with random samples and large numbers of participants, it is important for this phenomenological study to purposefully select those who will best help understand the issue being studied. Choosing participants who have personal experiences related to the phenomenon and are able to communicate their experiences with it are necessary for the success of the study (De Rivera, 1984; Sandelowski, 1995).

The study occurred in a middle school in northwest Georgia. The 2010/2011 total school population is 605 students in sixth, seventh, and eighth grade regular education mathematics classes. The student body composition is as follows: "79% White, 16% Hispanic, 2% Multi-racial, 2% Black, .64% Asian, and .03% Limited English Proficient" (Gordon County Board of Education, Ashworth Middle School 2010-2011 Profile, Student Demographics, para. 6).

Ethical Protection of Participants

Rooted in the constructivist assumption, this study took the approach that the researcher and participants jointly construct meaning of the experiences described throughout the study (Nicholls, 2009). For this reason, it was important for the researcher to remain subjective and create a caring, trusting relationship with all participants. This was facilitated by the prior experience I had with the participants as they are former students. It is through this mutual relationship that meaning was constructed for the phenomenon of the study. Because the participants ultimately determine whether and to what extent the research question is answered, establishing a collaborative, working relationship with them was critical. Participants must understand their role and responsibility, as well as the role in which I would serve in the research process. Implementing a plan for helping participants “learn how to be studied” (Hatch, 2002, p. 51) will help build trust not only between the participants and myself, but among each other as well. This was achieved by clearing defining expectations of each of the participants and making them feel at ease, understanding that there are no *right answers* during the data collection process.

Because the participants were middle school students, I was greatly aware of the ethical responsibility throughout the research process and of ensuring that participants fully comprehended what their participation entailed. Validation measures were used as techniques to protect the rights and voices of the participants in this study. These will be discussed in detail later in this section.

To make sure that the research was designed in ways that protect minors from harm, access to the participants was only gained based upon the approval by the Walden University Institutional Review Board (IRB # 06-22-11-0127935) to conduct the research (Creswell, 2007; Glatthorn & Joyner, 2005; Hatch, 2002). Establishing an environment where participants feel at ease with me and each other was particularly important. An essential element in creating this environment was the ethical obligation of protecting those who have agreed to contribute to this. First, no participant was accepted into the study without parental consent and student assent agreeing to participate. Second, student responses to interview questions made during the one-on-one interviews will be kept confidential, and students were told throughout the preliminary stages of participant selection and participant determination that inclusion in the study was voluntary. At the informational meeting, students were instructed that if chosen as a part of the study, the participant were allowed to withdraw at any time or to refuse to answer any questions that made them uncomfortable. Only former students of the researcher were included. Likewise, considering the nature of middle school students and their sometimes eagerness to please the teacher, they were also assured that there will be no favoritism shown toward students for their participation in the study. Furthermore, it was explained that no extra credit or compensation would be given to members of the study to ensure that participation was completely voluntary. All procedures put in place for this study (e.g., IRB approval, informed consent, voluntary participation, and confidentiality) were designed to protect participants for harm.

Role of the Researcher

Because of the probing and interpretive nature of such studies, qualitative research demands attention to ethical procedures throughout the research process (Creswell, 2003, 2007). Just as in the case with quantitative studies, instruments need to be described. Throughout qualitative studies, however, the researcher is the instrument that gathers data. Therefore, readers should know about relevant aspects of the researcher—that is, biases and assumptions, and relevant history to the research topic.

I have served as the only remedial mathematics instructor at the middle school in the Gordon County school district of northwest Georgia. Considered a highly qualified teacher by the state of Georgia, I am certified to teach middle grades mathematics. My particular role at the school has been to identify and teach the so-called bubble students who are at risk for not meeting the Georgia Performance Standards (GPS) for mathematics.

The initial sample population for the study included any student who has formerly been a part of the remedial mathematics program. Because of the nature of the 9 week term of the school, a student may be a part of the program any one or all of the four grading periods of the school year. However, participants of the study were not current students. There seemed to be a core group of seventh and eighth grade students who are frequently in the class. So, although no participant was a current student at the time of the study, he or she likely would have spent much of their middle grade years with me.

I believe that my understanding of the research site, the typical middle school student, and the characteristics of an individual in the remedial mathematics program enhances my knowledge and sensitivity to the challenges faced by someone studying mathematics within a remedial mathematics program. However, my perceptions of this phenomenon are shaped, in part, by my own personal experiences as a mathematics student. As one who generally excelled in mathematics, bracketing my own beliefs was important to guarantee objectivity so that any preconceived notions that I may have in regards to this topic did not affect data collection or analysis. To this end, using quality indicators such as detailed descriptions and elucidation of my preconceived notions of being involved in a remedial mathematics program helped validate the study.

Chosen out of a desire to help those within my own school environment, the research took place within my own workplace or “backyard” (Creswell, 2003; Hatch, 2002). Although collecting data in one’s workplace can compromise the integrity of the research, I used research strategies that would increase the validity of the study and decrease the bias that might be present because of my past relationship as the remedial mathematics teacher of the participants. These strategies included the use of triangulation of data sources; rich, thick descriptions; peer debriefing; and disclosing any information that seems to be discrepant from expected findings. These strategies will be discussed in a later portion of this section where quality assurance measures are explained.

Participant Selection Criterion

The criterion for selecting participants was past participation in the school’s remedial mathematics program. Approximately 180 students were serviced in the remedial mathematics program. Students are chosen as candidates for the remedial mathematics program primarily based upon their past standardized testing data. In addition to considering student’s overall score on past standardized tests, attention was given to their level of success in each of the grade-specific categories or domains. These elements provide indicators that a student was a candidate for the remedial mathematics class. The Georgia mathematics curriculum is organized into five content domains that are used as an organizing tool for each of the standards: (a) numbers and operations, (b) algebra, (c) measurement, (d) geometry, and (e) data analysis and probability (Georgia Department of Education, 2009). For any given term, or 9-week period, the sample population may include, at most 90 students. There are two sections taught for each grade level, with each section having a maximum of 15 students, or 30 per grade level.

Selection Procedures

Based upon IRB guidelines, no data were collected prior to receipt of approval on June 22, 2011, IRB # 06-22-11-0127935. Once permission was gained from the IRB to conduct the research, school administrators were made aware of detailed aspects of the study through personal contact with administrators within the school district and the school. Because approval was gained during the summer break, all other key personnel within the school (e.g., math specialist, regular education mathematics teachers, and special education mathematics teachers) were informed of the study in a mathematics faculty meeting during pre-planning for the 2011-2012 school year. Any student who had been served in the remedial mathematics program was a potential candidate for the total population of the study. A purposeful sampling strategy produced the participants who will know and provide the most information about the phenomenon being studied, as it is often *experiences* that are actually being sampled (Sandelowski, 1995). Hatch (2002) offered examples of how different purposeful sampling strategies are applied in educational settings. Maximum variation strategies are used to include a variety of perspectives from individuals on the same phenomenon. More specifically, a phenomenal variation sampling strategy was employed so that the unique and diverse perspectives of enough individuals will be a representation of the whole. Further supported by Morse (as cited in Sandelowski, 1995), the use of phenomenological qualitative studies require about six participants. Because this study spanned several grade levels, 12 participants were initially considered as potential participants of the study. This number was chosen with the expectation that there was a possibility that some may not accept the invitation to participate. However, no student being served in the remedial mathematics program at the time of the study was considered for participation. Rosters of the first 9-week term of the remedial mathematics class were examined to ensure that none of these students, nor the parents/guardians of these students, received an invitation to participate in the research study.

A consent letter was mailed to parents/legal guardians of the 12 potential participants of the study. In language that was understandable to them, the consent letter explained the purpose and duration of the research, the procedures that would be followed for data collection and analysis, any foreseeable risks and benefits to the student, how confidentiality will be maintained, and that participation is completely voluntary and can be revoked at any time. The informed consent letter sent to parents or guardians of remedial mathematics students is provided in Appendix A. Parents were given one week to respond to the letter (August 1 – August 8, 2011). These consent letters included a self-addressed, stamped envelope and were returned to and retained at the home of the researcher.

Upon receipt of the consent letters, those students whose parent/guardian agreed to the participation in the study convened for a brief informational meeting with the researcher. Because of the exclusion criteria for the study, no current student of the researcher was a part of this meeting. As well, no student for whom a parent consent letter was not received was a part of the informational meeting. Of the 12 potential candidates, two letters were not returned by the deadline, and one parent denied participation in the study. Therefore, there were nine participants to take part in the study, all of whom were present at the informational meeting. At such time, the students were told why the research study was being done, the purpose of the study, why they were candidates for the study, what would be expected of them if they participate, how their participation would be kept confidential, expected benefits of the study, that they can drop out at any time, and any known risks associated with the study. Along with this verbal overview, students were provided assent letters, describing the above mentioned items, as well as how they will collaborate with the researcher during the analysis phase to ensure that data are analyzed properly. The letter given to students is provided in Appendix B. Students were given one week to consider whether they will participate in the research study (August 8 – August 14, 2011). Signed letters were returned to and retained at the home office of the researcher.

