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Inner City African American Girls' Learning Mathematics: Parental Influence And Classroom Experience As They Impact Mathematics Scores On The Act

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INNER CITY AFRICAN AMERICAN GIRLS' LEARNING MATHEMATICS: PARENTAL INFLUENCE AND CLASSROOM EXPERIENCE AS THEY IMPACT MATHEMATICS SCORES ON THE ACT

by

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DEDICATION

To my late father, Neal F. Simeon, who opened the door for me, and his many students, to persevere and remain on the quest of life-long learning. His kind and patient way of teaching gave me the confidence to believe in myself, along with the knowledge I could attain anything I set my mind to accomplish.

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Chapter 1: Introduction

Mathematics…this word stirs up deep feelings within me, feelings consisting of wonder, discovery, and anticipation at finding solutions to problems. When I have successfully completed a mathematical task, these same feelings are coupled with an exhilarating sense of fulfillment and accomplishment. This sense of fulfillment and accomplishment can quickly be changed to one of anxiety, frustration, and failure when a new mathematical concept is presented. All these emotions are juxtaposed together to create the concept of mathematics in my psyche. Why is there such a dichotomy of feelings? It begins with my first experiences with mathematics as a child.

A Reflective Inquiry into My Personal Mathematical Development: How a Father Developed Mathematical Thinking in His Daughter

My father was a graduate of Illinois Institute of Technology (IIT) in Chicago, Illinois. Even though his degree was in engineering, he loved children, and had the calling and gift to teach. He began his career as a machine shop teacher at Dunbar Vocational High School in Chicago, and at the time of his death, when I was seven and a half years old, he held the position of Director of Vocational Education for the City of Chicago. I remember my father as a very patient and fun-loving man. As I reflect on the times I spent with him, I remember playing many educational games, although as a child I was unaware the games were educational, and mathematics oriented.

My father made every moment he spent with me meaningful, and tied mathematical concepts and skills into many of those moments. My earliest memories of mathematics began with counting. My father and I counted literally everything. We counted the clouds, ants, birds, trees, people, cars, and even leaves on plants. Whatever I saw, I counted.

On car trips to Wisconsin, Indiana, and Michigan, my father and I would play the license plate game. When I was first learning how to count, he would have me look for and identify particular numbers. Once I learned how to recognize numbers, the game progressed to me quickly summing all the numbers on the license plate together, followed by adding the digits in the answer together to finally come to one digit. This game was fast moving, and fun. To me, it was a lot better than working with and memorizing flash cards.

Like most children traveling, I wanted to know "When will we get there?" My father would answer that question by having me mentally calculate the distance left to our destination. This game proved to be a great way to help me reinforce subtraction in a context that had real meaning for me. He would tell me the mileage from our home to the destination, then he would have me look on the odometer (I was free to lean over and look from the back seat since seat belts were not used at that time) to see how many miles we had traveled. I would then have to mentally calculate how many miles were left to travel. I remember this was difficult; however, he would explain and give me shortcuts as to how to solve the problem. This game also laid the foundation for rounding, estimation, and algebraic equations.

Mornings were always fun in our home because of the games my father would play with me. My father and I loved to eat Cheerios™. My mother stored the cereal in large glass containers, which made it perfect for playing estimation games. As we would eat our cereal and talk about things, my father would ask me to guess how many Cheerios™ I thought were left in the jar. I remember one particular day we made guesses, then dumped the Cheerios™ out of the jar onto the kitchen table, and counted each little circle to see whose estimate came closest.

Even though my mother was not too thrilled with this game, it helped to develop valuable mathematics awareness skills in me at an early age.

My earliest memory of associating mathematics concepts with everyday activities happened when I was about four years old, and had to learn how to tie my shoes for a nursery school assignment. I had the hardest time understanding how to make the loops fit together. My teacher and mother showed me the steps to tying my shoes many times, but all to no avail. I was so frustrated. After trying to tie my shoes for most of the afternoon, I remember my father coming home from work, and sitting down with me on the steps leading from the kitchen to the basement, and patiently showing me what to do. He simplified each step by saying, "First, take the shoe string and…second…" I repeated each step by saying to myself, "First, take the shoe string and...second…" After practicing these steps the way he showed me, I finally understood, and mastered tying my shoes. This was a very powerful lesson for two reasons. First, I learned to tie my shoes that day, and more importantly, I understood I could use mathematics as a tool to help me learn other lessons in my life not mathematics related. My father helped me transfer my knowledge of counting into other areas. By synthesizing the concept of counting, I began to understand mathematics was just not an isolated activity, but a thought process intertwined into all aspects of life.

My father was not only an engineer, he was also a great handyman who was always working on some home improvement project around our house, while continuing to be a consummate teacher to me. I am a visual learner. My father understood my learning style, and used it to teach me in a variety of ways. During the summer months, I would wake up to the sound of the saw humming in our garage, and the fragrant smell of freshly cut lumber. After washing-up and dressing, I would immediately head out to the garage to watch my father work.

Whatever the job he was working on, he would always find a way for me to me his “little assistant”. I was often given the task of counting out a certain number of screws, nails, and washers. He would also allow me to assist him with what he referred to as “the important job”, which was taking measurements. My first memories of the importance of measurement occurred during these times with my father. He always stressed to me the importance of taking accurate measurements. Checking and rechecking was the norm in our garage on those mornings. The practice of checking my work, whether it is taking measurements or calculating a mathematical problem, has automatically become part of my life due to my father’s training.

My father always made up little learning songs. His 5-Multiplication Table song helped me identify, through sound, the rhythmic pattern of numbers. Later, the rhythmic pattern of hearing the “five” made it easy for me to learn how to tell time once I saw the repetition, and number sequence on paper. I used his songs to help me with other math projects we worked on.

Like most children, I loved to bake. On special occasions, my father and I would make homemade donuts. After I had assembled the ingredients (with my mother’s help) needed for the recipe, my job would be to measure everything needed for the batter, and put it into the bowl. My father and I would make the batter. He would actually fry the donuts because I was not allowed to be near the hot oil; but while the donuts were frying, my job was to watch the clock to be sure the donuts were not over or under cooked. This activity helped strengthen my awareness of telling time.

My parents understood giving me money for completing my chores was a good incentive for me to learn responsibility, and learn how to count and keep track of my money. The money I received was used to buy toys at the Dime Store. It became obvious to me the more chores I completed, the more money I could earn, and spend.

Up to my father's death, he continually helped me to be aware of the many ways mathematics was used and applied in everyday life. His guidance helped me to use mathematical lenses naturally to view the world. He greatly expanded my mathematical knowledge at a young age by thoughtfully guiding my natural tendencies of exploration and discovery.

After my father's death, the math games stopped. Anxiety, embarrassment, and fear of failure were constant bedfellows with my mathematics experiences. The love, nurturing, and patience I experienced as a young child were replaced with impatience and humiliation from teachers. Consequently, years of being afraid to raise my hand to tell the teacher I did not understand the concept or a problem, resulted in me falling further and further behind in mathematics. I developed a fear of mathematics causing great anxiety. Despite such a dramatic set-back, I tenaciously clung to the pleasant memories of knowing there was a time when I found mathematics to be easy and fun to learn.

The memories of learning mathematics from my father never left me. I have passed the skills and concepts I learned from him on to my children and students. To this day, I still rely on the skills and concepts he taught me as a young child, the most important ones being how mathematics is intricately woven into every fiber of our lives, and the importance of inculcating this knowledge to our children using love and patience.

How did my father impact my thinking and perceptions of mathematical learning? Even though my father died when I was very young, his lessons in mathematics have shaped my mathematical thinking and perception of mathematics to a large extent. By his constant informal emphasis on teaching mathematical concepts and skills to me as a young girl, I have subconsciously learned to look for solutions to traditional and nontraditional mathematical problems (e.g., in art, music and dance) by automatically applying the skills I learned from him.

My father's lessons of showing me how mathematics plays a vital part in everyday life helped me to gain a broader and deeper understanding of its practical applications. When my father was alive, mathematics, in conjunction with reading and writing, became the doorway to wonderful and exciting learning adventures that stimulated further learning explorations.

My father used numbers as tools to accomplish the completion of projects he worked on. These projects ranged from statistical reports he had to analyze as an educator to home improvement projects. I observed my father constantly, and tried to imitate his every move. I remember working on an assignment in second grade. I had to collect pictures from magazines to create a collage. My father and I cut out and collected many images from various magazines to fulfill the assignment's requirements. What stands out in my mind is the precision with which he had me apply the pictures to the cardboard. My father and I first measured the cardboard then the pictures to find the best possible arrangement for the magazine clippings. After several layout arrangements of the magazines clippings were made, we decided on what we thought was the best one. The lessons I learned from this activity with my father helped my mathematical thinking not only in how mathematics helps organization, but more important to me, how mathematics can be used to create something aesthetically pleasing. As an artist, I rely on mathematics continually, from calculating the correct amount of materials needed for the piece, to the placement of designs.

My thinking and perceptions of mathematical learning after my father's death changed dramatically due to the mathematics anxiety I developed from impatient teaching styles in elementary, and high school. I found myself relying constantly on the fundamental mathematic lessons I learned from my father to help me during those difficult times. One of the most powerful gifts my father gave me was the perception that mathematics is merely a means to an end. In other words, it is a tool, and like any tool, it is vital to learn how to use it correctly. Once the learning of the tool is accomplished, myriad possibilities manifest themselves. Even though my apprenticeship with my father was very brief, I have held on tightly to this metaphor to assist me with my thinking and perceptions of mathematical learning.

What is my perception of school mathematical learning? As a product of this country's educational system, I both suffered and benefited greatly at the hands of teachers. I know my experience is not an isolated case. I truly believe teaching is a "calling" and a complex art form. Too many teachers in the field of education never recognize the potential of children, and fail to help children develop their inherent abilities to make monumental contributions to our society. These students' attributes are dashed to pieces due to the harsh and often harmful ineffectiveness of teachers teaching mathematics. Conversely, there are very talented and caring teachers who have inspired and nurtured many students in mathematics. Currently, the school system in our country is experiencing a shortage of mathematics and science teachers (Futrell, 1999; Reis & Graham, 2005). We must ask ourselves, why there is a shortage in two of the subject areas that are integral parts of a child's education. Could the reason be that teachers were not taught properly themselves, not so much as pre-service teachers in college, but as students in elementary school?

Mathematical learning in school should be a wonderful experience for students and teachers. New and innovative curricula have been developed to help teachers teach mathematics more effectively by focusing on students' learning styles, rather than the teacher's teaching style. Programs like the *Everyday Mathematics* curriculum, developed by the University of Chicago, and the math component of *Success for All*, developed by Robert E. Slavin, and others at John Hopkins University, all hold great promise for promoting quality mathematics experiences for students (Madden et al 2001; Woodward & Baxter, 1997). These curricula follow the scope and sequence of most of the standards and benchmarks of the country by using multicultural, practical, project-based materials. The lessons are fun and fast-paced for the students, while presenting real-world situations the student can relate to and understand. As long as children see the need and value of learning mathematics, they will be in a better position to apply and transfer their mathematical skills to other subject areas, thus creating a more meaningful learning experience.

