

INSTITUTIONAL FACTORS THAT AFFECT THE
MATHEMATICAL ACHIEVEMENT OF
AFRICAN AMERICAN FEMALES

by

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A DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Education
in the Department of Educational Leadership,
Policy, and Technology Studies
in the Graduate School of
The University of Alabama

TUSCALOOSA, ALABAMA

2011

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ABSTRACT

This dissertation explored how institutional factors impact the mathematical achievement of African American middle school females. The purpose of the research was to provide insight into African American females' perception of their mathematics experiences and demonstrate how both internal and external factors contribute to their achievement. Data collection occurred at a middle school in Southeastern Alabama and included classroom observations, individual interviews, participant journals, and analysis of state standardized assessments, report card grades, discipline information, and system-wide mathematics benchmarks. The achievement gap and resiliency research served as the framework for analyzing the effect of motivational factors on the achievement of African American females in mathematics. The findings in this study established that internal resiliency factors, such as persistence and confidence in self, are essential to continuous improvement in mathematics. Further the data demonstrated that school related factors such as the teacher, peer interaction, and engaging strategies assist in shaping students' attitude towards mathematics. The implications for this research are for educators to reassess hidden biases and begin to view African American females as a rising new minority model for resiliency and mathematical excellence.

ACKNOWLEDGMENTS

I would like to take this opportunity to thank all my committee members, Nirmala Erevelles, Doug McKnight, Stephen Tomlinson, and Jeremy Zelkowski for their vital input, thought provoking questions, and support of both the dissertation and my academic journey.

I would like to especially convey my deepest gratitude to my advisor and chairperson, Natalie Adams, for her insight, patience, and critical input on various aspects of this dissertation. Her knowledge and enthusiasm for research in the area of females inspired my quest for this dissertation study. I sincerely appreciate her support and the time invested in this endeavor as demonstrated by the numerous conversations through e-mails and meetings. She continuously encouraged me to persevere and press forward. I am honored to have experienced this journey with such a dedicated and knowledgeable educator, researchers, and writer.

I would like to thank the district superintendent who allowed me to utilize the district for the study. Thanks to the administration and staff at the targeted middle school who were extremely welcoming and provided me with invaluable information for this study. I would especially like to thank the nine female participants who made this case study an enjoyable task. They have earned a special place in my heart and I will continue to monitor their academic achievements.

This research would not have been possible without the support of my family. I would like to thank my husband, James, for supporting and encouraging me throughout this process. I would like to thank my daughters, Brittany and Trinity, for their patience and understanding during those times that I continuously worked on this project. I would also like to thank my

sister, Carolyn, for providing a listening ear and shoulder to cry on when the road got rough. I want to thank my dad for always encouraging me to reach for the stars and to never let anything stop me from reaching my goals. Lastly, I would like to dedicate this work to my mom, Marie, who left a legacy for me to follow though her patience and resilient spirit. Mom, you demonstrated for me that my path is determined by the choices and goals that are set not by the obstacles that are placed on the course.

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CHAPTER I

INTRODUCTION TO THE PROBLEM

The issue of equity in academic achievement is emphasized in most debates on education. There are numerous groups, reforms, and educational agendas that are devoted to the issue of equity. The National Council of Teachers of Mathematics (NCTM) principle of equity is devoted to the belief that all students, regardless of their home environments, physical challenges, or other significant personal characteristics, are entitled to opportunities and assistance to learn mathematics. This belief in equity is augmented in the argument that equity does not mean treated the same but refers to the necessary access to a lucid and demanding mathematics curriculum presented to students by knowledgeable and professionally trained mathematics teachers (<http://standards.nctm.org>).

No Child Left Behind was passed with the intent to focus on equity and holding schools accountable for educating all students. The legal aspect of this mandate holds public schools accountable for the equitable achievement outcomes in subgroup comparisons such as minority versus non-minority, socioeconomically advantaged versus disadvantaged students, and nondisabled versus disabled peers (P.L. 107-110, 115 Stat. 1425, 2002). Additionally, this federal mandate incorporates annual testing in Grades 3-8 and holds schools accountable through the enforcing of adequate yearly progress to be shown by all schools receiving federal monies (Thermstrom & Thermstrom, 2003). The aim of the landmark 2002 education legislation was to close the achievement gap through accountability and an increased analysis of standardized

testing (Wagner, 2008). The *No Child Left Behind Act* has pushed schools to teach to mandated tests and scrutinize the aggregate scores as well as the data from various subgroups.