Each grade level had three participants, for a total of nine students for the study. Using this purposeful sample size allowed me to establish a working relationship with the participants, yet it was large enough to receive multiple perspectives of the phenomenon. With a rather small sample size, collecting data in multiple ways will help validate the study (Creswell, 2003; Hatch, 2002; Janesick, 2004).

Data Collection

The problem of this study was best examined using a phenomenological approach since it was important to develop a deep understanding of several individuals' shared experiences related to the study of mathematics. Qualitative data collection methods play a vital role in providing useful information to understand the essence of this phenomenon as it is described by the participants. This study used individual interviews, focus groups, and several forms of unobtrusive data (e.g., journal entries, student records). Journal entries included field notes taken during interview sessions, as well as notes of conversations with students as they describe their perspectives on their experiences within the mathematics classroom. These journal entries were a source of data that reinforced and confirmed ideas that were presented in the individual interviews and focus group sessions. For both individual interviews and the focus group session, a semistructured interview protocol was used with guiding questions, but conversations sometimes took a more probing approach as participants provided insight into the overarching research question. After all of the individual interviews had been held, one focus group session was conducted. From each of the three grade levels, three students, or total of nine, participated. Individual interviewing and focus groups were chosen to uncover the ways in which participants construct meaning of their experiences. These data collection methods bring to light important details that may be missed through direct observation of participants. Interviewing individuals or small groups of individuals also revealed the significance of the forms of unobtrusive data collected.

Grounded in a phenomenological perspective, the research study examined not only the facts surrounding an instance but how the student interpreted the meaning of its occurrence. Individual interviews sessions were held either before school or after school. Unless otherwise noted, all interviews were held between August 16, 2011, and August 24, 2011. The data collection period concluded with the focus group session which was held after school on the afternoon of August 25, 2011. Time spent with the participants began with asking participants to share particular incidents they remember about certain aspects of school. Their responses then served as prompts to delve deeper into the meaning of their constructed reality. The assumption was that there is a core, a shared nature, or essence that holds the experiences together.

Data Collection Procedures

The interview and focus group questions were designed to elicit: (a) rich, thick descriptions of their feelings of mathematics; (b) their experiences in elementary school years that shaped their feelings; (c) if there is a pivotal, defining moment that they can recall that still remains with them; (d) how their feelings affect them psychologically and physically; (e) the perceptions of the importance of mathematics for their future; (f) what motivates them in a mathematics class; (g) to what they attribute their success in mathematics; (h) to what they attribute their lack of success; and (I) how being a part of a remedial mathematics program effects their feelings about their mathematical abilities. One focus group session of all participants was held after all of the individual interviews were conducted as a secondary data source. This allowed me to gain insights that might not have been available from the individual interviews. As Hatch (2002) explained, an advantage of focus groups, as opposed to individual interviews, is that the researcher serves as a moderator as participants more freely share information. The existence of the group setting provided a degree of security which allowed for more candid and honest feedback that may not be gained through individual interview settings. "Being in a group may make participants more willing to express opinions that they perceive might not fit with researcher expectations" (Hatch, 2002, p. 132). The duration of interviews was approximately 45 minutes to an hour. However, the duration and the number of questions varied from one participant to the other based upon the number of probing, follow-up questions.

Nine individual interviews and one focus group session took place in a central location, the school's data room. Each of these was held outside of regular school hours and in no way took away from instructional time. Each meeting was audiotaped. Any notable facial expressions, nonverbal communications, and emotions were captured as field note records. Because analysis procedures were to begin immediately after collection, these field note data benefited subsequent interview sessions. Because this qualitative research process is an emergent one, insight gained through the development of codes and themes in the analysis process helped shape and refine questions asked of the participants. The cyclical and interrelated nature of data collection and analysis often led to these processes occurring simultaneously during the research study.

Another form of data collection derived from the process is the bracketed notes of the researcher of impressions that come to mind during the interviews. Used in conjunction with the audiotaped recording, my bracketed notes served as a comparative means to check for accuracy and consistency throughout the interview process. All bracketed notes were included as a part of my research journal and were processed immediately following each of the interview and focus group sessions. Specifically, comparisons were made between the bracketed notes and the audiotape to serve as concrete measure to assure that all data were captured correctly and in an ethical manner.

Qualitative Research Questions

Data were recorded with the use of an interview protocol, a predesigned form that includes a list of guiding questions and enables one to take notes during the interview. This protocol, as shown in Appendix C and Appendix D, also provided me with a reminder of pertinent information that must be shared with the participant at the beginning of each interview (e.g., the purpose of the study, issues of confidentiality, ability to not answer questions that make them uncomfortable, etc.). The date, time, and list of individuals in the room were also recorded on the protocol. Open-ended, guiding questions were listed as a means to get the participants to share their experiences as a *story*. I stressed that there are no correct answers, as middle school students are likely to find answers they think a researcher is looking for (Hatch, 2002). Therefore, using open-ended questions that make the participant feel comfortable to share things from their own perspective, without fear of penalty or harm was critically important. By nature, a phenomenological interview uses guiding questions followed by prompts and probing questions to fill in details or encourage elaboration and examples. Through these questions and their recounting of past experiences, many of my ideas and notions about the problem were confirmed. Throughout the interview process, it was critically important that the nature of middle school students was recognized. Not only was the conversation directed through language that is familiar to them but all questions were made clear so that the student felt certain of what is being asked of them and comfortable in sharing their responses. This applied not only to questions asked, but clarification of their responses. Phrases such as "Did I hear you say …?" or "Did I understand you correctly?" were avoided as these are misleading and tend to make the student feel as if maybe another response should have been given. Examples of the interview protocol with a listing of guiding questions for individual and focus group sessions are included in Appendix C and Appendix D.

Data Analysis Procedures

To make sense of the data, common qualitative analysis strategies were employed as the data were prepared, organized, coded into overarching themes to develop a deeper understanding of the data, and represented through interpretations (Dana & Yendol-Silva, 2003; Hatch, 2002; Rubin & Rubin, 2005). Creswell (2007) described the research process as a cyclical one, as opposed to one in which research moves in a fixed, linear fashion. This is evidenced by the fact that data collection, analysis, and reporting often occur at the same time and are related one to the other. Creswell's (2007) data analysis spiral was used as a guide throughout the process. Analysis began as soon as data were collected. Doing so shaped the future direction of data collection based upon what was found in the data.

Data management began by organizing the transcribed interviews as hard copies in file folders. In addition, an electronic form was saved in Microsoft Word with a backup copy saved onto an external hard drive. In order to get a sense of the whole, transcripts were read several times. Individual interviews were seen as pieces, and as such, transcriptions for each were read and reread with each subsequent interview. This was done so that the pieces could be put together in meaningful relation to one another.

Memos written as bracketed notes on the interview protocol and entries made in my research journal during data collection provided a starting point for making interpretations. Those memos that were relevant to the study were highlighted on the interview protocol form and then transferred to a computer program. These impressions were identified as useful in preparing some systematic interpretation. Because these were taken in a spontaneous manner during the actual interviews or shortly thereafter (i.e., research journal entries), this process was repeated to take a more deliberate look at the actual transcribed interviews to record memos (i.e., my interpretations of what is happening with a greater understanding of the topic as a whole).

Creswell (2007) described the heart of qualitative analysis—describing, classifying, and interpreting. Along with Creswell and Moustakas's (1994) approach to phenomenological studies was used to understand the lived experiences of this select group of former middle school remedial mathematics students. For this phenomenological study, a list of significant statements regarding students' experiences related to the study of mathematics was made, each being equally weighted in importance, and not overlapping other statements. A compilation of statements was then grouped as themes. Themes were created from commonalities among individual experiences and the context of those experiences. A coding system was used to track themes throughout the data. Codes were set up in an outline format with the theme being assigned a Roman numeral and all quotes or examples being assigned a letter (i.e., I. Student Perceptions, I.A. "I've never been good at math!"). These codes were kept in a hard copy form and a computerized outline format and then easily transferred to the transcribed documents. This system served as one that provided an ease in referencing and allowed for the creation of more themes as they were discovered during the analysis process. These statements were used as the basis for a textural description of *what* was experienced with regards to the study of mathematics. Then a structural description of how and when certain memories were experienced was written. Finally, a complete description of the essence of the study of mathematics was written and represents the culminating representation of the phenomenological study. This was done in such a way that the reader would be able to understand what the students experienced and how they experienced it.

Measures to Address Validity of the Study

Validation of the data collected in the study was maintained by spending time with participants; the use of thick, rich, detailed descriptions; and the relationship established between myself and the participants (Creswell, 2007; Creswell & Miller, 2000). The types of validation strategies used in this study were yet another way of protecting the rights of its participants.

Triangulation of different data sources (i.e., one-on-one interviews, focus group session, unobtrusive data from field notes, and a researcher journal) used evidence from each to support and justify the findings of the study. Rigorous data collection procedures through multiple forms of data also helped in identifying themes throughout the study, as one may be reflected in other sources. Unobtrusive data were useful in the triangulation process as these data provided an alternate perspective on the topic.

Rich, thick, detailed descriptions about the participants and the context of their experiences allows readers to come away from the phenomenological study with a better understanding of what it is like for someone to experience being a part of a remedial mathematics program.