Best Practices for Teaching Children Mathematics

No one disputes that teaching children mathematics requires a deep understanding of mathematics concepts and principles; but this is not enough to make an effective teacher. Cavey and others (2007) discuss how teachers can look for ways to continually expand student's mathematical thinking by being keenly aware of opportune times throughout the lesson to hone in and deepen students' natural curiosity and observations of mathematics principles during their exploratory processes. The importance of the teacher in the expansion of a child's mathematical thinking is supported in Timmerman's research stating a teacher's belief towards teaching children mathematics can significantly impact how the child learns and views mathematical concepts (2004). Her research showed how years of traditional teaching, that is, teacher-directed lessons without student inquiry into concepts and principles, causes children to view mathematics as not making sense (p.369).

Through informal instruction, students at the primary level begin to make number sense of their world through exposure in the home, preschool, and kindergarten (Hanley, 2005). School districts use Family Nights and family-based mathematics homework assignments and activities (Kyle et al, 2001) as opportunities to help parents develop their child's mathematical skills. These activities help to support the five strands of mathematical proficiency: conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition (Timmerman, 2004).

Status of African American Children and Mathematics

From 1982-2005, the percentage of African-American students taking advanced mathematics courses was considerably less when compared to their White counterparts (National Center for Education Statistics, 2009). Despite reforms such as No Child Left Behind (NCLB), there still exist disparities in opportunities for African-American students to take higher mathematics courses (Walker, 2007). Such disparities have caused some educators to take up the rallying call of mathematics as a civil right that has not been afforded to many African-American children (Kress, 2005; Tate, 1994). New and innovative curriculums need to be designed for African-American students, and all students (Tate, 1994) instead of traditional drill and skill methodologies. Lacking these innovations, teachers resort to how they were taught; and if a deep understanding of mathematics pedagogy and number sense is lacking, coupled with the teacher's own mathematics anxiety, the likelihood of adequate teaching and learning of mathematics skills is dismal at best (Bursal & Paznokas, 2006; Malinsky et al, 2006; Walker, 2007).

The effects of poor teacher preparation are evident in many studies. Many African-American students in economically disadvantaged areas are not receiving instruction based on recommendations from the National Council of Teachers of Mathematics (NCTM) when compared to White students (Berry, 2003). Coupled with poor pedagogy, and the limited mathematics knowledge parents may possess (Leedy, LaLonde and Runk, 2003; Whiteford, 1998), African American students are put at a great disadvantage for making mathematics advancement (Rozansky-Lloyd, 2005).

Having the ability to understand how to use mathematics in everyday situations is an important indicator to a student's mathematical growth and success. Teaching students these skills is vital. Hands-on activities with a strong emphasis on mathematical vocabulary and computational skills increase student achievement. School districts only using basals for "story" or "word" problems hamper students' abilities in analyzing and interpreting key concepts found in solving story problems. Students with poor computation and mathematic vocabulary have difficulty transferring lessons from school to everyday life. Inner-city school districts using a more kinesthetic approach when teaching African-American children have seen mathematic test scores increase (Pennington, 2000).

Status of Girls in Mathematics

Typically, girls have not chosen fields in mathematics to achieve their career goals (Reis & Graham, 2005). Girls share the same enthusiasm and comparable test scores as boys in mathematics in the primary grades, yet as girls progress though grade school, their mathematic confidence and test scores decrease considerably when compared to their male counterparts (Geist & King, 2008; Kloosterman, 2008). Research has shown attitudes and teaching styles affect the success of girls in mathematics (Bevan, 2001) as does the influence from their parents (Huang & Mason, 2008).

Furthermore, when there are gaps between the school and home culture, students are at an academic disadvantage (Hale, 1982). Even when these girls incorporate mathematics skills constantly in their home life, transferring this knowledge to school has been a struggle for African-American children in general (Hale, 1982). It may be shown in this study that quality classroom experiences can actually increase student scores on standardized tests if there is good home support.

Problem Statement

There is a need to closely examine possible causes as to why girls, especially African American girls, are underrepresented in the fields of science, engineering, architecture, and other professions requiring strong mathematical skills (Kurtz et al, 2008). The professional literature states all students can succeed when given access to a quality education (Flores, 2007). Educators and other concerned individuals have grappled with the reason why these girls have not been successful for years (Herzig, 2004). One reoccurring theme and question is; could poor mathematics pedagogy for African-American children contribute to poor high-stakes test scores (Lattimore, 2005)? Are educators the only ones who should take responsibility for African-American girls not ranking as high in mathematics as their White counterparts? How much impact do parents have on their daughter's mathematics success?

Independent and Dependent Variables of the Proposed Study

There is one dependent or outcome variable in this study: female African American students' scores on the mathematics portion of the American College Test (ACT). The two independent variables (predictor variables) are the students' parent's perception of their own role in supporting their daughters' mathematical thinking by implementing mathematical learning in the home setting, and the students' own perceptions of their experiences in their mathematics classes. A third hypothesis will look at the interrelationship between the two independent variables by testing whether the classroom can significantly influence students' mathematics scores on the ACT beyond what the parents' impact may have been.

Significance of the Study

Society is not developing one of its most valuable human resources—African American girls. Albeit institutions such as the National Science Foundation (NSF), and the American Association of University Women (AAUW) have focused on gender equity in science, technology, engineering, and mathematics (STEM) since the 1990s, girls continue to be underrepresented in these fields (Dentith, 2008) with African-American girls being considerably less represented than their White counterparts (NSF, 2006). Despite increased awareness of the disparity between the involvement of African-American children and other groups in mathematics, educators continually grapple with solutions to rectify the problem (Berry, 2003; Burke & Dunn, 2003; Kress, 2005; Matthews, 2003; Rozansky-Lloyd, 2005). The question remains, why are so few inner-city African American girls enrolled in institutions of higher learning?

African American girls creative abilities, coupled with their potential to become problem solvers in today's complex society, demands a conscientious effort to assist them to become productive and successful members of society. A strong mathematical background is one of the main determining factors as to whether or not these girls will pass the entrance exams needed for admittance to institutions of higher learning. Since the enrollment in institutions of higher learning is low for African American girls, parents, educators, and citizens need to identify, isolate, and correct the causes as to why this population is not represented in these institutions. By doing so, we will help make it possible for these girls to be successful, thus bolstering the presence of African-American girls in today's global society.

An investigation into the role the parents of these girls play in the development of their daughters' mathematics skills may help to shed some light on why a large percentage of African-American girls are not successful in mathematics. This study is being conducted to investigate how inner city parents of African-American girls informally teach mathematics to their daughters. The inquiry of how parents informally instill in their daughters the uses and needs of mathematics to stimulate their daughters' thinking and learning, may help educators find appropriate ways to improve the future success of African-American girls in mathematics.

Finally, although there seems to be ample research about perceptions in mathematics study, there is much less research about experiences in the classroom and in the home, and how these experiences relate to measured performance. It is hoped that this study will contribute to this less-examined aspect of mathematical performance.

Research Questions

Is poor mathematics ability with African American girls because of their experiences in their mathematics classes, or could the reason be rooted in these girls' early experiences and perceptions of mathematical learning and thinking in the home? A reflective inquiry into how parental involvement contributes to African American girl's mathematical thinking may help to answer these questions. Thus, the following objectives and focus questions frame this study:

1. How do parents, through their input at home, influence the mathematical performance of their daughters?
2. How do female African American student view their teachers' influence in their mathematical thinking?
3. How critical is the mathematical classroom experience for African American girls, and can positive classroom experiences (teacher implementation of best practices) significantly add to the effect of the parental mathematical input at home? How much can the two factors together predict higher mathematics scores on the ACT?

Research Hypotheses

In investigating these research questions, the following hypotheses will be tested:

H_1: The scores on the parent survey will significantly predict the students' scores on the mathematics portion of the ACT.

H_2: The scores on the student survey will significantly predict the students' scores on the mathematics portion of the ACT.

H_3: Classroom learning experience (as measured by the student survey), will significantly increment over the parents' mathematical input at home (as measure by the parent survey), adding to the prediction of the students' scores on the mathematics portion of the ACT.

Null Hypotheses

H_1: The scores on the parent survey measuring parental mathematical input at home, will not significantly predict the students' scores on the mathematics portion of the ACT.

H_2: The scores on the student survey measuring math classroom experience will not significantly predict the students' scores on the mathematics portion of the ACT.

H_3: Classroom learning experience (as measured by the student survey), will not significantly increment over the parents' mathematical input at home (as measure by the parent survey), thereby not significantly adding to the prediction of the students' scores on the mathematics portion of the ACT.

Definition of Terms

AA – African American

ACT – American College Test

HBCU - Historically black colleges and universities

Home Participation Component – Part of the mathematic curriculum involving home participation in mathematic lessons.

ICAAC – Inner City African American Children

Inner City – The economically poorer section of the city.

Pedagogy – The art and science of teaching.

Phenomenology - the study of the development of human consciousness and self-awareness ((Marten, 1981; Marten & Booth, 1997; Merriam-Webster On-Line Dictionary).

Urban Setting – In this study, an urban setting refers to a total population of 2,500 or more with at least 1,000 individuals per square mile as defined by the U.S. Census Bureau (University of Washington, 2010).

Chapter 2: Review of the Literature

This chapter is divided into four sections: The section on parental influence for success in mathematics explores the attitudes and fears parents have in regards to the mathematical success of their children. This leads to a discussion of mathematical thinking and learning in the school context, focusing on effective and ineffective mathematical pedagogy and how methodology affects students. Following this is a review of research literature on Inner City African American children and mathematics, which examines the importance of teacher expectations and the use of a multi-cultural curriculum. Then the discussion narrows to research pertaining specifically to African American girls in mathematics; this section investigates the differences between how girls and boys learn mathematics, the different teaching styles and approaches prescribed by experts for teaching mathematics to girls, and the importance of exposing African American girls to positive role models in the mathematics classroom.

Parental Influence for Success in Mathematics

"Family and peer attitudes may positively or negatively influence students' attitudes toward mathematics, which in turn affect their levels of confidence" (Stuart, 2000, p. 330). Some homes abound with overt mathematic influences. Children can see and hear family members constantly using mathematics term and usages in cooking, sewing, building, and budgeting because they are made participants in the activities (Paznokas, 2003). On the other hand, some households never make the connection for children between the use of mathematics and everyday activities. The following quote from Bevan states that parents sometimes have lower expectations for their daughter than for their sons.