The laudable rationale of “leaving no child behind” is not without criticism. Despite the commendations from advocates, critics argue that there are many flaws in this mandate. Wagner (2008) and Sacks (2007) cite flaws such as an over-emphasis on testing, ignoring the impact of social class on student performance, and moving schools away from preparing students for successful integration into college and the job market. The criticisms of this mandate also target its effects on schools and teacher instruction. Wagner (2008) spotlights several criticisms of *No Child Left Behind* citing the unrealistic goal of 100% proficiency in reading and mathematics for all students by 2014 as a major blemish in this mandate presenting the argument that poor funding hinders this goal. A second criticism of the mandate is the inconsistency in standards used among states in rating students as proficient and determining schools’ adequate yearly progress (AYP) status. Linn, Baker, and Betebenner (2002) provide an example from three states demonstrating the variation of standards used to define proficiency. The 2001 assessment results for eighth grade mathematics for the states of Mississippi, Louisiana, and Texas revealed a large discrepancy of students identified as proficient. Students in Mississippi scored 39%; Louisiana students scored 7% and 92% of the students in Texas attained proficiency. This inconsistency is further augmented when comparing the number of students rated as proficient by state measures in comparison to the National Assessment of Educational Progress (NAEP). The 2009 NAEP data for eighth graders in Alabama revealed that only 4% of students were rated as advanced and 17% were rated as proficient in the area of mathematics. On the other hand, the Alabama Assessment of Reading and Math (ARMT) disclosed that 26% of eighth grade students rated a level four, which indicated that they exceeded the standards and 47% of these students scored a

level three, which reflects that they meet the standards in the area of math. This comparison revealed a 52% difference in eighth grade students rated as proficient or advanced when comparing these two assessments. The percentage of Alabama eighth graders reflecting basic or below basic skills in mathematics on the NAEP assessment was an astonishing 80% while the ARMT test results indicated that 26% of eighth graders partially meet the standard and there were not any students that did not meet the standard (www.nces.ed.gov/nationsreportcard).

A third flaw cited is the weak definition for “highly qualified” teachers (Wagner, 2008). The Congressional Digest (2008) communicated the definition for “highly qualified” teachers encompassed elements for veteran and novice teachers. All public school teachers, however, must hold at least a bachelor’s degree, acquire a full State certification or pass the State teacher licensing examination and hold a license or certificate that has not been restricted according to the highly qualified definition. However, this definition does make an exception for teachers in public charter schools.

Critics of No Child Left Behind are calling for a different kind of education for the future; one that reflects our changing global society and includes survival skills for the future such as critical thinking, problem solving, collaboration, entrepreneurialism, adaptability, and innovation through the use of technology. These critics credit the current testing system with influencing schools to teach only standardized test objectives rather than ensuring that students are equipped with the survival skills necessary to navigate successfully in our 21st century global world (Wagner, 2008). A survey conducted in 2001 by the Business Roundtable reflected that 80% of Americans were in opposition to utilizing standardized assessments as the sole criteria for high school graduation (Thernstrom & Thernstrom, 2003). Sacks (2007) found several critics of high stakes testing who viewed this venue not as a solution for the achievement gap but a

contributor to it. These critics of the standardized test emphasis created by No Child Left Behind see schools moving away from enriching activities such as field trips, real-world applications, and hands-on activities towards more classes designed to boost test results.

In spite of the accolades and criticisms of the current accountability system, the quest of ensuring that all students receive an adequate and equitable education remains to be the challenge for most schools. Critics of No Child Left Behind saw the pressure of high stakes testing as a catastrophic cycle which produced failure, remediation, and more pressure. The challenge to miss the “school improvement” label has led to some schools looking for solutions in intervention programs, alternative school settings and programs (Thernstrom & Thernstrom, 2003; Sacks, 2007).