Any data that run counter to the initial interpretations or analysis are presented. In order to strengthen the study, this includes reporting discrepant cases that may be discovered during data collection. Specifically, quotations from students that indicate discrepancies from other students, the theoretical framework, or initial findings of the study are included.

Summary

The purpose of this phenomenological study was to discover the experiences of a select group of middle school students who had formerly been a part of a remedial mathematics program. The study further examined what meanings were given to these experiences and the perceptions of the participants. Using a qualitative methodology, data were generated from open-ended questioning through nine individual interview sessions and one focus group session of all of the participants. The phenomenological nature of the study shaped the data analysis process. The intent of the research study was to determine a core essence of the study of mathematics as experienced by remedial mathematics students. Since the participants of the study were young, middle school students, there was an emphasis on the ethical obligations to protect the rights of the participants. The study was validated through the use of multiple data sources; rich, thick descriptions; and the presentation of any data that ran counter to initial assumptions. Section 4 provides the findings of this phenomenological study.

Section 4: Results

Data Collection

The research problem that this qualitative project study addressed was the perceptions that middle school mathematics students have about themselves in regard to the study of mathematics. Current perceptions may have been formed partly as a result of years of repeated failure and lack of proficiency in mathematics. At the local level, this problem was evidenced by the number of students who meet the criteria for placement in the remedial mathematics program of a middle school in northwest Georgia. The following overarching research question guided the data collection process, "What are the experiences of a select group of middle school students in studying mathematics, and what meaning do these students give to their experiences?" Data were collected through nine individual interviews, one focus group session with all participants, journal entries, and student records. Journal entries included field notes taken during interview sessions and were a source of data that reinforced and confirmed ideas that were presented in the individual interviews and focus group sessions. Data were recorded with the use of an interview protocol, a predesigned form that includes a list of guiding questions and which enables one to take notes during the interview. Specific details of the data collection procedures were provided in Section 3. Examples of the interview protocol with a listing of guiding questions for individual and focus group sessions are included in Appendix C and Appendix D.

Data Organization

Procedures for the processing and storing of data are detailed as follows: Bracketed notes and all data from the audiotaped interviews and focus group session were transcribed immediately following the interview. Not only was this beneficial from the aspect of remembering the details of the meeting but immediate transcription served as a measure to help shape future sessions. A transcriptionist was paid for this service, with verification of the transcriptions made by reading the complete transcription while listening to the audiotape. This allowed me to correct any problems in the transcription or complete portions that the transcriptionist could not. All transcription tapes were labeled with a number associated with each participant and the date of the interview. Confidentiality was maintained throughout the transcription procedures by utilizing pseudonyms (e.g., Student 1, Student 2, etc.) to de-identify the data. This was done as soon as possible after the interviews to minimize the risk of disclosure of personal information. Careful attention was given to this precautionary measure of confidentiality so that no one may link any part of the data to an individual's identity.

A researcher journal was also secured that recorded facts related to the interview sessions and the focus group (e.g., date, time, place, and duration), impressions from the participants, and how subsequent sessions may be improved. Physical data were stored, including signed parental/guardian consent agreements, signed participant assent forms, interview protocols with field notes, and any communication between parents/participants in my home office. Interview transcriptions were stored electronically on my home office computer.

Data Analysis

For this phenomenological study, a list of significant statements regarding students' experiences related to the study of mathematics was made, each being equally weighted in importance and not overlapping other statements. A compilation of statements was then grouped by themes. Themes were created from commonalities among individual experiences and the context of those experiences. A coding system was used to track themes throughout the data. Codes were set up in an outline format with the theme being assigned a Roman numeral and all quotes or examples being assigned a letter (i.e., I. Student Perceptions, I.A. "I've never been good at math!"). Records were kept of these codes in a computerized outline format with a reference to the page number in the transcription where each particular statement or example could be found. This computerized outline served as the master codebook. Then the identified codes were also written in the margin of the transcripts so that as new themes or statements were identified, they could easily be added to the master codebook. This system served as one that provided an ease in referencing and allowed for the creation of more themes as they were discovered during the analysis process. These statements were used as the basis for a textural description of *what* was experienced with regards to the study of mathematics. Then an interpretive, structural description of *how* and *when* certain memories were experienced was written. Finally, a complete description of the essence of the study of mathematics was written and represented the culminating representation of the phenomenological study. This was done in such a way that the reader would be able to understand what the students experienced and how they experienced it. The structural description and essence of the phenomenon are included in Section 5 in which interpretations of the findings are discussed.

Textural Description

This study explored the perceptions that students have about themselves in relation to the study of mathematics. In doing so, this study sought to answer the main research question: "What are the experiences of a select group of middle school students in studying mathematics, and what meaning do these students give to their experiences?" Data were collected through nine individual interviews, one focus group session with all participants, journal entries and student records. From the interviews and focus group sessions, a list of participant statements was compiled to create a coding system guide. The statements were grouped together based upon commonalities. This led to the creation of several major themes that were identified throughout the data collection and analysis process. Table 1 presents the overarching themes and subthemes that emerged from the data.

Table 1

Themes and Subthemes in the Data

Theme	Subtheme
1. Self-efficacy	1.1 Student effort
2. Grades	2.1 Past academic performance
3. The learning environment	3.1 The math teacher 3.2 Interactions with peers
4. Student attitudes	

Theme 1: Self Efficacy

Theme 1, self-efficacy, refers to the confidence that a student has in his or her ability. Bandura (1977, 1989, 2005, 2006, 2008) asserted that individuals anticipate results based upon past experiences and develop certain judgments about their capability to deal with certain situations. Regardless of how a student felt about the study of mathematics, each of the nine participants in some way referenced their lack of ability. Within the self-efficacy theme, a subtheme of *student effort* was revealed. The data validated what was discovered in the literature. The expectancy-value theory claimed that the amount of effort expended by an individual is directly correlated to the amount of interest in the task, the perceived likelihood of success, and the meaning association with its completion (Wigfield & Eccles, 2000). The following statements, excerpts from the individual interviews and focus group session, support the self-efficacy and student effort themes.

1. Self-efficacy.

a. Student 5: I would say I am pretty confident in math, but wouldn't say I'm great at it. Math is my favorite subject and that is why I like it so much.

b. Student 2: I feel like I need a lot of help. I am kind of good at math but sometimes I struggle.

c. Student 1: I feel like I can do better and that I can do this if I set my mind to it!

d. Student 8: I'm not really good at math, and if I get something wrong, I get mad at myself.

e. Student 4: I'm pretty good at math but sometimes it is really, really hard.

f. Student 9: Math makes me feel dumb.

g. Student 9: I've never been good at math. That's just the way it's been ever since 3rd or 4th grade. It's just not my thing.

h. Student 3: Math makes me feel less smart than all of the other students.

i. Student 7: Sometimes when I start a math problem, I don't know where to start or what to do next.

j. Student 6: To me, math feels like another language because I don't understand most of it.

1.1 Student Effort.

a. Student 1: I feel pretty good about studying math because I know if I try hard enough then I can do it.

b. Student 3: I just don't feel like I understand math sometimes so I just don't try.

c. Student 7: Especially when I have to do an assignment at home, I get so frustrated because I can't remember what to do. So, I just don't complete it.

d. Student 6: I admit that sometimes I don't even try a problem because it looks hard. I hate word problems.

Theme 2: Grades

The second theme, Grades, surfaced as students revealed that their present feelings about math were caused by repeated failures or disappointments through the years concerning assessments of mathematic material. Three of the nine participants referenced receiving bad grades through their years of studying mathematics when they were asked to explain their comment, "I've never been good at math." This led to a subtheme of past academic performance. Students also recognized that the way in which they were assessed by their teachers contributed to their feelings. They appreciated being graded on participation and effort. The following statements provide a textural description to support these themes.

2. Grades.

a. Student 1: I love to study and it gives me something to do and gives me good grades.

b. Student 3: I like how our teachers use the workshop model and we have struggle time by ourselves, but then we get to work together in small groups for our grade.

c. Student 5: I like how you used to give us grades many times based on our efforts. I may not have gotten all of the answers just perfect but you recognized the work that I had done to try and get it right.

d. Student 9: It's discouraging to see all those red pen marks on my test when I really did try my best!

e. Student 7: In math, your answer is either right or wrong. There's no in between!

2.1 Past academic performance.

a. Student 4: My math scores on the CRCT weren't too good. They were low but I still passed. I want to raise it higher so that on the CRCT, I will exceed instead of making a low grade.
b. Student 2: Many times I have to guess answers and get them wrong. Then if I get a bad grade, I sometimes get in trouble.
c. Student 8: In the last 2 years, my grades have really dropped. I used to get good grades all the time. Then it started getting really hard so that I couldn't understand.
d. Student 6: In fourth grade was when I started falling low on math to a C.

Theme 3: Learning Environment

The theme of the learning environment was most definitely the most prominent of those revealed in the data. When asked to recount what they felt regarding the study of mathematics, all participants would reference a classroom environment, or more specifically a past or current mathematics teacher. The fact that seven of the participants, or 77% of the students, immediately responded with comments about a mathematics teacher made this an obvious subtheme. These responses regarding a math teacher were given regardless of the question—whether it was a neutral one, or asked specifically about positive or negative experiences related to mathematics. The data also showed that students were more apt to succeed or felt more comfortable in a mathematics classroom based upon the way in which they were allowed to interact with their classmates. Specific statements from the students regarding the mathematics teacher and interaction with peers are provided.