> Parents often have lower educational expectations, in general, for daughters than sons. Moreover, they tend to have a greater acceptance of low levels of achievement in math (Wiest, 2001) for girls than boys. When considering future aspirations, parents are inclined to think of math as a more appropriate career for boys than girls; and within the

> domestic situation help for math homework is more frequently sought from men than women. (Bevan, 2001, p.4)

Such a viewpoint towards girls pursuing mathematical aspirations greatly limits if not totally nullifies the importance of girls learning mathematics in such homes. It is important to understand how the cultural aspect of the home influences how parents view the importance of mathematics in their child's lives. If the culture does not put strong emphasis in the attainment and use of mathematics, it will be challenging for the child to apply and relate mathematical concepts and skills learned in school to their home environment. Conversely, if mathematics has a high priority in the family's life, the children will be strongly encouraged to use the knowledge acquired in school (Wiest, 2002). This does not mean parents do not want the best for their daughters. It means there continues to be the perpetuation of out-dated ideas from the past (Reed, 2008) which are still ingrained in the psyche of some families in respect to the importance of assuring their son's will receive a more complete educational experiences than their daughters (Bevan, 2001).

Previous research supports the notion that parents tell their children to study hard and learn as much as they can in school (Hrabowski, 2003). Hrabowski reviewed several studies of parents' influence on their children's educational expectations and attainments. These studies have consistently found relatively strong positive effects on student achievement. In a study by Trusty (2002), they interviewed African-American and Mexican-American college students who had clear career goals. According to the students, their parents' encouragement helped them stay focused on their academic goals (p. 334). In a similar study conducted by Hrabowski (2002), parents of successful students stressed the importance of reading, holding their child to high expectations, working closely with their child's teachers, being involved when their child worked on homework, continually supported and encouraged their child, and sought community resources.

Similarly, Yan and Lin (2005) found that parental nurturing and high expectations also increased the likelihood of student achievement. In another study (Rytkonen et al, 2005), it was found that parental educational levels also appear to determine how parents view their children's mathematical success. Children of less-educated parents tend to attribute the success of their children to how much effort the child put into the lesson, whereas children of parents with a higher educational level tend to attribute their child's success to the child's ability.

Importantly, Callahan, et al (1998) found that some parents lack the skills and mathematical knowledge to help their children live up to these high expectations. Despite all the good intentions of parents, there is still the possibility their children will not succeed in mathematics due to the parents' own mathematics anxiety (Flore, 1999). These problems can be minimized when parents are given the resources and confidence to help their children (Huang & Mason, 2008). Once these resources are in place, and the parents have the tools to help their student achieve (Whiteford, 1998), parent involvement in the educational process becomes a critical factor in the academic success of the student (Halawah, 2006).

Mathematical Thinking and Learning in School

"I love math!" Those words are a teachers' dream come true. Every parent longs to hear children effortlessly say those words from their heart. This love of mathematics is not completely out of reach. Schools utilizing innovative pedagogy have established approaches designed to help children understand mathematical concepts (Davis Cook & Buchholz, 2005; Galbraith & Jones, 2006; Hill, Rowan, & Loewenberg Ball, 2005; Warfield, 2001; Watson & deGeest, 2005; Yates & Collins, 2006). These innovative approaches do not include methods from the past that relied solely on memorizing facts and formulas, commonly called the "drill and practice" methods (Harper & Daane, 1998). Instead, these approaches consider the nature of mathematics. "Mathematics is first and foremost a form of reasoning analytically about particular types of quantitative and spatial phenomena, mathematics consists of thinking in a logical manner, formulating and testing conjectures, making sense of things, and formulating and justifying judgments, inferences, and conclusions" (Battista, 1999, "The Nature of School Mathematics", para. 1).

Prescott's article, *We Love Math!* (1999), states the paradigm has shifted from the teacher not allowing the student to use a method for solving a problem different from the one she used, to the teacher explaining to students there are many different ways to arrive at a solution, and readily accepting the students' approaches. Prescott cites examples of how teachers can make mathematics exciting and fun for children. For example, for a morning activity, students sit in a circle, and a soccer ball with mathematics problems written on each of its sections is rolled from one student to the other. When the ball comes to the student, they are to solve the problem, and pass the ball on to another student. Schools are decorated with geometric objects, and the centers in the classrooms are mathematics oriented, whether they are based in social science, science, literature, or writing. The students have exposure to mathematics continuously throughout the school day (Prescott, 1999).

Another innovation joining the arsenal of "best practices" is supporting mathematics instruction with manipulatives and modeling. Because children need to understand the relationship between numbers, and how the numbers work together, manipulatives are suggested in order to provide the student with hands-on experimentation, allowing the student to construct and test their ideas, and to come to an understanding of the concept and skills presented in a lesson. Many students are visual and kinesthetic learners (Burke & Dunn, 2003). Modeling provides the student with examples and systematic procedures for finding solutions to mathematics problems. To effectively use manipulatives and modeling in the classroom, colleges of education require pre-service teachers to practice with them. This practice with the manipulatives removes the "mystery" of their purpose and design so that education students find themselves comfortable with the concepts imbedded in the manipulative and the variety of usages and interpretations the materials might manifest in their own pupils (Dalle, 1990, as cited in Sherman, 1992). If the teacher is not trained or is not comfortable using modeling and manipulatives, however, she will often resort to the ineffective traditional methods of teaching mathematics.

Unfortunately, the main scenario carried on in too many classrooms across the United States is the mundane mathematics lesson of the teacher showing students several examples of how to solve a certain type of problem and then having them practice this method in class and in homework. The National Research Council has dubbed the "learning" produced by such instruction as "mindless mimicry mathematics" (Battista, 1999, "How Math is Taught", para. 1). Instead of understanding what they are doing, students simply parrot what they have seen and heard (Battista, 1999, "How Math is Taught", para. 1).

This repeated parroting of mathematics facts and procedures without a thorough understanding of the concepts has continued from one generation to the next, resulting in an influx of students entering college unprepared for and disengaged from conceptual learning. These students have become complacent in that they have become conditioned to merely memorizing facts and formulas, rather than studying the material to gain deep understanding of the subject (Kuh, 2003). The practice of having students memorize facts without understanding the concepts has caused many students to be unsuccessful in mathematics classes and to dislike mathematics.

One reason an expression such as “I hate math!” is voiced is that students have been taught only facts, and not the meaning underlying mathematics vocabulary. For these students, mathematics becomes a foreign language, causing the student to become disengaged due to the teacher ineffectively translating the language. The textbooks abound with mathematics vocabulary, stopping the student from seeking avenues to finding understanding (Cornell, 1999). Poorly written textbooks and antiquated instructional methods, according to experts in the field, are clearly associated with poor mathematics achievement (Carine, 1991; Russell & Ginsburg, 1984 as cited in Fleischner & Manheimer, 1997).

Teachers are realizing many of their students are coming to them with severe mathematics anxiety resulting from ineffectively teaching. To make matters worse, because ineffective mathematics teaching has been going on for generations, parents who have math anxiety can end up passing their math anxiety on to their children (Lazarus, 1974, as cited in Flore, 1999). So, even an effective teacher can find himself faced with a class full of students who harbor serious mathematics anxiety and lack of confidence. The teaching profession has a weighty responsibility for molding students’ perceptions of mathematics. Educators must take responsibility for causing fear of mathematics, mathematics anxiety, and mathematics phobias in students. Studies support the idea that much mathematics anxiety has its roots in the teachers and how they teach mathematics. In fact, research evidence suggests that mathematics anxiety results from the *way* the subject is presented more than from the subject matter itself (Greenwood, 1984 as cited in Flore, 1999; Tobias, 1978; Williams, 1988). On the other hand, using concrete, non-numerical representations of concepts, such as pictures and graphs, provides students an opportunity to integrate the new concepts into their mathematical schemas (Donnelly, 2007, p.12).

To explore this idea of mathematics anxiety, students with mathematics anxiety were asked when they first developed the problem (Jackson & Leffingwell, 1999). The researchers found that many students experienced their first traumatic encounter in third or fourth grade. The educational system must examine whether or not teachers have the depth of understanding of mathematics concepts and an understanding of their own mathematical thinking needed to effectively teach children to acquire mathematics conceptually. Indeed, a teacher's mathematical knowledge, or lack of it, greatly impacts his or her teaching ability (Patton, et al, 2008).

Thus, how teachers conceptualize mathematics has a great impact on how effectively they can convey mathematics concepts to their students. The following section zooms in more closely to examine the issue in relation to African American mathematics students.

Inner City African American Children and Mathematics

Because this study focuses specifically on African American learners, it is important to examine how teacher expectations, views, and biases impact the teaching and, consequently, the learning of mathematics for Inner City African American children (ICAAC). Rozansky-Lloyd's article entitled *African Americans in Schools: Tiptoeing Around Racism* (2005) quoted teachers who immediately have low expectations of their African American students due to the student's perceived economic background and the lack of parental support. High school teachers interviewed in the article spoke about counselors who justified not putting African-American students into advanced placement classes based solely on their low standardized achievement scores, rather than taking into consideration the student's classroom performance and curriculum-based assessments. Such a viewpoint hinders the possibility of success these students might have experienced if given the opportunity to take advanced placement classes, especially when their classroom performance and curriculum assessments showed they were capable of succeeding. Brand, Glasson, & Green (2006) examined the constant struggle African American students face by battling what the researchers called "disenfranchising stereotypes" placed on them by schools. The students interviewed for the article stated they constantly battle negative perceptions, which adversely affect their self-esteem along with the added pressure of proving these misperceptions to be false (Brand, Glasson, & Green, 2006, "Analysis" para. 1). Insightful and effective teachers embrace sociocultural issues to engage and promote mathematical concepts and thinking into their students lives. ICAAC battling negative perceptions and low expectations from teachers, puts them at a disadvantage when compared to other groups (Brand, Glasson, & Green, 2006, "Analysis" para. 1)

Overcoming this tendency to underestimate students is difficult. Matthews' (2003) research discusses the various "complexities" of incorporating culturally relevant teaching strategies into the mathematics lesson (p.68). Teachers in his study varied in their approaches and views of what and how to teach critical thinking in mathematics lessons. The most successful teacher of the three teachers cited, used her close relationship and understanding of her students' cultural background to ask probing questions to pique interest and stimulate higher order thinking by using cultural situations (Matthews, 2003, p. 73). This type of teaching strategy is the basis for good pedagogy. African American students frequently ask their teachers to explain the relevance of the mathematics lessons to their lives. Once the relevance of the lesson is understood by the student, the lesson becomes more meaningful for them (Tate, 1995).

Beyond explaining the relevance of lessons, incorporating students' cultural background into pedagogy can be a turning point into whether or not students will understand and engage in the lesson. Jerry Lipka and others (2005) closely examined the instructional approach of an Alaskan teacher as she integrated mathematics skills into a module on Parka and Patterns to several different elementary grades of Native American students. The lessons were video-taped and later reviewed by Yup'ik consultants. The consultants identified specific moments in the lesson when students responded favorably to the lesson due to connections to their cultural heritage. The study highlighted the importance of making cultural connections when teaching students (Lipka, 2005). In so doing, students have more of a vested interest in the learning process (Sankofa, 2005). One might think this would be intuitive, but it may be something that needs to be actually taught to teacher candidates.