The inclusion of females in the educational agenda has been a goal since the early 1970s. The 1972 enactment of Title IX of the Education Amendments signified acknowledgement by Congress that girls and boys should have equal educational opportunities in school. Furthermore, this amendment required the ending of blatant displays of gender bias in schools (Corbett, Hill, & St. Rose, 2008). In the 1970s, second wave feminists focused on inclusion and equitable treatment of females (particularly White, middle class) in education. In the late 1980s and early 1990s, girls were once again the subject of attention with books like *Reviving Ophelia*, *Failing At Fairness: How Schools Cheat Girls* and the AAUW report *How Schools Shortchange Girls*. However, in more recent years, reports by the Schott Foundation, American Council on Education, and the Education Trust spotlighting the discipline records, special education data, and lack of participation in advanced placement or college prep courses shifted attention to African American males (Varlos, 2005). Books such as *The War Against Boys: How Misguided Feminism Is Harming Our Young Men* and major news headlines like the 2006 New York Times

Article, “At Colleges, Women Are Leaving Men in the Dust” allude to an educational crisis for boys (Corbett, Hill, Rose, 2008). Unfortunately, the earlier emphasis on girls as a universal group and the more recent focus on African American males have had an unintentional consequence-that is, African American girls still continue to be an overlooked group in discussions about academic achievement.

Statement of the Problem

The problems that exist for African American females in the public school system are similar to the problems facing males. A report from the Schott Foundation for Public Education (2005) demonstrates that African American females are experiencing many of the same difficulties in the public school system as African American males. This report revealed that African American females in Atlanta comprise 37% of total school expulsions in comparison to White males and females who account for less than 1% each. This same study reports that 31% of the African American female population has been identified as having a specific learning disability in comparison to 2% of White males and females. This report demonstrates the need for a closer examination of the education system for African American females. The National Educational Longitudinal Study (NELS) in an unpublished document revealed that 29% of African American females from low socioeconomic backgrounds have repeated one grade in comparison to 24% of White females from similar backgrounds (<http://nces.ed.gov>).

The gap in mathematics achievement for males and females widens as these students transition through the education system. Studies reveal a variation in the achievement of females and males in mathematics during the early years. A study conducted by Willingham and Cole (1997) revealed that females show a slightly greater performance on tests that measure

mathematical computation; while males demonstrate an advantage on tests measuring mathematics concepts. Research has shown that girls begin their educational journey in elementary and middle school scoring higher on mathematics assessments than their male counterparts however, by high school this trend is reversed (Hyde, Fennema, & Lamon, 1990). When it comes to African American girls, the story is even bleaker. Results from the 2008 National Assessment of Education Progress (NAEP) long-term trend in mathematics revealed that eighth grade African American females nationally scored 17 points lower than White females, 22 points lower than White males, 42 points lower than Asian females, 41 points lower than Asian males, 2 points lower than Hispanic females, and 9 points lower than Hispanic males. This data furthermore substantiates a 1 point difference in scores of African American females and males with the males achieving higher. The achievement of African American females, in Alabama, on the 2009 NAEP math assessment discloses a 33 point difference between the scaled scores of African American females and White females and a 31 point difference between these students and White males (<http://nces.ed.gov>).

The problems that plague African American students both male and females, in mathematics, continue through their post-secondary education. The SAT and ACT exams, which are prerequisites for most colleges and universities, reveal a gap in mathematics performance for African American males and females in comparison to other racial groups. A study of the SAT results for Blacks, Whites, and Hispanics attending Berkley High School illustrated that the percentage of Whites and Hispanics scoring 1000 or greater was more than double the percentage of Blacks in 2001-2002. During 2001-2002, 0% of Blacks scored 1000 or greater on the SATs, while 14.9% of Whites and 3% of Hispanics scored 1000 or greater. However, by

2005, 10% of Blacks had scored 1000 or greater while the percentage of Whites had risen to 20% and Hispanics achieved at 8% (Sacks, 2007) (see Figure 1).