3.1 The math teacher.

a. Student 1: I also like math more now because I have a great teacher to teach me.

b. Student 2: I think I won't be so good with math unless I have a really good teacher to really help me with my math work and she makes sure I understand the work before we move on.

c. Student 6: Some teachers make learning math really fun—like when we do fun activities to learn something new. That makes it stick with me more.

d. Student 7: I don't like math because all the math teachers I have had in the past yell way too much or never helped when I asked for it.

e. Student 8: I've been yelled at because I can't catch on like other kids.

f. Student 9: In fourth grade, there was this mean teacher and she didn't explain it real well. All I could think about was her yelling at me!

3.2 Interaction with peers.

a. Student 2: The lessons I remember best are those where we do some group activity or play games.

b. Student 4: I like how in our class you would assign experts. Everybody had someone they could work with. You were either a teacher or you were being helped if you didn't get it.

c. Student 5: It seems so easy when we work in groups or when you do it, but I have trouble when I have to do it all by myself.

Theme 4: Student Attitude

The final theme, student attitude, clearly appeared, given the purpose of this phenomenological study was to examine the perceptions and feelings that students had regarding the study of mathematics. The questions presented in the individual interviews and focus group session (see Appendixes C and D) led to discussions that were brought about primarily through probing, follow-up questions. Participants were asked what they did and did not like about school, their positive and negative experiences regarding the study of mathematics, their opinion on how they would rate their mathematical ability, and how relevant they thought math was to their future. Throughout the interview process, the participants provided rich data that helped explain the essence of the phenomenon. Because the research study was entirely about student attitudes, this was labeled as the final theme. Data to support this theme is provided below. To give further evidence of attitudes regarding the study of mathematics, Appendix E provides a portion of each of the transcribed interviews.

Q. Overall, how would you rate how you feel about your math abilities on a scale from 1 to 10, with 1 being low and 10 being the highest?

A. Student 5: A 4 or 5. I feel like I am a 4 or 5 because sometimes I get math and sometimes I don't. I feel I could do better and have the attitude, "I can do this!"

Q. That is great. A positive attitude can go a long way, especially when faced with a difficult task, right?

A. Student 5: Yeah, I feel like I can do it if I set my mind to it. I need to forget about stuff that happens at home and drama that goes on at school and put my mind on my school work.

Q. I'm glad to hear that you have that confidence in yourself. You've been very successful in many areas at school. You're involved in so much. Let me ask you … in the future what do you think you need to be more successful? Or how do you see math being relevant to your future plans?

A. Student 5: I would like a lot of help. Someone to be understanding and caring. You know how sometimes you fell like just another student in a big class. It means so much when a teacher recognizes you and doesn't blame you for what you don't understand. I have not made an A in math – ever! And I do want to get an A. When I grow up, I want to study to be a nurse and nurses have to do a lot of math in their jobs.

The triangulation of data between the individual interviews, focus group session, and field notes supported the original premise of the study. Journal entries included field notes of observations taken during the interviews and focus group sessions. These observations consisted primarily of body language that I noted during these sessions. I noticed shrugged shoulders, excitement and inflection in voice, folded arms across the chest, and hand gestures. My field notes included interpretations of things that I perceived during the interview and focus groups sessions. These included feelings of excitement, guilt, sadness, and apathy. The interview protocol was also used to make general notes to myself regarding how certain comments made me feel. In the individual interview session, students were asked to share experiences about the study of mathematics. When the question was asked (Appendix C, Individual Interview Protocol, Question 3), students were not told specifically what aspect of mathematics to address. They would generally respond with how they felt about mathematics. Two thirds of the respondents had some negative initial statement. Two of the nine, or approximately 22%, said they liked math but immediately followed it with a comment of how they have never "been good at" math. One participant had only positive comments when asked this specific question. There were other parts of the interview that students were asked to specifically describe or give evidence of a time when they were anxious or uncomfortable or had negative experiences studying mathematics (Appendix C, Individual Interview Protocol, Questions 4 and 5). Table 2 provides quotes from the nine participants when asked about these experiences.

While there were positive comments in regards to the study of mathematics (i.e., liking math in earlier grades, favorite math teachers, feelings of pride when they make good grades), the consensus of the findings throughout all of the data was that students recalled negative experiences, primarily due to their own perceptions of their abilities to do well in math (responses from Student 1 and Student 3) or remembrances of an experience with a teacher (Student 2, 4, 5, 6, 7, 8, and 9).

Evidence of Quality

Validation of the data collected in the study was maintained by spending time with participants; the use of thick, rich, detailed descriptions of the collected data; and the relationship established between myself and the participants (Creswell, 2007; Creswell &

Miller, 2000). The types of validation strategies used in this study were yet another way of protecting the rights of its participants. Triangulations of different data sources, the use of rich, detailed descriptions, and the presentation of any data that ran counter to initial interpretations were strategies that were incorporated throughout this study.

Especially because the participants were minors, there was a greater awareness of the ethical responsibility throughout the research process. These validation measures were used as strategies to help ensure their rights were protected. The ethical responsibilities are heightened because this study involves middle school age students. This makes me more sensitive to the ethical concern of ensuring that they comprehend what their participation entails. These validation measures were used as techniques to protect the rights and voices of the participants in this study.

To make sure that the research was designed in ways that protected participants from harm, access to the participants was only gained after receiving approval from Walden University IRB (IRB # 06-22-11-0127935) to conduct the research. Above all, this showed that the ethical concerns of qualitative research were given serious attention when involving participants, particularly middle-school age children (Creswell, 2007; Glatthorn & Joyner, 2005; Hatch, 2002).

Table 2

Student Comments Regarding Negative Experiences Studying Mathematics

Student	Response
Student 1	I have a lot of negative feelings in math because math has haunted me since I was in 2nd grade. I think things like, "What if I fail the CRCT math section?" I have failed it before.
Student 2	I have always hated math ever since I started it. My 2nd grade math teacher, Ms. X, greatly influenced this.
Student 3	When we do things like algebra, I just want the class to be over. I think math class is not fun because I don't get it, and I see that everyone else gets it, so I am scared to speak up and feel humiliated.
Student 4	Every time I would get an answer wrong, my teacher would always scream at me.
Student 5	When teachers scream at you when you don't get the information, that's when they should give consideration to students. Like one time when one of my previous teachers yelled at me when I didn't get a thing she was saying.
Student 6	When my teacher tells us to ask questions, but when I do she always says, "I'm busy" or "Look back at your notes." And sometimes you can't always rely on just the notes.
Student 7	In 5th grade, my math teacher was mean the way she would yell at you if you did something wrong. It would make you not want to do anything.
Student 8	I have had negative experiences this year because Mrs. X goes too fast with what we are learning. The next day she will give us a test over it then go on to the next standard. Some of us don't get the problem that we were on with the last standard! She goes way to fast.
Student 9	Last year, I was in a tutoring class, and the teacher asked me what we have learned so far in math class. I didn't know, and there were some more students in the class that didn't either. The reason why we probably didn't get it was because the math teacher would rush you and you would try to hurry and then you'd get the wrong answer.

Establishing an environment where participants felt at ease with me and each other was particularly important. An essential element in creating this environment was the ethical obligation of protecting those who have agreed to contribute to this study. First, no participant was accepted into the study without parental consent and student assent agreeing to participate. Second, student responses to questions made during the one-on-one interviews were kept confidential. Moreover, throughout the preliminary stages of participant selection and participant determination, inclusion in the study as a completely voluntary action was stressed. At the informational meeting, students were instructed that if chosen as a part of the study, the participant could withdraw at any time or refuse to answer any questions that made them uncomfortable. The group being addressed at the meeting included only my former students. All of them were assured that they would in no way be penalized for their lack of participation. Likewise, considering the nature of middle school students and their sometimes eagerness to please the teacher, they were assured that there would be no favoritism shown toward students for their participation in the study. It was explained that no extra credit or compensation would be given to members of the study to ensure that participation was completely voluntary. All procedures put in place for this study (e.g., IRB approval, informed consent, voluntary participation, and confidentiality) sought to protect participants for harm.

This phenomenological study allowed students to share their perspectives on the study of mathematics. Representative of the larger middle school remedial mathematics student population, these students could benefit as they learned how to articulate their perspectives. In turn, this study sought to use the knowledge obtained to further educate mathematics instructors about the phenomenon. In this way, the students themselves could be the ultimate benefactors of this study.

Section 5: Discussion, Conclusions, and Recommendations

Overview of the Study

The purpose of this research study was to examine the perceptions of a select group of middle school mathematics students regarding the study of mathematics. The participants of the study were nine students who had previously been involved in a remedial mathematics program during sixth, seventh, or eighth grade. The goal of the study was to gain a better understanding of the present attitudes and feelings about mathematics based upon their past experiences. This could lead to an understanding of the essence of the phenomenon, the study of mathematics from the perspective of a remedial mathematics student.