In Moody's (2004) article, one student who was interviewed felt that being a successful mathematics student was a betrayal to her African American culture. Moody stated that this viewpoint does not apply to all African American students, but some students feel very stongly that being successful academically means giving in to "imposed ideologies" contrary to their cultural beliefs (p.144). Such thinking can be very detrimental to the student's academic success in general if it is in conflict with her culture. The same student also stated that she succeeded in mathematics by having teachers who would "look out for her" (p. 145), and served as *role models* since they were also African American.

This attitude factor can hold students back unless addressed. Sankofa and others in *Cultural Expression and Black Student's Attitude Toward High Achievers* (2005) discussed how students' attitude was more favoriable towards high achievement when culturally relevant pedagogy was introduced into the curriculum. African American students in the study were given four scenarios of high achievers. Two displayed the mainstream view of "individualism and interpersonal competiveness" and the other two models displayed "communalism and verve"

(p. 251). The study revealed the "cultural orientations that underlie high achievement moderate Black children's attitudes toward individual high achievers" (p. 257). Understanding this mindset equips teachers to hone in on cultural issues impacting student's perceptions of learning mathematics and how teachers can help students prepare for high stakes achievement tests.

Addressing students' attitudes and perceptions in the mathematics classroom seems to be key. In fact, as Hrabowski (2003) points out, "Many minority students have not had the necessary preparation to ensure success, or do not accept the importance of standardized tests" (p.45). In the past, some educators have felt minority students were not able to understand advanced mathematics concepts because "culturally biased assessment procedures may cause educators to make inappropriate educational decisions for students from specific cultures. Because achievement tests are meant to measure skills or content that students have had the opportunities to learn, this lack of overlap can result in questionable educational decisions" (Evans-Hampton, et al, 2002, p.529).

Thus, low test scores coupled with low teacher expectations have caused "powerlessness" among African American and Latino students (Calabrese, 1990, p.22) because of their "perceived inability to alter the school environment and the social relationship that exist among their peers" (p.25). For decades, forward-thinking educators have realized African American children need a curriculum using learning styles better suited for them. In Woodson's groundbreaking book first published in 1933, *The Mis-Education of the Negro*, he stated that African American children have different environments from those of white children, and need curriculums with an emphasis on their unique living situation (p.4). Janice E. Hale (1982) likewise emphasized the need for African American children to be exposed to a more home-like school environment (p. 159). Schools have begun to accept and adopt multicultural curriculums;

however, change usually comes slowly, but it is not impossible. In fact, Black colleges have been successful for years due to incorporating the African American culture into academic learning (Cole, 2006; Collins, 2008; Nealy, 2008).

Having established the need for effective pedagogy in mathematics classes, and the importance of incorporating culturally relevant contexts for teaching mathematics, the next question in this discussion narrows the focus a little more. What is it about teaching mathematics to African American girls that requires even more insight on the part of the teacher?

African American Girls in Mathematics

Girls learn and react differently to mathematics than boys (Lloyd, Walsh, & Yailagh, 2005). Observations of girls in grades 4-6 participating in an Olympiad math team revealed that the "girls took longer to arrive at solutions, whereas boys were quicker to offer answers and argue their point of view, and more willing to take a chance" (Volpe, 1999, para. 5) Additionally, the girls "were reticent about volunteering their thoughts and resisted invitations to voice their ideas" (Volpe, 1999, para.6). Albeit in high school there is little difference between the achievement level of boys and girls in the classroom, boys score higher on standardized tests (e.g., the SAT and ACT) than girls (Kennedy & Schumacher, 2005). Researchers have long sought to find the answers as to why there are gaps in the acquisition and mastery of mathematics between genders.

The question arises why do girls show such a reluctance to engage in mathematics starting in middle school and not in the lower grades? One reason may be gender bias that may be subtly evident in the classroom. The literature shows as a group, girls perceive themselves as being just as capable as boys in mathematics and science, yet girls are influenced by the societal stereotypical viewpoint held by adults that boys are more competent in these subjects (Kurtz-

Costes, 2008; Lloyd, Walsh, & Yailagh, 2005; Stuart, 2000; Wiest, 2001). Jackson and Leffingwell's (1999) study revealed teachers participating in the continuation of this stereotypical viewpoint did not stop or intercept negative comments made about girl's mathematical ability by their peers, and offered more repeated explanations to boys than to girls during instruction. Such treatment of girls has caused them "to feel less confident about their answers on tests and often express doubt about their performance" (Geist & King, 2008, p. 46). Bevan stated in the article, *Boys, Girls, and Mathematics: Beginning to Learn from the Gender Debate*, that research has been ongoing since the 1980s regarding this topic, and suggested that gender bias towards girls in mathematics is a persistent problem. The article also made a connection to the importance of examining how the learning styles of girls and boys may present a significant factor in determining how girls and boys learn mathematics (Bevan, 2001, p.2). So once again, the discussion returns to learning styles.

Bevan states girls tend to lean more toward serial learning (Bevan, 2001). If a learner relies on remembering the concept only when triggered by key words or steps from the original presentation of the material (in sequenced or serial learning), they tend to remember less than someone who has fully integrated the learning into their schemata. The draw-back to this learning style is that it limits the learner's ability to acquire a broader understanding of how various mathematical operations relate to each other. A significant percentage of boys take a more holistic approach to learning mathematics by being "more comfortable with the unknown, and more inclined to infer connections as they arise" (Bevan, 2001, p.4). In other words, they seem to fit the new learning into the big picture. Studies show boys tend to favor memorization of facts related to abstract concepts rather than developing a thorough understanding of the concept, whereas girls try to make connections to specific concrete contexts to gain a better understanding of abstract facts (Bevan, 2001) by using visual representations when solving mathematic word problems (Edens & Potter, 2008). Bevan further states girls pay more attention in class and show more of a willingness to take time to learn, and to work in cooperative groupings where boys prefer to rush through a lesson, are more competitive, and work well in pressurized environments (Bevan, 2001. p. 4). Bevan stated even though it is noteworthy to mention not all studies support a significant difference between the learning styles of girls and boys (Adey *et al.*,1998, as cited in Bevan, 2001, p. 4) many studies do show a difference in the learning styles of the genders (Arnot *et al.,* 1998, as cited in Bevan, 2001, p. 5). Having this knowledge affirms the need to use research-based best practices to assist girls in acquiring mathematical skills. Understanding how girls differ in their learning styles from boys should be used in conjunction with a multicultural approach when considering best practices for teaching African American girls.

Further studies agree on the importance of basing African American girls' mathematical success on curriculum multicultural sensitivity. Stuart (2000) states that "gender and ethnic backgrounds are not determining factors in mathematical competence, but peers, teachers, and ethnicity may increase or decrease one's confidence in mathematical skills" (Tobias, 1978, as cited in Stuart, 2000, "A Definition of Math Anxiety", para. 3). Likewise, Pennington posits that the lack of cultural context in pedagogy affects the academic success of African American students'. In his article, Pennington states, "The more that math is presented in a context and experienced in a social framework of learning – the more it appears to fit with the diverse African American culture" (Pennington, 2000, "Implications for African American Education". para. 2). He goes on to explain:

> "In a book called *Shortchanging Girls, Shortchanging America* (American Association of University Women, 1990), an interesting finding was documented in reference to African American girls' self-esteem: These females have an overall higher self-esteem than white girls; they possess a greater sense of personal and familial importance, are

> more satisfied with their appearance, and even feel more entitlement to speak out. Moreover, even as adolescence progresses, African American girls experience only a minor drop [in self-esteem] of 7 percent – to be contrasted with the white girls' plunge of 33 percent. The higher self-esteem does not translate into success at school however – both African American boys and girls report lower academic self-confidence than their white counterparts – presenting significantly more pessimism about schoolwork and their teachers" (Pennington, 2000, "African American Experiences and the School Connection", para. 2).

Even though the African American students possess high self-esteem, the lack of culturally relevant lessons decreases their chance of academic success. Understanding and employing cultural pedagogy into the curriculum will increase the African American student's success in mathematics (Pennington, 2000).

Related to self-esteem is the presence of good role models. Positive role models for girls can have a significant impact upon their self-esteem, participation in class, and views towards mathematics. In a study conducted by Trotman & Roberts (2006), a group of at-risk seventh-grade girls were mentored by women who had strong mathematics and science backgrounds. These mentors encouraged the girls to view mathematics positively and helped the girls master mathematics skills and concepts. By the end of the study, the girls had a more positive outlook towards mathematics and higher education, and expressed interest in attending college and taking mathematics and science courses (Trotman & Roberts, 2006).

Adding further strength to this line of reasoning, many studies highlight the distinction between the way girls and boys learn mathematics (Bevan, 2001; Edens & Potter, 2008; Lloyd, Walsh, & Yailagh, 2005). These studies emphasize the negative implications of the sterotypical viewpoint of some adults towards the success rate of girls in mathematics, which impedes the possibility of these girls succeeding and taking more advanced mathematics classes (Kurtz-Costes, 2008; Lloyd, Walsh, & Yailagh, 2005; Stuart, 2000; Wiest, 2001). Culturally relevant pedagogy helps African American girls make connections to mathematic concepts by tapping into prior knowledge, resulting in the girls assimilating new concepts into more meaningful mathematical perspectives. The use of cooperative learning groups, project-based learning, high expectations expressed by the teacher to students, and regular teacher feedback creates an environment for African American girls to succeed in mathematics (Pennington, 2000).

In summary, Chapter 2 has shown that there is a great deal of research regarding how African American girls perceive mathematics instruction and what experts prescribe for improving results and bringing higher achievement in mathematics. Beyond the parental influence in the home, the classroom may be the decisive avenue to success in mathematics for African American girls.

Chapter 3 will now present an outline of the research design for this study which attempts to answer these research questions:

1. How do parents, through their input at home, influence the mathematical performance of their daughters?

2. How do female African American student view their teachers' influence on their mathematical thinking?

3. How critical is the mathematics classroom experience for African American girls, and can positive classroom experiences (teacher implementation of best practices) significantly add to the effect of the parental mathematical input at home? How much can the two factors together predict higher mathematics scores on the ACT?

Chapter 3: Methodology

This chapter discusses the methodology used for this research study. The study showed how African American parents described their mathematical influence based on how they have interacted with their daughters in the home environment. The study showed to what extent the parents' input predicted their daughter's scores on the mathematics portion of the ACT. Additionally, the girls described their experiences in mathematics classes to help determine how their interaction with the subject matter and with their mathematics teachers predicted their ACT mathematics scores. Finally, analyses determined to what extent the classroom experiences may add further predictability of ACT mathematics scores when added to the parental influence.

Setting for the Study

The study was conducted at two urban high schools located in the Midwest. Both high schools are from the same school district. The racial makeup of the district is 95% African-American, 3% White, and 2% Hispanic. The total enrollment for both schools for the Spring of 2011 was 1800. Neither high school made Adequate Yearly Progress (AYP) and both are in the process of restructuring by the State. Of the students from both schools, 72% qualified for free or reduced lunches.