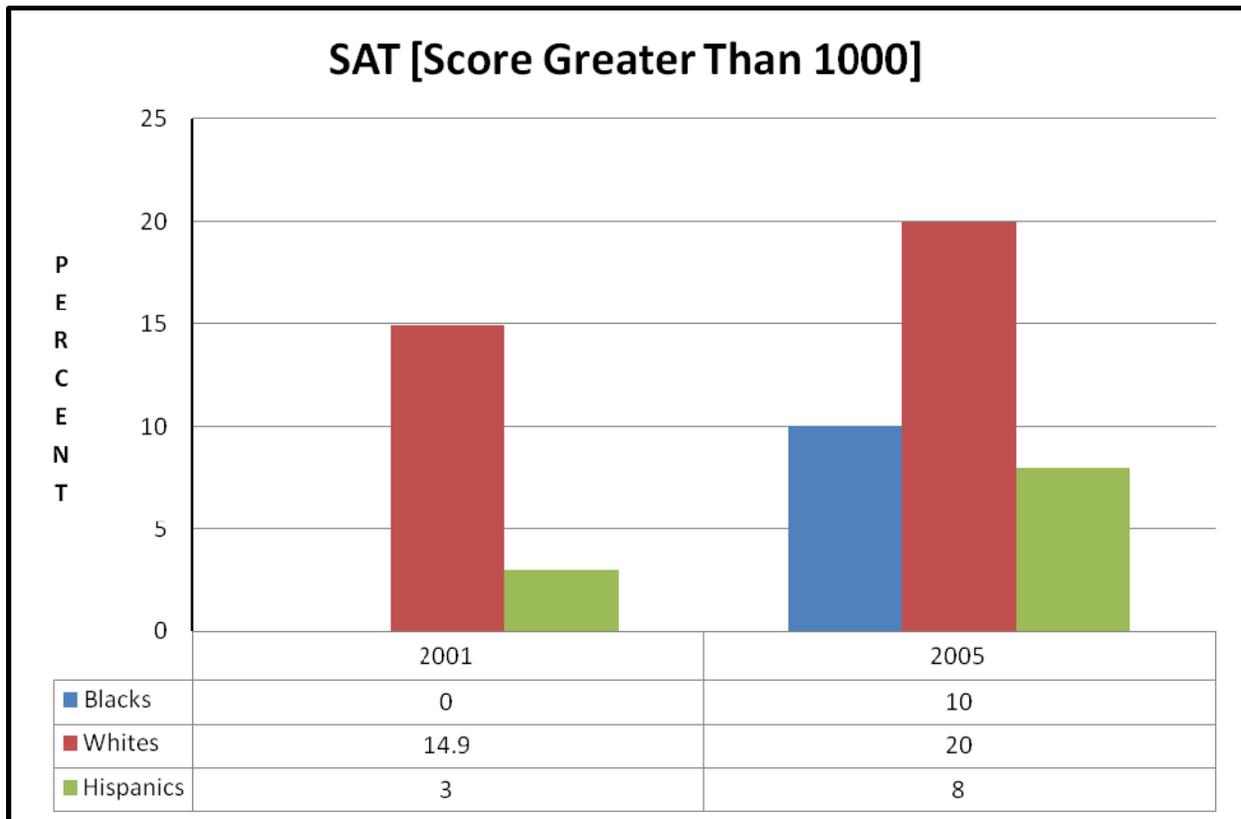


Figure 1. Berkley High School SAT Results.

The SAT exams exposed a gap in mathematics performance between African American males and females. The results of the SAT-Math, from 1994-2004 exposed a 34- to 36-point difference between the mean scores of males and females, with males achieving higher. During this 10-year trend, African American females attained their highest mean score in 2002 with a score of 420, still lagging behind African American males by 18 points, White males by 133 points, and White females by 98 points (Corbett, Hill, & Rose, 2008) (see Figure 2).