A phenomenological research design was chosen in order to examine "the lived experiences or lifeworlds of people being studied" (Hatch, 2002, p. 29). Data were collected through individual interviews, a focus group session, and several forms of unobtrusive data through journal entries. Journal entries included field notes taken during interview sessions and were a source of data that reinforced and confirmed ideas that were presented in the individual interviews and focus group sessions. Data were collected through individual interviews and one focus group sessions with all participants in order to gain rich, thick, descriptions of their experiences. This was accomplished through the central research question, "What are the experiences of a select group of middle school students in studying mathematics, and what meaning do these students give to their experiences?" An interview protocol was used during interview and focus group sessions with a list of questions to be asked of each of the participants. Probing questions were often added in order to obtain clarification or greater detail of responses. Each session was audiotaped and transcribed as soon after the interview as possible. All of the data collected through interview transcriptions, research logs and journals, and bracketed notes from interview protocols were organized and coded for analysis. Several themes emerged during this phase of the research process. The findings of the study are summarized into the following themes:

1. Student self-efficacy: The extent to which a student put forth effort in the study of mathematics was related to the level of confidence in his or her mathematical abilities.
2. Grades: Student perceptions about mathematics generated from the past academic performance and how successful they felt they had been in the area of mathematics.
3. The learning environment: All of the participants recognized the impact that former math teachers had upon their perceptions of the study of mathematics. The classroom culture or the way in which students were allowed to interact with one another also influenced their feelings.
4. Student attitudes: At the crux of the study, students' attitudes about the study of mathematics were revealed through the way in which math makes them *feel.* Positive and negative experiences were revealed through questions about math classrooms, homework, tests, the impact of family, friends and teachers, and the relevance of mathematics for the future.

A discussion of how each of these themes relates to the larger body of literature on the topic of the study of mathematics and how these findings address the central research question of the research study is included in the following section.

Interpretation of Findings

As a foundation of this doctoral study, understanding the essence of shared experiences in the study of mathematics from the perspective of the student is critical. This phenomenological study used individual and focus group interviews to answer the overarching research question, "What are the experiences of a select group of middle school students in studying mathematics, and what meaning do these students give to their experiences?" The conclusions that address this research question were reached by formulating a structural description of the phenomenon under study. Then, using the outcomes and findings of the study which were discussed in Section 4, a composite description was written to convey the essence of the phenomenon, the study of mathematics from the perspective of a remedial mathematics student.

Structural Description

The structural component of phenomenology involves examining the *how* of the experiences—the circumstances surrounding or the factors that influenced the experiences (Moustakas, 1994). As transcribed responses to interview questions were studied, reflections upon the conditions surrounding what was experienced were made. This process helped create an understanding of how student attitudes came to be and the circumstances surrounding the experiences that led to those attitudes. When asked, "How have you come to have the feelings that you do about studying mathematics?" each of the nine participants, at some point in the discussion through follow-up question, had a response that referenced a former teacher. To begin, many of the students used words such as “nice” or “mean” when describing a teacher. Being such relative words, the participants were asked to describe what made the teacher the way they remembered him or her (i.e., sweet, nice, mean, or horrible). Four of the nine participants were able to recall and recount some positive experiences with former teachers. Their descriptions, in each case, revolved around the teacher being understanding, teaching the material slowly, not being upset when they did not understand, and generally having a good personality and sweet disposition. However, each of these four students was also able to recall teachers with whom they had been less comfortable in their mathematics classroom. Examples of statements made by the participants included the following:

1. Student 2: I get so nervous in class because I don’t want to be yelled at!
2. Student 6: I’m afraid to ask my math teacher because she’ll get mad at me.
3. Student 7: She won’t explain it to me one more time. She’ll tell me to go ask my friend.
4. Student 8: My grades depend on this and she doesn’t even care!
5. Student 9: I dreaded even going in the room.

As stated earlier, each of the participants considered the mathematics teacher having the greatest effect on their feelings about studying mathematics. Student 1, a seventh grade female, described what a difficult time she has always had in math classes and that she just did not like math. When probing further to try to understand the source of her feelings, the student had a frustrated, almost tearful look. Student 1 shared,

> I remember in the 5th grade I had a teacher, Mrs. X. She was an older teacher and had taught for a long time. One time she told me, "Math is just not your thing." I think that's when it all started—my math issues.

Similarly, an eighth grade male recounted how math teachers "just don't get it." When he was asked him to explain, his response gave me an "Ah-ha!" moment. Student 4 explained,

> For them, math comes easy. Obviously they understand the stuff or they wouldn't be teaching it. But I guess it's just hard for "a math person" to understand how those of us "who don't get it" feel. It really is like they speak a different language.

It was from my field notes (i.e., impressions of body language and participant responses) from this particular interview that the most insight into the phenomenon of this research study was gained. While most students were easily able to describe how their past experiences had helped shape how they feel about math today, no one expressed it as eloquently as this young man. Mathematics teachers need to try to understand things as the student does. The mathematics teacher cannot assume students have foundational mathematics knowledge.

In the focus group session, students were asked to consider *how* they have come to have the feelings that they do about studying mathematics. More specifically, they were asked to rate the degree to which others played a part in influencing these feelings. So that a participant's response could remain confidential, each of them wrote the response on paper that was provided for them. Table 3 provides these data, with 1 being little to no influence on their feelings and 10 being greatly influenced.

In summary, although there were varied responses regarding *what* was experienced, each of the participants attributed their relationship with the mathematics teachers as having the greatest influence upon *how* the study of mathematics was experienced. The topics that were revealed throughout the study were traced back to references to the mathematics teacher. More specifically, and in keeping with the phenomenological study, they were traced back to the way in which the students *perceived* the mathematics teacher made them feel.

Table 3

Degree of Influence on Feelings About Mathematics

Student	**Parents or Relatives**	**Friends**	**Teachers**
Student 1	1	1	10
Student 2	1	1	10
Student 3	2	2	10
Student 4	7	4	9
Student 5	9	2	10
Student 6	1	1	9
Student 7	1	8	9
Student 8	7	3	9
Student 9	3	0	5
Average Degree of Influence	3.5	2.4	9.0

Note. Ratings are on a scale with 1 = little to no influence, and 10 = greatly influenced.

Composite Description—Essence of the Phenomenon

The culmination of all data collected and analyzed in the interviews, focus group, and field notes led to a textural and structural description of this phenomenon. Finally, with all of the individual pieces woven together, a complete description of the study of mathematics formed the tapestry for this phenomenological study.

The attitudes, beliefs, feelings, and perceptions that we possess today are shaped by our past experiences. The past experiences of a select group of middle school mathematics students formed the basis for this research study. Students, both individually and in a focus group session, were asked to recall certain memories regarding the study of mathematics. They were also asked to recall how others (i.e., friends, family members, and teachers) may have influenced the way that they felt about the study of mathematics. Figure 1 is a model of the outcomes of this study. The main themes of the study were grouped together to depict that they have the greatest impact on a student's current perceptions about the study of mathematics. Likewise, these current feelings impact the extent to which a student puts forth effort in the study of mathematics.

The problem that this qualitative study addressed was the perceptions that middle school mathematics students have about themselves as a result of years of repeated failure and lack of proficiency in mathematics. At the local level, this problem was evidenced by the number of students that meet the criterion for placement in the remedial mathematics program of a middle school in northwest Georgia. The outcomes of the study, as shown in the model of Figure 1, directly relate to the research problem and the

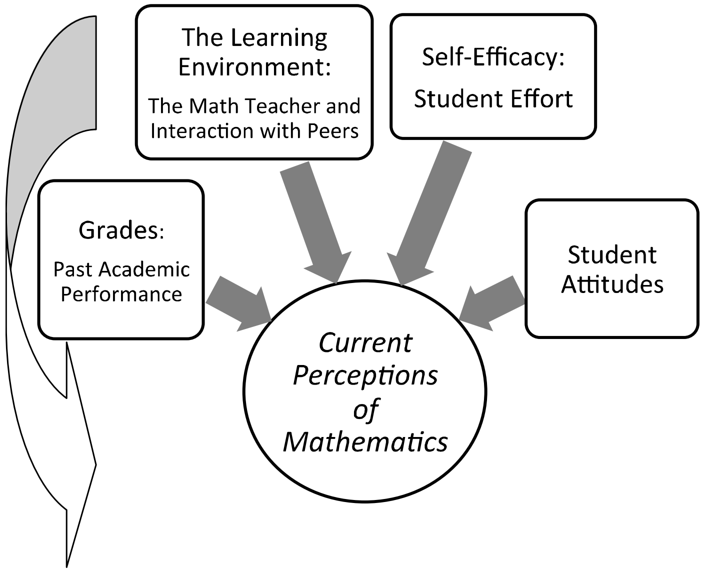

Figure 1. Past experiences in the study of mathematics.

research question, "What are the experiences of a select group of middle school students in studying mathematics, and what meaning do these students give to their experiences?" The data collected from the participants revealed that past experiences with mathematics teachers, their past academic performance in mathematics, and their own beliefs about their mathematical abilities had the greatest impact on their current feelings and attitudes about the study of mathematics. Examples of these reoccurring themes in the data include:

1. Student 3: I've just come to accept it [math] is one of those things I just don't get.
2. Student 6: I've made bad grades in math since about fifth grade. I really try but don't know what else to do. My parents aren't much help either. They both say they always stunk at math.