Participants

Participants for this study were 11th and 12th grade African American girls who had taken the ACT and their parents. The girls were randomly selected by their counselors to complete the survey. The samples of participants were chosen for their preexisting characteristics consistent with the inclusion criteria. All of the girls who had taken the ACT were invited to participate in the study if their parent had given consent.

Research Design

This study used a non-experimental static group design, which consists of various continuous variable analyses. This research design lends itself well to this social study due to providing the researcher with specific information easy to interpret; it also aids in determining significant relationships (O'Sullivan, Rassel & Berner, 2003). The independent variables were measured by a survey of parents' math input in the home setting, and a survey of the students' classroom experiences. These were the predictor variables. The dependent variable, or outcome variable, was measured by the students' scores on the mathematics portion of the ACT.

Instrumentation

Self-reporting surveys were given to the girls and their parents. Particular attention to the structure of the survey statements was considered. The survey statements have the three attributes of focus, brevity, and clarity (Alreck & Settle, 1995). The surveys focused on how the parent described their involvement in their daughter's mathematical learning at home, and solicited from the girls how they viewed their own mathematics experiences in the classroom. The questions on the parent survey were adapted by the researcher, based on a previously constructed survey for a study of home numeracy experiences; they were adapted for use with this particular sample (LeFevre, et al., 2009). The parent survey also included questions suggested by research regarding parental attitudes towards their daughter's mathematical learning. The student survey questions were based on the literature review—best practices and learning styles research—in order to paint a picture of the experiences the students had in their mathematics classes.

Both surveys used a Likert Scale format for the responses. This self-reporting method provided insight into the respondent's perceptions of their mathematical learning (McDonald, 2008, p. 1-2).

Reliability and Validity of the Survey Instruments

The statements on the survey were framed to “ensure reliability and validity of results” (Miller, 2004, p. 127) to “easily and accurately collect the desired data from the respondents” (p. 127) to avoid bias. Cronbach’s Alpha (reliability statistic) was calculated for each of the primary scales. This statistic measured how well the items of the scale correlate with one another, and therefore, how reliably they measure the construct. The Cronbach Alpha showed high reliability of each scale.

Table 1
*Internal Consistency Reliability of Scale Items in *** Survey (n= 47)*

Scale Number	Scale Type	Number of Items	Scale Label	Cronbach’s Alpha
1	5-point Likert	8	Student Survey	.80
2	5-point Likert	24	Parent Survey	.96

Validity was strengthened by having several experts examine the survey to determine appropriateness and bias in the survey questions.

Data Collection

The girls took the parent survey home for their parents to complete. Consent forms and assent forms were included in the packet with the survey for the parents with instructions on how to complete the survey along with the researchers contact information. The girls completed their surveys at school under the guidance of the researcher, who was not the instructor of any of the participants. Statistical research is one of the curriculum benchmarks in high school mathematics. Thus, using 5-10 minutes of class time was not an interruption of instruction, but an informative and instructive application of mathematics concepts for the students. Without including any personally identifying information, the surveys were coded to accurately match the girl's surveys to their parents' surveys. The surveys were approved by the Institutional Review Board before they were issued and completed by the participants.

Data Analysis

Analyses were descriptive in nature, as variables were not manipulated (Johnson & Christiansen, 2008).

Hypothesis 1 was analyzed using a simple linear regression. The predictor variable was the score on the parental survey, and the outcome variable was the mathematics score on the ACT.

Hypothesis 2 was also analyzed using a simple linear regression. The predictor variable was the score on the student survey, and the outcome variable was the mathematics score on the ACT.

Hypothesis 3 was examined using a hierarchical regression to analyze both predictor variables and the outcome variable. The variable of classroom experience (the score on the student survey) was entered into the regression as the first predictor, and the variable of parental input (the score on the parental survey) was entered into the regression as the second predictor. Variability in the outcome variable (ACT score) accounted for by the scores of each predictor was compared to determine whether the scores of the predictor of classroom experience increment over the scores on the parental involvement survey in predicting the scores on the ACT.

Chapter 4: Results

This research was conducted to show how African American parents describe their mathematical influence based on how they have interacted with their daughters in the home environment. The research showed to what extent the parents' input predicted their daughter's scores on the mathematics portion of the ACT. Additionally, the girls described their experiences in mathematics classes to help determine how their interaction with the subject matter and with their mathematics teachers predicted their ACT mathematics scores. Finally, analyses were done to determine to what extent the classroom experiences may add further predictability of ACT mathematics scores when added to the parental influence.

Data Preparation and Data Entry

Each item on the surveys was entered using variables and labels, which included identification, parent survey items 1-15 (including 6a-6k), the student survey items 1-8, and the ACT math scores. The items were assigned scaled/data types. The ordinal variables listed on the survey (i.e., 1-5 = strongly disagree to strongly agree) were all dummy coded. The data was entered with a Total N=47 (by student). No surveys were excluded due to missing data.

Aggregate Variables

Three aggregated variables were created based on sums of single items. One aggregate variable was created for the parent survey: item #6 (methods), and two new aggregate variables were created for the total parent and student score.

Below is a table showing the type of data associated with each scale/question:

Table 2
Data Types and Coding

Question	Data Type	Coding
Parental Total Score	Interval	Individual items are each ordinal scales; each were coded into aggregate variables (interval data)
Student Total Score	Interval	Individual items are each ordinal scales; each were coded into aggregate variables (interval data)
Math ACT Score	Ratio	Single scale.

Internal Consistency

Internal consistency reliability statistics were run using Cronbach's alpha for each of the two predictor scales (See Table 1 in Chapter 3). This alpha was used to "provide a measure of the internal consistency of a test or scale" (Tavakol, Dennick, 2011, p.53). The "reliability estimates show the amount of measurement error in a test" (Tavakol, Dennick, 2011, p.53). The reliability for each scale was good.

Screened Data

Screened data was included in the primary scales to determine whether they violated the assumptions necessary to use parametric tests, specifically regression analyses.

The assumptions included:

(1) The outcome variables in the regressions are interval/ratio – This assumption was met.

(2) Independence of observations- it is assumed the scores of one person on the survey did not influence the score of another person – This assumption was met.

(3) Data must be nearly normally distributed (assessed univariate and multivariate normality). First, frequencies/descriptive were run for each of the three final scales to get an idea of what their distribution looked like. It was discovered the normality assumption were met as the kurtosis/skewness values were within the desired limits, which are between -/+ 1.5 for the two surveys; however, the ACT score variable was fairly kurtotic at 6.19.

Table 3
Parent/Student/ACT Survey Score

		Total Parent Survey Score	Total Student Survey Score	Math ACT Score
N	Valid	47	47	47
	Missing	0	0	0
Mean		81.68	25.04	14.72
Median		86.00	26.00	15.00
Std. Deviation		17.85	6.27	1.61
Skewness		-.551	-.239	-1.51
Kurtosis		-.262	-.717	6.18
Minimum		37.00	13.00	8.00
Maximum		115.00	37.00	18.00

To address this problem, the univariate outliners were first assessed. Z scores were created for each of the scales. If any of the scores are > +/- 3.0, then they are generally considered outliers (more than three standard deviations from the mean). No outliers were revealed for the survey variables; however, there was one outlier (z = -3.52) for the ACT score variable. This was the ACT score of eight (8).

Table 4
Parent/Student/ACT Zscore

	N	Minimum	Maximum
Zscore: Total Parent Survey Score	47	-2.50	1.86
Zscore: Total Student Survey Score	47	-1.91	1.90
Zscore: Square Transformed ACT Score	47	-3.52	2.37

Valid N (Listwise)	47

In reviewing this outlier score, it was found to not warrant exclusion (it is not in error and it is meaningful to the analysis), so it was truncated. In other words, its value was changed to the closest score that was within three (3) standard deviations of the mean. This way the more extreme scores are still represented, but the distribution is smoothed toward normality.

The ACT score variable's outlier was (z = -3.83) Subject #1396, raw score 8.00. The nearest z score was -2.23, with a raw score of 11. So the raw score for Subject #1396 was changed from 8.00 to 11.00. After truncating the outlier, the descriptives were rerun to reassess normality. With the outlier truncated, the new kurtosis value for the ACT score is 1.63, which was greatly improved and acceptable to continue with the analysis with near normally distributed data (See Output 1 – Reliability in the Appendix for the descriptive data for before and after the outlier was truncated.)

Table 5
Math ACT Score

N	Valid	47
	Missing	0
Mean		14.78
Median		15.00
Std. Deviation		1.38
Skewness		-.374
Kurtosis		1.634
Minimum		11.00
Maximum		18.00

To determine whether there were any multivariate outliers, Mahalanobis distance scores for each participant on the combination of variables in this study was done, and then compared to a critical value. In this case, with two (2) predictor variables, we used the critical value of 13.816. Any numbers equal to or over this value can be considered a multivariate outlier. Our maximum value for any case (subject identification) was 8.13. As such, there are no multivariate outliers.

Table 6
Mahalanobis Distance

Mahalanobis Distance	N	Minimum	Maximum
Mahalanobis Distance	47	.50	8.13
Valid N (Listwise)	47		

(4) The linearity of each of the variables used in the analyses was assessed via scatter plot matrices, which revealed no violations.

(5) Homoscedasticity was assessed using case diagnostics and residual scatter plots. This examination indicated normality among the errors of prediction; thus, this assumption was met.

(6) Multicollinearity was done to ensure the absence of perfect muticollinearity, which indicates the independent variables in the analysis are not inter-correlated to an extent that they would influence the model. To evaluate this assumption, Tolerance and VIF statistics was examined for each of the multivariate analyses during hypothesis testing. Acceptable values are [Tolerance > .01 and VIF < 10].

Hypothesis 1

Variables Entered/Removed[a]: One Simple Linear Regression with Parent Survey Score as the predictor of the outcome variable, Math ACT scores was run. *Model Summary*[b]: There were no significant findings. F(1,45) = 0.02, adjusted R^2 because sample was <60. About 2% of the variance in ACT scores was accounted for by the model with parent responses as the predictor. Because the significant level >/= .05, the model was not a significant predictor. The parent responses did not predict ACT scores. *ANOVA*[a]: F(1,45) = 0.02, P=.89.

Table 7

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.020[a]	.000	-.022	1.39711

a. Predictors: (Constant), Total Parent Survey Score

b. Dependent Variable: Math ACT Score.

Table 8
ANOVA[a] *Parent Score v. Math ACT Score*

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	.037	1	.037	.019	.892[b]
Residual	87.836	45	1.952		
Total	87.872	46			

a. Dependent Variable: Math ACT Score

b. Predictors: (Constant), Total Parent Survey Score

Hypothesis 2

A simple linear regression was run. *Variables Entered/Removed*[a]: Student Survey Scores as the predictor of the outcome variable, Math ACT Scores. *Model Summary*[b]: R squared accounted for about 3%. *ANOVA*[a]: $F(1,45) = 2.33$, $p = .13$. Thus the student responses did not significantly predict ACT scores.