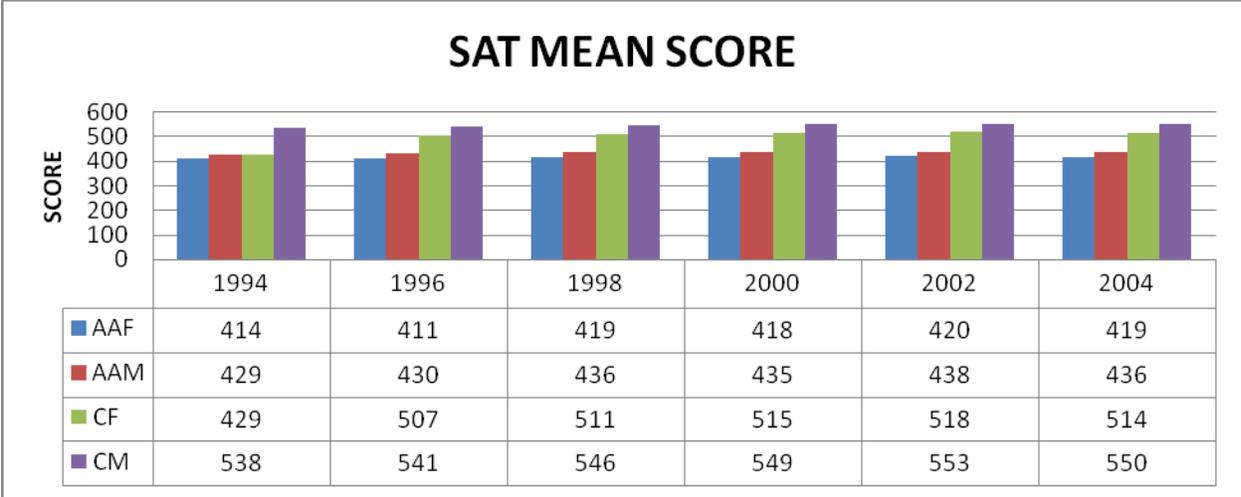


Figure 2. SAT Math Trend Scores Comparison Across Race and Gender.

The 2007 ACT average math scores confirmed the consistently lower achievement of African Americans in comparison to other racial groups. African American females’ math performance was the lowest of all groups on the ACT, with a mean score of 16.9. This score was .3% lower than African American males, 4% lower than White females, and 5% lower than White males (Corbett, Hill, & Rose, 2008) (see Figure 3). The California State University system reported that 78% of Black freshmen entering in 2001 were required to take remedial classes in math as compared to 36% of their White peers (Thernstrom & Thernstrom, 2003).

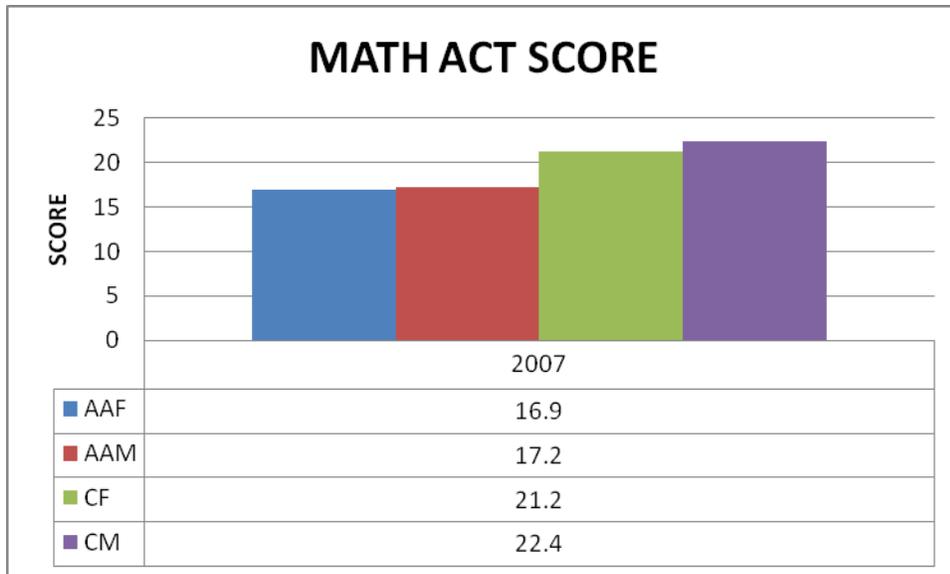


Figure 3. ACT Math Scores Across Race and Gender.

Purpose

The purpose of this study is to highlight the dilemmas that African American females face in schools and to demonstrate how these dilemmas affect their academic achievement in mathematics. This study will examine factors that contribute to some segments of the African American female population overcoming these dilemmas and performing successfully in mathematics. These factors include scrutinizing the formal and informal curriculum to measure their impact on the achievement of African American female students. This research spotlights the impact of gender and race on the mathematical achievement of middle school students. The study will investigate the role of institutional norms (i.e., curriculum, discipline procedures, school and district policies, and teacher practices) on the self-concept and mathematical achievement of female African American middle school students. Furthermore, this study analyzes the role of social networks on student achievement. The voices of African American

female students and their perception of school and social related factors that affect their mathematical achievement are brought to life through this research.