3. Student 4: We have this struggle time in the workshop model. It helps that if we don't get something on our own, we get to work in our groups for most of the class. But the teacher doesn't help much during this time. We are to use our resources as she says. But what do we do if we all don't understand?
4. Student 2: It helps if he does something fun to help us remember. But even when we do these fun group activities, I have a hard time when it comes to putting on paper or passing a quiz over the same stuff!

Understanding this composite description could lead to practical applications that may improve the research problem. The study found that past experiences in the study of mathematics has profound effects on current perceptions. Each of the themes of the study served as factors that impacted these perceptions. However, none influenced student perceptions more than the relationship with the mathematics teacher. Therefore, practical applications involve equipping mathematics teachers with professional development opportunities that make them aware of the problem. More specifically, through dissemination of the results of this study, mathematics teachers should recognize how powerful their impact is upon those who sit in their classroom. Other applications involve teaching mathematics in a way that stresses meaning and relevance. A more detailed description of practical applications is provided under Recommendations for Action.

Relation to Conceptual Framework

When relaying their feelings about the study of mathematics, the participants told of the confidence or lack of confidence in their skills and abilities. Students experienced feelings of frustration, embarrassment, anger, and apathy. Math makes them feel *stupid*, *pathetic*, and *mad*. These feelings come from years of feeling like they just do not measure up when they compare themselves to others. These findings are related to the foundations of the achievement goal theory (Dweck & Leggett, 1988) in that an individual is motivated as an attempt to achieve some goal or improve how others perceive them to be. Some have experienced these feelings as young as first grade. These self-efficacious perceptions (i.e., lack of self-efficacy) then influenced the degree of effort put forth in mathematical related tasks. Most of the participants felt the pressure of high-stakes tests such as the Criterion Referenced Competency Test (CRCT), and referenced it specifically in their comments.

The study also revealed that the students had come to have the feelings that they did about mathematics based upon the way in which they were assessed on material, as well as their past academic performance. For most, there had been years of not making good grades in mathematics or not meeting the mathematics standards on the CRCT. However, there was a deep desire to learn and do well in the study of mathematics. Unfortunately, though, it is as if they recognize that they are not proficient in this subject and truly believe they never will be. These findings also reflected portions of the conceptual framework. Self-worth theory (Covington, 1984) suggests that one's value is directly related to performance. The higher the grade, the more valuable a person is assumed to be. Attribution theory (Weiner, 1984, 1985) focuses upon the reason given for an outcome. This study found that students often see the history of failure or their own circumstances as the attribute for their difficulty with the study of mathematics. The study also exposed the powerful impact of the teacher-student relationship in the learning environment that was first presented in Section 2 of the literature review. While some spoke of the importance of learning alongside their peers, all of the participants clearly indicated that the teacher had more to do with influencing their experiences than anything else. This relates to the expectancy-value theory (Wigfield & Eccles, 2000) which stated that the amount of effort given to a task is directly related to the level of interest in the task, the perceived likelihood of success, or the meaning associated with the task.

Implications for Social Change

As was revealed in Section 1, the demands of NCLB resulted in increased accountability of school systems, teachers, and students. Schools are judged based upon yearly improvements on state standardized tests. The incremental yearly gains that are expected from school systems are ultimately placed upon the student. This study's contribution to the literature has implications for positive social change as it reveals life experiences and attitudes about the study of mathematics from the perspective of the student.

The increased need for remedial mathematics services at both the local and national level demonstrates a lack of mathematical literacy. However, at the heart of the problem under research is the perception that students have about the study of mathematics. Many times, poor or negative perceptions are caused by repeated academic failures. As the outcomes of this study revealed in Section 4, the greatest impact on student perception was the relationship of the mathematics teacher and student. When mathematics educators begin to recognize and understand the factors that influence student attitudes and behaviors, they may begin to work together to improve negative perceptions. More importantly, improved attitudes may lead to gains in academic achievement.

These steps toward positive social change are especially applicable to remedial education. Local school systems, states, and the nation at large could benefit from understanding how to relate to the struggling mathematics student. An increased awareness and appreciation of the student perspective may prompt mathematics teachers, at all levels, to become more sensitive to the factors that influence learning. This study's ultimate implication for social change is that it could promote a positive regard for the study of mathematics among students who value a quality education.

Recommendations for Action

The results of this qualitative study provided valuable information that could be practically applied in the mathematics education setting. Based upon the findings and conclusions of the study, the obvious application is with the mathematics teacher. Relaying a can-do attitude from the teacher can speak volumes in giving the student the confidence he or she needs in order achieve academic goals. Some students may work at a slower pace or have unconventional approaches, but the belief that they all can learn and acting upon that belief will help student perceptions in regards to the study of mathematics. Van de Walle (2006) expressed this sentiment with the following:

> Math makes sense! This is the most fundamental idea that any teacher of mathematics needs to believe and act on. It is through the teacher's actions that every student in his or her own way can come to believe this simple truth and, more important, believe that he or she is capable of making sense of mathematics. Helping students come to this belief should be a goal of every teacher. (p. ix)

The results of this study indicated action steps that could be taken that align with the overarching recommendation of improving the perceptions that students have in regards to the study of mathematics. These include (a) creating professional development programs that emphasize increased awareness and understanding of poor perceptions that students have about the study of mathematics, particularly at the elementary school level; (b) providing professional development programs that relay the impact of the learning environment upon learning and mathematical achievement; (c) developing remedial mathematics programs that would remove the negative stigma associated with involvement in these programs; (d) emphasizing conceptual learning and the relevance of mathematics and placing less emphasis on standardized testing; and (e) creating programs that would improve communications with the parents/guardians and family of remedial mathematics students. The results of the study could benefit many stakeholders at the local level. Presenting the results of this study would assist the leaders of the school district as well as the administrators at each school within the district. Further, dissemination of the results can include the instructional coordinators and mathematics coaches throughout the school district. Others who could be impacted by the study are those who have direct contact with mathematics students and include (a) student teachers;

(b) elementary, middle, and high school mathematics teachers; (c) remedial mathematics program directors and instructors; and (d) parents/guardians and family of remedial mathematics students.

Recommendations for Further Study

The problem that this phenomenological qualitative study addressed was the perceptions that middle school mathematics students have in regards to their experiences with the study of mathematics. The study explored the lived experiences and attitudes from the perspective of students who had previously been a part of a remedial mathematics program. There were many aspects of the study of mathematics that were identified from the study that warrant recommendation for further study. These recommendations are given in order to examine the issues that have been brought to light from this research study but are beyond its scope.

This research revealed the factors that influence the perceptions of middle school mathematics students who have been a part of a remedial mathematics program. A topic that could be more closely examined is the impact that the mathematics teacher, particularly the elementary mathematics teacher, has upon perceptions of mathematical ability. Many studies have explored the teacher-student relationship and this study found that the behavior and attitude of the mathematics teacher had the greatest influence upon how a student perceived the study of mathematics. Further questions to be examined include the following: (a) What characteristics or personality traits of elementary teachers are best suited for teaching elementary mathematics students? (b) How does negativity from teachers impact student perceptions of future mathematical ability? (c) Is it possible for mathematics teachers to reverse mathematics negativity in students? (d) What are elementary school mathematics teachers' attitudes about mathematics? (e) What are elementary school mathematics teachers' attitudes and perceptions of their own mathematical abilities? (f) What characteristics or personality traits are desirable for a remedial mathematics instructor?

This study also revealed that past academic performance influenced a student's perception of mathematics. Another recommended topic for further study is the appropriate assessments to be used for low self-efficacious, struggling mathematics students. Further questions to be examined include the following: (a) How effective are traditional forms of assessment with struggling mathematics students? (b) What are forms of assessing mathematical ability that might measure mastery of the standards but also boost student confidence? (c) What strategies can be used to build foundational mathematics skills at each grade level? (d) What forms of assessments and teaching strategies utilize student strengths and keep their interests in mind? (e) What forms of assessment are appropriate for struggling mathematics students that may reduce negative responses to mistakes and increases levels of participation?

The results of these recommended studies and suggested research questions could reveal key components in bringing about positive social change for struggling mathematics students. As a result, all stakeholders involved in mathematics education could benefit as changes are implemented to remedial mathematics programs and regular mathematics education. Answers to these questions could promote increased self-confidence in mathematical abilities among students and boost their academic achievements.

Reflection

As I reflect upon this research process, I naturally think of how grateful I am for the young students who agreed to participate in this important study. As the former remedial mathematics instructor of these participants, I had already established a relationship with each of them. It was important for the validity of the study that I set aside any personal biases that I may have had about the individuals or the topic being discussed. I believe the relationship I had with each of the participants served as a benefit rather than a hindrance to this research process. They seemed more comfortable during the data collection process because they knew me and were helpful because they knew the importance of this research study.

Most of the information I gathered from the participants was precisely what I expected. This is primarily due to my years of experience with working with these students and others like them. On the other hand, it was refreshing to hear positive experiences that students had studying mathematics. It thrilled me to hear, “I love math!” Even more so, it made all of my years of teaching and extremely hard work during this research process so worthwhile when participants, my former students, referred to things that I did to help them have an “ah-ha!” moment in mathematics, or how I helped them feel comfortable with mathematics.