Table 9
ANOVA[a] *Student Score v. Math ACT Score*

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	4.330	1	4.330	2.332	.134[b]
Residual	83.542	45	1.856		
Total	87.872	46			

a. Dependent Variable: Math ACT Score

b. Predictors: (Constant), Total Student Survey Score

Hypothesis 3

One Hierarchical Multiple Regression with the Student Survey Scores as the predictor in model one and the Parent Survey Scores added to the Student Survey Scores (to include both as predictors) in model two were run. The outcome variable was Mathematics ACT Scores. The combination of parent and student responses did not significantly predict ACT scores. (see Table 14). *Variables Entered/Removed*[a]: The addition of parent responses to student responses did not increase the prediction of ACT scores. *Model Summary*: Model 2 adjusted the R^2, showing that adding parent scores reduces prediction, and with both predictors, only about 1% of variance in the ACT scores is accounted for. *ANOVA*[a]: $F(2,44) = 1.18, p = .32$ for the model when both predictors were included.

Table 10
Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.222[a]	.049	.028	1.36253
2	.222[b]	.051	.008	1.37674

a. Predictors: (Constant), Total Parent Survey Score

b. Predictors: (Constant), Total Student Survey Score, Total Parent Survey Score

c. Dependent Variable: Math ACT Score.

Table 11
ANOVA[a] *Student Scores v. Parent-student Total Scores on ACT Scores*

Model	Sum of	df	Mean	F	Sig.

	Squares	df	Square	F	Sig.
1 Regression	4.330	1	4.330	2.332	.134[b]
Residual	83.542	45	1.856		
Total	87.872	46			
2 Regression	4.474	2	2.237	1.180	.317[c]
Residual	83.398	44	1.895		
Total	87.872	46			

a. Dependent Variable: Math ACT Score

b. Predictors: (Constant), Total Student Survey Score

c. Predictors: (Constant), Total Student Survey Score, Total Parent Survey Score

Post Hoc Analyses

The ACT scores were recorded into five (5) groups. ACT scores = 11-13, new score 1; ACT score = 14, new score 2; ACT score = 15, new score 3; ACT score = 16, new score 4; ACT score = 17t, new score 5. A MANOVA was run to determine whether any significant differences existed between the ACT score levels and scores on either survey. There were no significant group differences found. *Between-Subjects Factors*: Shows how many people were in each group, low to high. *Descriptive Statistics*: Surveys (Mean). *Multivariate Tests*[a]: The between group analysis revealed no significant differences.

Table 12
Between-Subjects Factors

		N
ACT Scores by category	1.00	6
	2.00	11
	3.00	18
	4.00	9
	5.00	3

Table 13
Descriptive Statistics

ACT Scores by Category		Mean	Std. Deviation	N
Total Parent Survey Score	1.00	85.0000	11.36662	6
	2.00	80.7273	21.14280	11
	3.00	81.0556	19.57030	18
	4.00	81.7778	19.09043	9
	5.00	82.0000	4.35890	3
	Total	81.6809	17.85461	47
Total Student Survey Score	1.00	30.5000	3.98748	6
	2.00	24.2727	6.01815	11
	3.00	23.8889	6.19192	18
	4.00	25.3333	7.68115	9
	5.00	23.0000	3.46410	3
	Total	25.0426	6.27610	47

Table 14
Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.970	669.349[b]	2.00	41.000	.000
	Wilks' Lambda	.040	669.349[b]	2.00	41.000	.000
	Hotelling's Trace	32.651	669.349[b]	2.00	41.000	.000
	Roy's Largest Root	32.651	669.349[b]	2.00	41.000	.000
ACT Cat.	Pillai's Trace	.134	.754	8.000	84.000	.644
	Wilks' Lambda	.866	.763[b]	8.000	82.000	.635
	Hotelling's Trace	.155	.773	8.000	80.000	.628
	Roy's Largest Root	.154	1.616[c]	4.000	42.000	.188

Frequencies

To determine survey scores based on a specific ACT score in an effort to see if there was a trend in any direction or generally what the relationship looked like, descriptive statistics for the surveys by every ACT score was run. These tables illustrate specifically how the survey responses change in relation to the ACT scores. (Table 16 shows no trend upwards or downwards of ACT scores when viewed in relation to the mean responses on the parent survey.

Likewise, Table 17 shows no trend upwards or downwards of ACT scores in relation to the students' responses on the student survey.)

Table 15
Math ACT Score Parent Responses

ACT Score	Mean	Std. Deviation	Minimum	Maximum
11	81.50	13.43	72.00	91.00
13	86.75	11.95	75.00	101.00
14	80.72	21.14	53.00	115.00
15	81.05	19.57	37.00	107.00
16	81.77	19.09	44.00	107.00
17*	80.00		80.00	80.00
18	83.00	5.65	70.00	87.00

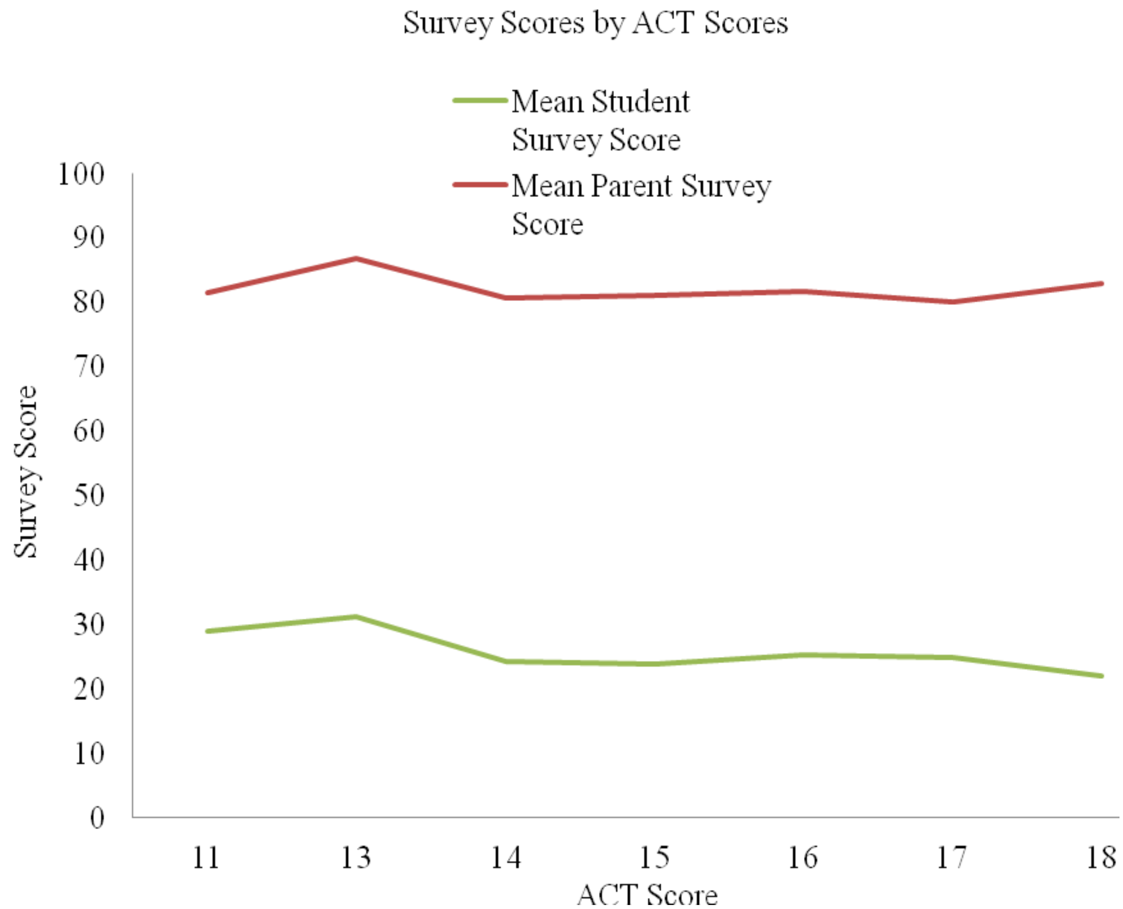
*No standard deviation due to only one score.

Table 16
Math ACT Score Student Responses

ACT Score	Mean	Std. Deviation	Minimum	Maximum
11	29.00	.00	29.00	29.00
13	31.25	4.92	25.00	37.00
14	24.27	6.01	15.00	33.00
15	23.88	6.19	13.00	33.00
16	25.33	7.68	13.00	37.00
17*	25.00		25.00	25.00
18	22.00	4.24	19.00	15.00

*No standard deviation due to only one score.

The following graph illustrates the relationship between each ACT score and mean survey responses. Note the consistency of the survey scores.



Conclusion

Internal consistency reliability based on Cronbach's alpha for each of the two predictor scales proved to be good. Normality assumptions for the two surveys were within the desired limits. The ACT score variable was problematic as it was fairly kurtotic at 6.19. To address this problem, Z scores for each of the scales was created. There was one outlier (z = -3.52) for the ACT score (8). In reviewing this score, it was discovered it did not warrant exclusion, as it was not an error, and it was meaningful to the analysis. The outlier score was truncated to change its value to the closest score that was within 3 standard deviations of the mean. The score still represented a more extreme score, but did not distort the normality of the distribution.

Hypothesis 1 and 2 were tested using Simple Linear Regression. Both the parent and student responses did not significantly predict ACT scores. Hypothesis 3 was tested using Hierarchical Multiple Regression with the student survey scores as the predictor in model 1, and the parent survey scores added to the student survey scores as predictors in model 2. The outcome variable was Math ACT scores. The combination of parent and student responses did not significantly predict ACT scores. Thus, none of the three hypotheses were supported. Albeit the hypotheses were not supported, interesting findings did occur when looking at the individual survey responses. For example, on the student survey for Question #2 (see Appendix D), over half of the students replied "Never" receiving assignments requiring their parents to be involved. The girls also reported their teachers expected them to work hard and succeed in mathematics (Question #5), and their teachers made them feel confident in their mathematics ability (Question #4). Yet, the girls reported they did not look up to their mathematics teachers as someone they admired (Question #8). The parent survey (Appendix C) also had interesting findings. Over half of the parents stated they told their daughters they were good in mathematics (Question #3). When looking at the individual surveys, the students of these parents received some of the lowest ACT scores of the participants. Another finding was over half of the parents responded with a "Neutral" or "Disagree" when asked if they could solve Algebra, Geometry, Trigonometry, and Calculus problems (Question #11), and if they enjoyed solving these types of mathematics problems (Question #12).

Chapter 5 will now present an interpretation of these findings and consider reasons for why there was no support for the hypotheses. Also, the discussion will address possible avenues for future research.