Significance of the Study

This study is significant in that it provides needed research to the dilemma of closing the achievement gap. The achievement gap continues to be an issue facing many schools and school systems across the nation. The current field of scholarly research and professional journals provide a plethora of studies targeting the lack of achievement of African American students. This study proposes to reflect an alternate view of African American female students' achievement in mathematics. Most research and current literature focuses on the deviant behaviors of African American females (e.g., school dropouts, teenage pregnancy, increased aggression, and discipline issues). There have been limited studies spotlighting African American females' resiliency in the academic arena.

Resiliency studies ask questions pertaining to the motivation and persistence of students that lead to their being successful (Evans-Winters, 2005). This research focuses on the positive aspects of student achievement and success in the school setting. The absence of this research has left the need for a body of research that focuses on African American females as a separate group to add to current studies. This research study adds to and expands the body of research on gender studies and African Americans with its emphasis on African American females' achievement in mathematics.

Research Questions

The following research questions guided this study:

1. What strategies within the formal and informal curriculum are having an impact on the mathematical achievement of African American female students?
2. What are the classroom interactions occurring in a mathematics classroom among teacher, students, and peers?
3. What are African American female students' perceptions of their mathematical experiences within the school setting?

Methodology

This study is a qualitative single embedded descriptive case study focusing on a middle school in the Southeast. Hulsey Middle is a pseudonym for the school in the study to protect the identity of the participants. Hulsey Middle houses a population of 400 students. Of the students in this middle school, 73% qualify for free or reduced lunch meals. The student demographics reflect a slightly higher percentage of Caucasian students, with these students comprising 65% of the total enrollment and African American students 34%. The other 1% of the population is Hispanic, Asian, or Indian. African American female students represent 17% of the student population. African American female students served as the primary unit of analysis. A total of nine high, middle, and low students were targeted from Grades 6-8 as primary participants. There were three students in each grade level from the following groups: high achievers in mathematics, average achievers, and below average achievers. Achievement for this study was measured by academic performance in math as measured by grades. Furthermore, the achievement of individual participants was measured by participant responses to select interview questions and teacher responses to interview questions. The data were collected primarily through classroom observations, participants' journals, and interviews with students,

administration, and math teachers for selected participants. The interviews and field notes were transcribed, coded, and analyzed for emerging themes and patterns. Additional data sources were results of individual participants' state standardized assessment scores, report card grades, discipline information, and system-wide mathematics benchmarks.

Definition of Terms

Achievement gap--“Pervasive racial and socioeconomic disparities in student achievement and inequalities in America’s schools” (Lavin-Loucks, 2006, as cited in Allen, 2008, p. 13). The academic differences that exist between various subgroups (i.e., African Americans, Hispanics, free and reduced students, special education students, males, females, etc.) as measured by state or national standardized tests (Anderson, Medrich, & Fowler, 2007).

Adequate Yearly Progress (AYP)--The section of No Child Left Behind that mandates all subgroups of students reach 100% proficiency by 2014. This mandate is measured in incremental steps that reflect continuous gains in student achievement each year comparing economically disadvantaged, students with English as a second language, students from racial and ethnic groups, and students with disabilities (Thermstrom & Thermstrom, 2003; NCLB, 2001, Sec. 1111). States determine standards of proficiency and these standards must include one additional academic indicator (Congressional Digest, 2008).

Gender gap--The academic differences that exist between males and females.

Gender stereotyping--The historical belief system that characterizes mathematics as a male domain (Forgasz, Leder, & Kloosterman, 2004).

National Assessment of Educational Progress (NAEP)--Test performed by the U.S. Department of Education utilizing a large representative national sample of students focusing on the reading and math performance of these students in Grades 4, 8, and 12 (Mead, 2006).

Resilience--The process of exhibiting positive acclimatization in the face of harsh conditions (Luther et. al. 2000; Masten 1994).

Triangulation--The use of multiple sources to confirm emerging research findings (Merriam, 1998).

Limitations of the Study

This study focused on the school-related factors affecting the mathematical achievement of African American females. The focus on school-related factors limited the scope of this study. An in-depth analysis of parental and outside school related factors were not included in the research or data collection. This study was a single embedded case study and concentrated on one middle school. The focus middle school was located in a rural area in Alabama. The study focused on nine African American female students in Grades 6-8. The focus on one school limited the findings and the generalizations to other settings.