In summary, a time of personal reflection on this research process brings to mind how I am the greatest benefactor of this work. The journey certainly had many unexpected bends in the road. However, through perseverance and great determination, there were many valuable lessons learned along the way. In my professional life, I have benefited from this research process not only because of the unique experience of conducting a doctoral study but also because of the ways that I teach mathematics with a more compassionate, sympathetic, and loving nature.

Conclusion

To begin to see improved academic achievement in mathematics at the local and national level, educators should begin to acknowledge, appreciate, and understand the perceptions of students about the ways in which they are being taught mathematics. This qualitative study contributes to the literature because it provides insight about the experiences and attitudes of middle school students who had formerly been a part of a remedial mathematics program. In light of what was revealed in the literature review regarding the declining status of the national mathematical prowess, change in necessary. This research study concludes that educators should realize that although teaching the mathematical concepts are extremely important, the manner in which they are taught oftentimes becomes the lesson that students are learning instead.

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Appendix A: Informed Consent Letter to Parent/Guardian

Your child is invited to take part in a research study to learn about middle school students' past experiences with the study of mathematics. Your child was chosen for the study because your child has been in the remedial math support class at some point during his or her time at Ashworth Middle School. This form is part of a process called "informed consent." It allows you to understand this study before deciding whether to allow your child to take part. This study is being conducted by a researcher, your child's former remedial math support teacher, who is a doctoral candidate at Walden University.

Background Information: The purpose of the study is to examine the particular mathematical experiences of middle school mathematics students as expressed through their attitudes and feelings.

What will be involved? If you agree to allow your child to be in this study, your child will be asked to:

- Participate in an individual interview session after school that will last about 45 minutes – 1 hour (if arrangements cannot be made after school, the interview will be held during homeroom and focus time: 7:45 a.m. – 8:30 a.m.)
- Participate in one 45-minute – 1 hour focus group session after school with eight to eleven other participants of the study

Voluntary Nature of the Study: Participation in the study is completely voluntary. This means that everyone will respect your decision of whether to allow your child to be in the study. If you agree, the researcher will meet with a small group of potential participants to explain the study to your child and ask if he or she wants to take part. No one at Ashworth Middle School will treat you or your child differently if you or your child does not participate. If you decide to consent now, you or your child can still change your minds later. Anyone who feels stressed during the study may stop at any time. A child may also skip any parts he or she feels are too personal.

Risks and Benefits of Being in the Study: During the interview sessions, your child might recall negative experiences dealing with math (former math classes, classmates, teachers, exams, homework, etc.), but I do not believe that your child will be hurt or upset by participating in this study. Again, if your child should feel uncomfortable in any way, he or she may withdraw from the study with no penalty whatsoever. Possible benefits from this study may include an increased awareness and understanding among elementary and middle school mathematics teachers of how to motivate students and better serve students in their mathematics classrooms.

Compensation: Students will not be rewarded or compensated for participating in the study.

Confidentiality: Any information your child provides will be kept confidential. The researcher will not use your child's information for any purposes outside of this research. Also, the researcher will not include your child's name or anything else that could identify your child in the reports of the study. All information gathered during the interviews will be secured in the home office of the researcher.

Contacts and Questions: You may ask any questions you have now. If you have questions later, you may contact me at 706-625-7036 or christy.vaughn@waldenu.edu. If you want to talk privately about your child's rights as a participant, you can call Walden University's Research Participant Advocate at 1-800-925-3358, extension 1210. Walden University's approval number for this study is IRB # 06-22-11-0127935. If you agree that your child may participate in the research, please sign and return this form. I will then give you a copy of this form to keep. If you do not wish for your child to participate, there is no need to return the form.

Statement of Consent: I have read the above information and I feel I understand the study well enough to make a decision about my child's involvement. I am agreeing to the terms described above.

Printed Name of Child ____

Printed Name of Parent / Guardian ____

Date of Consent ____

Parent's Signature ____

Printed Name of Researcher ____

Appendix B: Student Assent to Participate in Study

Mrs. Vaughn is doing a research to learn about middle school students' thoughts on studying math. I picked you for this because you have been in the math support class some time during middle school. I am going to read this form to you. I want you to learn about this before you decide if you want to be in it.

Who I Am: I am a student at Walden University. I am working on my doctoral degree. I am also the Math Support teacher at Ashworth Middle School.

About the Study: If you agree to this, I will ask you to:

- Participate in an individual interview session after school that will last about 45 minutes – 1 hour (if arrangements cannot be made after school, the interview will be held during homeroom and focus time: 7:45 a.m. – 8:30 a.m.)
- Participate in one 45-minute – 1 hour focus group session after school with eight to eleven other participants of the study

It's Your Choice: You don't have to be in the study if you don't want to. You won't get into trouble with the principal or any of your teachers if you say no. If you decide now that you want to join the study, you can still change your mind later. If you want to skip some parts of the study, just tell me.
Being in this study will make you remember past experiences you have had in math. This may help me and other math teachers understand better ways to motivate and teach math students. This might help students succeed in math.
You will not be rewarded or paid in any way for participating in this study.

Privacy: Everything you say during the individual interviews and focus group session will be kept private. That means that no one else will know your name or what answers you gave.

Asking Questions: You can ask me any questions you want now. If you think of a question later, you or your parents can reach me at 706-625-7036 or christy.vaughn@waldenu.edu. If you or your parents would like to ask my university a question, you can call Walden University's Research Participant Advocate at 1-800-925-3358, extension 1210. I will give you a copy of this form.

Please sign your name below if you want to join this study.

Printed Name of Student ______________________________
Student Signature ______________________________
Date ______________________________
Printed Name of Researcher ______________________________
Researcher Signature ______________________________

Appendix C: Individual Interview Guide Questions

After a few rapport-building questions to put the participant at ease, these questions will be used as a guide to explore the phenomenon of studying mathematics. With each, following a phenomenological study design, I will be looking for opportunities to have the student further describe or explain his or her initial answers so that responses will be grounded in particular concrete examples of their experiences. Descriptions will be explored and probed as each student tells his or her particular "story."

1. **Tell me about your fondest memories or experiences in school.**
    a. If student mentions particular classmates or teachers: Describe how these people have made you feel. What causes you to remember them in this way?

2. **What are some things that you don't like about school?**
    a. If student mentions schoolwork or assignments: Which in particular and why?
    b. If student mentions classes: Which particular classes and why? What is it about your experience in this class that you do not like?
    c. If student mentions teachers: Explain what it is about these teachers that make you feel this way.
    d. If student does not mention mathematics specifically: What about your math class? Do you like it? Why or why not?

3. **Tell me about your experiences with math.**

    As necessary, use follow-up questions to obtain further description of:

    a. Experiences while studying for or taking an exam
    b. Experiences while doing homework
    c. Experiences of being asked questions in a math class
    d. Experiences when being compared to others.

4. In what ways have you had negative experiences toward studying math? Who or what encouraged those feelings?

5. Think about lessons, tests, activities, or times in a mathematics class when you felt very relaxed and comfortable. What were the things that made you feel this way? Include every recollection you can – grade level, what you were studying, the classroom, your friends, your teacher, etc.

6. Think back to the day you took the Mathematics portion of the CRCT. Give a description, with as much detail as possible, how you felt before the test, during the test, and after taking the test.

Appendix D: Focus Group Interview Guide Questions

Because focus group settings rely upon the interaction among participants to generate data, the students will be given a brief overview of expectations for participating in the focus group session. It is important that each student understand the purpose of the focus group setting and their role in the process. Once an overview of expectations and the following ground rules are shared, students will be asked to agree to these conditions of participation.

Introduction [to be read verbatim]:

Thank you for agreeing to participate in this group interview. I am conducting a study about students' experiences in math, and with the information I collect, I hope it will help me and other math teachers understand better ways to motivate and teach math students. Anything that is discussed in this group interview cannot be discussed or shared outside this room. It is very important that every student keep private other students' comments and opinions. Also, you should not share the names of individuals, including your parents, friends, or former or current teachers, when you answer a question. There are no "right answers," so each of your points of view is important. I ask that you speak one at a time, and listen carefully to what other students are saying while they are speaking. Other students participating in this group interview are sharing their personal opinions or recounting their past experiences just like you. Therefore, I expect that you will speak respectfully and kindly to one another. I want everyone to feel comfortable giving their opinions. Again, I want to remind you that whatever is said must not be shared with anyone outside this meeting. I, in turn, will not share your name with anyone outside this group interview. The only time I have to tell someone is if I learn about something that could hurt you or someone else. Does everyone understand and agree to these rules? [end of introduction]

The intent of these sessions is to enrich the data gained from the individual interviews. Specific examples of experiences shared during these sessions will help further develop each student's particular "story."

1. **As an opener for discussion, students will be given time to think about and complete the following sentence. "Math makes me feel ____."**

   I will then build upon the opening statements as these guiding questions are addressed.