Chapter 5: Discussion

The purpose of this research was to investigate possible causes as to why African American girls are underrepresented in the fields of science, engineering, architecture and other professions requiring strong mathematical skills (Kurtz et al, 2008). In an effort to discover the reason for this problem, surveys were given to parents of African American girls who had taken the ACT, and to African American girls who had taken the ACT.

Discussion of Hypothesis 1

The first hypothesis stated the scores on the parent survey would significantly predict the students' scores on the mathematics portion of the ACT. The study used a non-experimental static group consisting of various continuous variable analyses. The self-reporting survey was given to parents with the attributes of focus, brevity, and clarity (Alreck & Settle, 1995). The parent survey focused on how the parent described their involvement in their daughter's mathematical learning at home. The scores on the parent survey proved to be null, as they did not significantly predict the girl's scores on the mathematics portion of the ACT. This study did not support the findings of Hrabowski (2002/2003) since it did not find positive effects from parental influence on the student's educational attainment as measured on the ACT. When looking at the individual parent surveys, it was evident the parent's attitude towards mathematics may have influenced their daughters mathematic achievement. Over half of the parents responded with a "Neutral" or "Disagree" when asked if they could solve Algebra, Geometry, Trigonometry, and Calculus problems (see Appendix C: Question #11), and if they enjoyed solving these types of mathematics problems (Question #12). The parent's lack of skills and mathematical knowledge may have contributed to their daughter's low ACT scores as discussed in Flore's (1999) study of parental mathematics anxiety. Most of the parents stated they

“Strongly Agreed” or “Agreed” to encouraging their daughter to excel in mathematics (Question #1). This corresponds to Huang & Mason (2008) research stating parents generally want the best for their daughters.

This study did not show a correlation between strong parental influence and girl’s mathematical success as measured by the ACT (see Appendix C: Question #3). Perhaps a deeper look into the girls’ report card grades, mathematics curriculum assessments, and other standardized mathematics assessments in conjunction with the ACT scores may have shown statically significant findings. Despite the findings in this study, it is important to continue looking at the ways that inner city African American parents influence their daughter’s mathematic abilities.

Discussion of Hypothesis 2

This hypothesis stated the scores on the student survey would significantly predict the students’ scores on the mathematics portion of the ACT. As with the parent survey, the student survey also used a non-experimental static group consisting of various continuous variable analyses. The self-reporting survey was given to the girls with the attributes of focus, brevity, and clarity (Alreck & Settle, 1995). The student survey focused on how each student viewed her mathematical classroom experiences and her teacher’s influence on her mathematical thinking. The scores on the student survey proved to be null, as they did not significantly predict the girl’s scores on the mathematics portion of the ACT. As with Hypothesis 1, these findings provide important implications worth considering when taking a closer look at the girls’ survey responses. Most of the girls’ ACT scores were below what is normally accepted to enroll into college. Yet more than half of the girls stated they felt their teachers had prepared them well to take college classes requiring mathematics (see Appendix D: Question #6). We must beg the question, why would the girls feel this way when they scored so low on the ACT. Pennington (2000) stated African American students possess high self-esteem, but have low academic self-confidence. The students in this study stated the opposite when asked about their mathematic abilities. They stated their mathematics teachers made them feel confident in what they could do mathematically (Question #4). These findings are important, but how does this translate into improving these student's mathematics abilities as measured by the ACT? A closer look at the curriculum and the teacher's understanding of mathematics and student data analysis for improving student achievement may reveal more significant findings.

Another interesting finding was the absence of mathematics assignments involving parents. Schools often stress the need for parents to be involved in reading literacy, but seem to not stress the same involvement when it comes to mathematics literacy. Many of the student surveys stated their mathematics classes include real-life situations. This was significant because once the student understands the relevance of using mathematics in a real world context, the lesson becomes more meaningful (Tate, 1995). This approach would fit nicely into assignments involving parents. What was surprising was the girl's negative response to whether or not they admired their mathematics teacher (Question 8). This was startling since the same girls stated their mathematics teacher made them feel confident, expected them to work hard and succeed, and had prepared them well for college mathematics classes (Questions #'s 4-6). This finding could be the result of a cultural breakdown between the student and teacher. Successful relationships between teachers and students can help students academically (Matthews, 2003, p. 73). A more thorough investigation into this area may unlock the discrepancy.

Discussion of Hypothesis 3

A hierarchical regression to analyze both predictor variables and the outcome variable was run for this hypothesis. The variable of classroom experience (the score on the student survey) was entered into the regression as the first predictor, and the variable of parental input (the score on the parental survey) was entered into the regression as the second predictor. Variability in the outcome variable (ACT score) accounted for by the scores of each predictor was compared to determine whether the scores of the predictor of classroom experience increment over the scores on the parental involvement survey in predicting the scores on the ACT. The results were the classroom learning experiences on the student surveys of the girls who had taken the mathematics portion of the ACT did not significantly increment over the parent's mathematical input at home as measured by the parent survey, thereby not significantly adding to the predication of the girls' scores on the mathematics portion of the ACT. Again, by looking at the student and parent survey responses on an individual basis, we see critical findings between the students' classroom learning and parental mathematical input. For example, about half of the girls reported looking forward to going to their mathematics classes (see Appendix D: Question #8), while the majority of the parents stated in Question #1 (see Appendix C) they encouraged their daughters to excel in mathematics.

Limitations of Study

One of the limitations of this study was the small number of participants. It was estimated a larger number of girls had taken the mathematics portion of the ACT. A total of 107 student surveys were completed, yet only 47 parent surveys were completed and returned. A larger number of parent surveys may have yielded significant findings. Including other factors such as report card grades, curriculum assessments, and benchmark scores might also have garnered more findings.

Educational Implications

Educators are always seeking better ways to educate students. Albeit the results of the study showed no significant implications between parents' perception of their own role in supporting their daughter's mathematical thinking by implementing mathematical learning in the home setting, and the students' own perceptions of their experiences in their mathematical classes and how these experiences influence the mathematical portion of the ACT, important individual findings occurred related to parental thinking regarding the mathematical influence they had on the their daughters mathematical learning. Several parents did not want to complete the survey because they felt they did not contribute to their daughter's mathematics learning in the home environment or at school. Once the parents read, and in some cases, the survey was read to them by the researcher, they understood how cooking, traveling, shopping, and even the weather contributed to how they taught mathematics in the home environment. Thus the parents realized the importance of these lessons and how they laid the foundation for their daughters to further understand mathematical concepts in school. It may be helpful for the school to use a parent survey similar to the one used in this study to understand how parents have exposed their daughters to mathematic experiences, and suggest additional ways for parents to enhance their daughter's mathematical experience in the home.

High stakes testing such as the ACT is a part of the educational process. It is not going away. New standards such as the Common Core State Standards (CCSS) are quickly becoming a reality. Parents need to understand these standards and how they are affecting their children. This study and others such as this highlight the need for parents and schools to work more closely together to assure the success of students in mathematics and across the curriculum.

Direction for Future Research

Since this study's findings did not reveal any significant implications between parents' perception of their own role in supporting their daughter's mathematical thinking by implementing mathematical learning in the home setting, and the students' own perceptions of their experiences in their mathematical classes and how these experiences influence the mathematical portion of the ACT, more in-depth research should be conducted. (1) A comparison of the mother's mathematics grades in school to their daughter's mathematics grades in school to see if there is a trend or not of the same grades between the mother and daughter. (2) Research of the before and after results of girls who have participated in after school mathematic programs, and how such participation has impacted their ACT scores. (3) A comparison of parents who have and have not participated in strategies endorsed and taught by the school to be used in the home setting to enhance their daughter's mathematical knowledge, and if these strategies improved the girl's mathematics grades.

African American girls are not the only group under represented in professions requiring mathematics. Future research focusing on African American boys, Hispanic girls and boys, and White girls and boys from lower economic levels should be conducted to stop this trend.

Conclusion

My own experience perhaps was unique in that I remember the tremendous impact my father had on my mathematical learning as a young child. The struggles I had in mathematics as a child after his death left an indelible mark on how I learned and responded to mathematics. I learned from my father how mathematics could be fun, and I also learned from various teachers the anxiety mathematics can cause. As an educator, I know the importance of supportive parental involvement in laying a solid foundation in mathematics for students, as well as good mathematical pedagogy. This study was designed to show how parental influence and classroom experiences impacts inner city African American girls' ACT scores. An example can be seen on the parent survey. The parents viewed themselves as supportive (Appendix C; Question #3), and responded on the survey that they told their daughters they were good in mathematics (Question #1). This proved to be interesting since many of their daughters scored low on the ACT. It was hoped this study would show findings between such responses. This study supports other studies stating African American girls have high self esteem, but it does not support the finding that the girls' self esteem does not carry over to academic areas (Pennington (2000). The girls in this study stated they felt academically ready to take college mathematics courses even though their ACT mathematic scores were below average for the majority of the participants. Such responses open the door to more investigation in this area. In closing, the three hypotheses proved to be null, but important findings were revealed when looking at the individual parent and student survey responses.

APPENDIX A: RESEARCH INFORMATION SHEET

[Behavioral]Documentation of Adolescent Assent Form
(ages 13-17)

Title: Inner City African American Girls' Learning Mathematics:
Parental influence and classroom experiences as they impact mathematics scores on the ACT

Study Investigator: Sharon A. Simeon

Why am I here?
This is a research study. Only people who choose to take part are included in research studies. You are being asked to take part in this study because you are an 11^{th} or 12^{th} grade African American girl who has taken the ACT. Please take time to make your decision. Talk to your family about it and be sure to ask questions about anything you don't understand.

Why are they doing this study?
This study is being done to find out how parental influence and classroom mathematics experiences impacts the learning of mathematics with African American girls, and how these experiences impacts mathematics ACT scores.

What will happen to me?
Nothing will happen to you. You and your parents will be asked to take a survey.

How long will I be in the study?
You will be in the study for approximately 15-30 minutes.

Will the study help me?
You will not benefit from being in this study; however, information from this study may help other people in the future by seeing how parental influence and classroom mathematics experiences impacts the learning of mathematics with African American girls, and how these experiences impacts mathematics ACT scores.

Submission/Revision Date: May 2, 2012 Participants Initials _______
Protocol Version #:

Will anything bad happen to me?
Nothing bad will happen to you.

Will I get paid to be in the study?
For taking part in this study, your name will be put into a drawing for a $50.00 gift certificate from Genesee Valley Mall in Flint, Michigan once you have returned your survey and your parent's survey. You may also be given community service hours for your participation in the study.

What about confidentiality?
Every reasonable effort will be made to keep your records and information confidential.

What if I have any questions?
For questions about the study please call Mrs. Simeon at (810) 287-8003. If you have questions or concerns about your rights as a research participant, the Chair of the Institutional Review Board can be contacted at (313) 577-1628.

Do I have to be in the study?
You don't have to be in this study if you don't want to or you can stop being in the study at any time. Please discuss your decision with your parents and researcher. No one will be angry if you decide to stop being in the study.