2. **In what ways have you had positive experiences toward studying math? Who or what encouraged these feelings?**

3. **Do you think the study of mathematics is important for your future plans? Why or why not?**

4. **How have you come to have the feelings that you do about studying mathematics?**

    a. **In what ways do your parents or relatives play a part in your feelings about math?**

    b. **In what ways do your friends influence your feelings about math?**

    c. **In what ways do your teachers influence your feelings about math?**

    d. **Rate the degree to which each play a part in your feelings about math with 1 being little to no influence and 10 being greatly influence (a. parents or relatives, b. friends, c. teachers)**

5. **Think about lessons, tests, activities, or times in a mathematics class when you felt very relaxed and comfortable. What were the things that made you feel this way? Include every recollection you can – grade level, what you were studying, the classroom, your friends, your teacher, etc.**

6. **Think back to the day you took the Mathematics portion of the CRCT. Give a description, with as much detail as possible, how you felt before the test, during the test, and after taking the test.**

Appendix E: Excerpts of Transcriptions

Q: In what ways have you had positive experiences studying math? Who or what encouraged those feelings?

Student 1: When I was learning about Pythagorean Theorem recently with Mrs. X and Mrs. Y. They made it easier to understand. I understand Mrs. X and Mrs. Y better than any other teacher because they make learning fun.

Q. In what ways have you had any negative experiences studying math? Who or what encouraged those feelings?

Student 1: In 7th Grade…algebra.

Q: What happened with algebra?

Student 1: Well, I didn't really get how to do it or understand it. I think Ms. M wasn't very good at what she was teaching!

Q: Tell me what makes you say that?

Student 1: Well, most of us in her class were failing the whole year. And that wasn't the case with the other 7th grade teacher, Mr. W. What does that say if your whole class is failing?

Q: Describe to me how these experiences with her maybe shaped your feelings about math today.

Student 1: Well, at the time, I disliked math a lot. Until now in 8th grade. Now I feel a little bit more confident about math.

Q: Speaking of that, how confident do you feel in your math abilities?

Student 1: Well, right now I would say I'm pretty confident.

Q: Overall, how would you rate how you feel about your math abilities on a scale from 1 to 10, with 1 being low and 10 being the highest?

Student 1: I believe a 6. I feel much better about things this year.

Q: Can you tell me a little bit more about how you feel about math? Why is it that you say you don't like it?

Student 2: It is just hard for me and I don't get it at all. When I listen, I forget it and then it becomes a blur to me and I'm afraid to ask my math teacher because she will probably get mad at me and yell at me. Then she won't explain to me one more time and I go ask my friend and they explain but before they are done, she says, "Be quite." So I get stuck on the problem and she says, "Times up. Put your pencils down." And I am still stuck on that problem and then I'll get a low grade.

Q: But you've described other times were you have felt successful in math class. Overall, how would you rate how you feel about your math abilities? Maybe on a scale from 1 to 10, with 1 being low and 10 being the highest?

Student 2: I'd probably say a 2 or 3. Because when I listen to the teacher, it comes in one ear and out the other and I forget what she is talking about.

Q: Do you think the study of math is important for your future plans? Tell me why or why not.

Student 2: Sure, you need to know math in your everyday life and when you get a job, you need to know it.

—

Q: Overall, how would you rate how you feel about your math abilities on a scale from 1 to 10, with 1 being low and 10 being the highest?

Student 3: I guess a 4. Because in 7th grade, my teacher didn't teach me very well. That's why I pick 4.

Q: Why do you say that?

Student 3: Oh, I don't know. I really don't know how I'd rate myself. I'm pretty good at math. But sometimes it's hard. And I know it's going to get even harder. But I need help from somebody like you. Math is fun and stuff but it's pretty hard. The other subjects I do real well in.

Q: Do you think the study of math is important for your future plans? Why or why not?

Student 3: Yes, I think math is important because almost everything in this world involves math. When I grow up, I would like to be a plane engineer and that requires a lot of math.

—

Q: In what ways have you had positive experiences studying math? Who or what encouraged those feelings?

Student 4: When I struggle with something in math and I don't seem to get it, it makes me feel like I am the only one. Then finally, my teacher teaches me a different way of doing it and when I get it right, I can't even describe how I feel. I feel like anything is possible. My goal this year is to pass the math CRCT.

Q: In what ways have you had negative experiences studying math? Who or what encouraged those feelings?

Student 4: I have a lot of negative feelings in math because math has haunted me since I was in 2nd grade. I think things like, "What if I fail the CRCT math section?" I feel like I learn better if someone focuses on me instead of a large class. Sometimes I goof off in class. That is one of the reasons I got off track.

Q: Describe how these experiences have shaped your feelings about math or math class today.

Student 4: Sometimes I think, "Why does everyone else get it except me?" and that makes me feel mad at myself. Sometimes it is to the point that I put my pencil down and decide to wait until class ends.

—

Q: Overall, how would you rate how you feel about your math abilities on a scale from 1 to 10, with 1 being low and 10 being the highest?

Student 5: 4 or 5. I feel like I am a 4 or 5 because sometimes I get math and sometimes I don't. I feel like I could do better and have the attitude, "I can do this!"

Q: That is great. A positive attitude can go a long way, especially when faced with a difficult task, right?

Student 5: Yeah, I feel like I can do it if I set my mind to it. I need to forget about stuff that happens at home and drama that goes on at school and put my mind on my school work.

Q: I'm glad to hear that you have that confidence in yourself. You've been very successful in many areas at school. You're involved in so much. Let me ask you…in the future what do you think you need to be more successful? Or how do you see math being relevant to your future plans?

Student 5: I would like a lot of help. Someone to be understanding and caring. You know how sometimes you feel like just another student in a big class. It means so much when a teacher recognizes you and doesn't blame you for what you don't understand. I have not made an A in math – ever! And I do want to get an A. When I grow up, I want to study to be a nurse and nurses have to do a lot of math in their jobs.

Curriculum Vitae

Christy H. Vaughn, Ed.D

Educational Background

Ed.D Walden University, Minneapolis, MN, expected conferral January 2012
Specialization in Teacher Leadership
Doctoral Study *Middle School Mathematics Students' Perspectives on the Study of Mathematics*

Master of Service Management, Mercer University, Macon, Georgia, 1995

Bachelor of Business Administration, Mercer University, Macon, Georgia, 1993
Major: Management/Marketing

Teaching Experience

Ashworth Middle School – Calhoun, GA 2006 – Present
6th, 7th, 8th Grade Remedial Mathematics Instructor

As the only remedial math instructor of AMS, I teach the majority of students who failed to meet the standards of the math portion of the CRCT. With this, I feel a great sense of responsibility.

Within my classroom, both individualized and small group lessons are essential. Individual and subgroup data is used to drive differentiated instruction. With these struggling students, I incorporate proven research based strategies as a part of my classroom. The use of cooperative learning, jigsaw grouping, graphic organizers, tiered instruction, and portfolios are just some of the best practices that are in integral part of my lessons. Technology is used in some form each day as I try to help students understand the real-world importance of math and its concepts. Using the math workshop model, students are encouraged to develop problem solving skills. By collaborating in small groups, asking appropriate questions, and seeing different approaches by classmates, students are able to gain a deeper understanding of the mathematics involved. Whole group discussion then centers on the efficiency of different strategies used. In my unique position, I am very familiar with the curriculum of each grade level. With this, I am well aware of the vertical alignment of the curriculum and what is necessary for a student in the following year's grade level standards. I collaborate with each of the regular education and inclusion math teachers since we share students. Many of these teachers have spent time in my classroom, and I, in theirs. This teamwork allows more opportunities for success as we all work together toward a common goal – student achievement.

Gordon Central High School – Calhoun, GA **2003 - 2006**
9th – 12th Grade Business Instructor

Marketing Principles: Within the Career and Technical Education Department, I was the sole marketing teacher for the Gordon County School System. I was responsible for teaching basic marketing concepts including segmentation, and the marketing mix of product, place, price, and promotion. Students learned the basic functions of business through an in-depth study of pricing strategies, sales presentations, promotion, advertising, product development, and marketing research. My personal background in the business world brought knowledge to the classroom that no textbook could provide.

Fashion Merchandising: This course introduced students to the fashion industry including all the fundamentals of fashion marketing, types of businesses involved in the industry, and the array of career opportunities available in fashion marketing. Students will develop skills in such areas as fashion economics, marketing segmentation and target marketing, product selection and buying, and inventory systems.

Banking and Personal Finance: Prior to teaching, I spent many years in the financial industry. My experiences helped develop a basic understanding of banking concepts, terminology and operating procedures. Using project-based instruction, students were introduced to the banking system, negotiable instruments, and the deposit and credit functions of banks. The second half of the course, Personal Finance, was truly a "life's lessons" course. Teaching juniors and seniors, I helped them see their current financial responsibilities and the need to prepare for the choices that were ahead. Students explored career options, money management, credit management, and consumer rights and responsibilities.

Professional Development & Leadership

- Ashworth Middle School Data Leadership Team
- TAPP Mentor
- Teacher Representative for the School Council of Ashworth Middle School
- Redelivery of Math Workshop Model to AMS math teachers
- Redelivery of Georgia Department of Education Data Retreat to AMS faculty
- Development of Grades 6 – 8 Pacing Guides
- 7th Grade Math Tutorial Teacher
- Summer School Teacher – 2007, 2008

Leader of Professional Development Training includes:

- Learning Focused Schools
- Response to Intervention
- Georgia Performance Standards
- Math Workshop Model
- Differentiated Instruction
- Performance Matters
- Ascend Online Math Program