AGREEMENT TO BE IN THE STUDY

____ ____________________
Signature of Participant (13 yrs & older) Date

____
Printed name of Participant (13 yrs & older)

____ ____________________
Signature of Parent Date

____
Printed name of Parent

____ ____________________
Signature of Person who explained this form Date

____
Printed Name of Person who explained form

APPENDIX B: RESEARCH INFORMATION SHEET

Title of Study: Inner City African American Girl's Learning Mathematics:
Parental influence and classroom experiences as they impact mathematics scores on the ACT

Principal Investigator (PI): Sharon A. Simeon
College of Education – Wayne State University
(810) 287-8003

Purpose:
You are being asked to be in a research study of how parental influence and classroom mathematics experiences impacts the learning of mathematics with African American girls, and how these experiences impacts mathematics ACT scores. This study is being conducted at Wayne State University, Northwestern High School and Northern High School.

Study Procedures:
If you take part in the study, you and your parents will be asked to fill out a survey. The student survey asks questions about your experiences in mathematics class. The parent survey asks questions about how they influenced your mathematics learning at home. The survey will take approximately 15-30 minutes to complete.

Benefits:
As a participant in this research study, there will be no direct benefit for you; however, information from this study may benefit other people now or in the future.

Risks:
There are no known risks at this time to participation in this study.

Costs:
There will be no costs to you for participation in this research study.

Submission/Revision Date: May 2, 2012 Participants Initials _______
Protocol Version #:

Compensation:

For taking part in this study, your name will be put into a drawing for a $50.00 gift certificate from Genesee Valley Mall in Flint, Michigan once you have returned your survey and your parent's survey. You may also be given community service hours for your participation in the study.

Confidentiality:
You will be identified in the research records by a code name or number.

Voluntary Participation/Withdrawal:
Taking part in this study is voluntary. You are free to not answer any questions or withdraw at any time. Your decision will not change any present or future relationships with Wayne State University or its affiliates.

Questions:
If you have any questions about this study now or in the future, you may contact Mrs. Simeon at the following phone number, (810) 287-8003. If you have questions or concerns about your rights as a research participant, the Chair of the Human Investigation Committee can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call (313) 577-1628 to ask questions or voice concerns or complaints.

Participation:
By completing the surveys, you and your parents are agreeing to participate in this study.

APPENDIX C: PARENT SURVEY: MATH AT HOME

Please respond by marking the column that best describes your recollection.

Strongly Agree 5	Agree 4	Neutral 3	Disagree 2	Strongly Disagree 1

	5	4	3	2	1
1. I encourage(d) my daughter to excel in mathematics.					
2. As my daughter grew up, I made learning mathematic concepts fun for her by playing cards and board games.					
3. I told my daughter I was good in mathematics.					
4. I gave my daughter mathematics problems to work on in addition to homework assignments.					
5. I regularly spoke with my daughter's teachers regarding her mathematics progress.					
6. I showed my daughter how mathematics is used in: • Cooking					
• Sports					
• Home Repair					
• Traveling					
• Gardening					
• Sewing					
• Making Purchases					
• Bill Payments					
• Weather					
• Other: (please explain)					
7. I can solve basic addition, subtraction and division problems.					
8. I always helped my daughter with her mathematics homework.					

9. I enjoy solving basic addition, subtraction and division problems.					
10. I have taken Algebra, Geometry, Trigonometry, and Calculus.					
11. I **can** solve Algebra, Geometry, Trigonometry, and Calculus problems.					
12. I **enjoy** solving Algebra, Geometry, Trigonometry, and Calculus problems					
13. I expect my daughter to take Algebra, Geometry, Trigonometry, and Calculus.					
14. I taught my daughter to see how mathematical concepts can be found in every area of life					
15. I have discussed the importance of doing well in mathematics to secure a six-figure or more income with my daughter.					

APPENDIX D: STUDENT SURVEY REGARDING MATH CLASS EXPEREINCES

Please respond to each of the following items, marking the option that best describes your view.

Very Often **5**	Often **4**	Sometimes **3**	Not Very Often **2**	Never **1**

	5	4	3	2	1
1. In my math classes, my teacher has us do practical projects where we use math in some **real-life** situations (for example, measuring to carpet or paint a room, building a project like a dog house, figuring out mileage for a trip, planning out spending when going shopping, figuring out how much money we need to make to pay our bills, etc.)					
2 In my math classes, we receive assignments that require my parent or other adult to be involved. (for example, a math family night, a project to do with an adult, etc.)					
3. In my math classes, we do many **hands-on activities** to help us understand and visualize the math concepts.					
4. In my math classes, my teachers make me feel **confident** in what I can do in math.					
5. My math teachers **expect** me to work hard and succeed.					
6. I feel that my teachers have prepared me well to take college classes that require math.					
7. I look up to my math teachers as someone I admire.					
8. Throughout high school, I have looked forward to going to my math classes.					

APPENDIX E: PARENT SURVEY INTERNAL CONSISTNECY RELIABILITY OF SCALE ITEMS (n=24)

Scale Number	Scale Type	Number of Items	Scale Label	Cronbach's Alpha
				.96

STUDENT SURVEY INTERNAL CONSISTENCY RELIABILITY OF SCALE ITEMS (n=8)

Scale Number	Scale Type	Number of Items	Scale Label	Cronbach's Alpha
				.79

APPENDIX F: KENDALL'S TAU[b]

			Math ACT Score
Kendall's tau[b]	Parent Survey Item 1	Correlation Coefficient	.209
		Sig. (2-tailed)	.116
		N	46
	Parent Survey Item 2	Correlation Coefficient	.022
		Sig. (2-tailed)	.863
		N	47
	Parent Survey Item 3	Correlation Coefficient	-.215
		Sig. (2-tailed)	.078
		N	46
	Parent Survey Item 4	Correlation Coefficient	.061
		Sig. (2-tailed)	.619
		N	47
	Parent Survey Item 5	Correlation Coefficient	-.041
		Sig. (2-tailed)	.735
		N	47
	Parent Survey Item 6a Cooking	Correlation Coefficient	.027
		Sig. (2-tailed)	.831
		N	46
	Parent Survey Item 6b Sports	Correlation Coefficient	-.017
		Sig. (2-tailed)	.890
		N	42
	Parent Survey Item 6c Home Repair	Correlation Coefficient	-.027
		Sig. (2-tailed)	.830
		N	41
	Parent Survey Item 6d Traveling	Correlation Coefficient	-.058
		Sig. (2-tailed)	.649
		N	41
	Parent Survey Item 6e Gardening	Correlation Coefficient	-.138
		Sig. (2-tailed)	.274
		N	42
	Parent Survey Item 6f Sewing	Correlation Coefficient	-.047
		Sig. (2-tailed)	.712

	N	42
Parent Survey Item 6g Making Purchases	Correlation Coefficient Sig. (2-tailed) N	-.029 .834 42
Parent Survey Item 6h Bill Payments	Correlation Coefficient Sig. (2-tailed) N	-.122 .356 45
Parent Survey Item 6i Weather	Correlation Coefficient Sig. (2-tailed) N	-.026 .839 41
Parent Survey Item 6j Other	Correlation Coefficient Sig. (2-tailed) N	-.401 .210 9
Parent Survey Item 7	Correlation Coefficient Sig. (2-tailed) N	.185 .157 46
Parent Survey Item 8	Correlation Coefficient Sig. (2-tailed) N	.074 .549 46
Parent Survey Item 9	Correlation Coefficient Sig. (2-tailed) N	-.012 .926 45
Parent Survey Item 10	Correlation Coefficient Sig. (2-tailed) N	-.058 .632 46
Parent Survey Item 11	Correlation Coefficient Sig. (2-tailed) N	-.143 .239 46
Parent Survey Item 12	Correlation Coefficient Sig. (2-tailed) N	-.264 .035 44
Parent Survey Item 13	Correlation Coefficient Sig. (2-tailed) N	.159 .222 46

Parent Survey Item 14	Correlation Coefficient	-.092
	Sig. (2-tailed)	.460
	N	46
Parent Survey Item 15	Correlation Coefficient	-.196
	Sig. (2-tailed)	.131
	N	45
Student Survey Item 1	Correlation Coefficient	-.271
	Sig. (2-tailed)	.024
	N	47
Student Survey Item 2	Correlation Coefficient	-.226
	Sig. (2-tailed)	.076
	N	47
Student Survey Item 3	Correlation Coefficient	-.046
	Sig. (2-tailed)	.711
	N	45
Student Survey Item 4	Correlation Coefficient	-.063
	Sig. (2-tailed)	.606
	N	47
Student Survey Item 5	Correlation Coefficient	-.038
	Sig. (2-tailed)	.764
	N	47
Student Survey Item 6	Correlation Coefficient	-.060
	Sig. (2-tailed)	.626
	N	47
Student Survey Item 7	Correlation Coefficient	-.118
	Sig. (2-tailed)	.326
	N	47

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ABSTRACT

INNER CITY AFRICAN AMERICAN GIRLS' LEARNING MATHEMATICS: PARENTAL INFLUENCE AND CLASSROOM EXPERIENCE AS THEY IMPACT MATHEMATICS SCORES ON THE ACT

by

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The objective of this study was to discover how parents (N=47), through their input at home, influence the mathematical performance of their daughters; how female African American students view their teachers' influence in their mathematical thinking; how critical is the mathematical classroom experience for African American girls; and can positive classroom experiences (teacher implementation of best practices) significantly add to the effect of the parental mathematical input at home. And lastly, how much can the two factors together predict higher mathematics scores on the ACT. Research instruments consisted of parent and student surveys. The participants were African American girls who had taken the ACT ranging in ages from 17-19 years old from two urban high schools located in the Midwestern portion of the United States, and their parents. There were no significant findings in the study.

AUTOBIOGRAPHICAL STATEMENT

Sharon A. Simeon graduated from Mott Community College in Flint, Michigan, with High Honors in 1994, earning an Associate Degree in general studies. Sharon then transferred to the University of Michigan-Flint, graduating with High Honors in 1999, with a Bachelor of Science degree by continuing to take night classes after work. In August of 1999, Sharon gained employment with the Flint Community Schools (FCS). She continued her education at Marygrove College where she earned a Master in the Art of Teaching in 2002. During this time, Sharon worked as a fifth and first grade teacher, and as the dance and drama teacher at Williams-Edison Community School. Sharon continued her educational pursuits by applying and being accepted into the doctoral program at Wayne State University, seeking a doctorate in Curriculum and Instruction. After completing the course work for her doctoral studies, and passing her written and oral exams in 2002, Sharon enrolled at Saginaw Valley State University (SVSU) to become a special education teacher to students with learning disabilities and emotional impairments. She graduated from SVSU with her second masters in the Art of Teaching in 2007, with a concentration in special education. Sharon was a special education teacher for four years before becoming a teacher consultant. She is certified to teach Elementary K-5, all subjects (K-8 in a self-contained classroom), Emotional Impairment K-12, Fine Arts, Language Arts, and Learning Disabilities K-12. Sharon retired from the Flint Community School the Fall of 2012.