In this study, gender, race, and ethnicity were key factors. However, the study did not control for socioeconomic status as a factor in the investigation of these students' mathematical achievement. Furthermore, the study did not investigate the occupation or parental education level of the students' parents. Academic success for the focus students was measured by their performance against themselves. There were no comparisons for these female students' math performance to other students' math performance or to each other.

Researcher Positionality

I entered this research with my own experiences as an African American female, a teacher for 11 years, and an assistant principal for 6 years. The experience that impacted this research most was my gendered experience as an African American female in middle and high school mathematics classes. I have always enjoyed mathematics and performed well in this subject area despite the fact of being the youngest of six in a home with less than \$25,000 a year in income. My family background included a mother and father who had not attended college and did not provide tutoring or assistance with math or other homework. As a student in high school, I took advanced math courses and competed in mathematics competitions. My academic efforts granted me highest honors in Trigonometry and all divisions of Algebra.

My love for math followed me into adulthood. As a first grade teacher for 11 years, I emphasized the importance of math to the students that I had the pleasure of teaching. Unlike some of my co-workers, in my classroom mathematics was always given the state mandated amount of time as well as integrated with other subject areas.

As I went into administration, I was able to see the performance of students in the area of mathematics across the school. This bird's eye view often left me feeling perplexed and a little frustrated. My puzzlement was due to how the African American female students appeared to be performing better than African American males in mathematics as measured by report card grades and standardized test scores. I was familiar with the research on the gender gap in mathematics and the research supporting males being stronger in mathematics than females. I felt frustrated from the knowledge that although African American females were doing better in math than their African American male peers, there was still a difference in the achievement performance of these students and their White peers. During Awards Day ceremonies at my

school last year, I noted that the highest academic average in mathematics for Grades 5 and 6 went to African American female students. Hence, my curiosity was piqued as to the factors that contributed to these girls performing well in math despite standardized testing data that showed that as a group African American females were performing lower in mathematics than White males and females. My interest in this research is a result of my desire to investigate what motivates some African American females to demonstrate positive adaptation and resiliency in the area of math.

My positionality influenced this study in several ways. The research questions are a direct reflection of my personal aspiration to discover how African American female students feel about their mathematical experiences. The data collection was impacted in that the observations and interviews that were conducted interested me personally and professionally. My professional interest included tapping into what the focus middle school in the study is doing that has caused some African American female students to make continuous gains in math as measured by normative standards (grades and standardized test scores). As a budding administrator, I wanted to learn how to improve school factors that may promote improving math achievement for not only my school but the district as well. My own biases as an African American female, educator, and researcher had to be inspected and reflected on while performing the research and exploring the data.

CHAPTER II

LITERATURE REVIEW

Introduction

Many factors affect the mathematical achievement of African American female students. These factors range from gender and ethnicity related factors to educational practices. A review of the literature is presented in this chapter. This literature review juxtaposes the positive and negative research findings relating to the mathematical achievement of African American female students. This review includes findings that are pertinent to this study. The review is presented as follows: (a) the achievement gap, (b) females gendered journey, (c) the gender gap in mathematics, (d) gender and educational practices, and (e) identity issues.

The Achievement Gap

Historical Path to the Achievement Gap

The gaps in educational learning for minority students have not always been termed an “achievement gap.” Prior to 1960, differences in test performance for minorities and non-minorities were gauged using samples of convenience, which limited the monitoring of trends in performance for these students. The use of these samples of convenience did not allow for student comparison on a large national scale. The first widely representative sample utilized was the Equality of Educational Opportunity (EEO:65) survey, which was implemented in 1965. The EEO included a national representative sample of students and also introduced a comparison of race (Hedges & Nowell, 1998). In the late 1960s, the Coleman report depicted the ethnic

differences in academic achievement across various years of schooling. This report was the first national study of achievement variations across grade levels. The Coleman Report acknowledged that an achievement gap between Blacks and White existed at every grade level and widened as students progressed through school (Coleman as cited by Fryer & Levitt, 2004). In 1971, the federal government initiated a recordkeeping system for the educational outcomes of three major ethnic groups. The outcome of these records revealed disparities in the educational outcomes of these groups, which further spotlighted the inequities in education. These records demonstrated that education was key in sustaining or reducing the variance in achievement among groups in both education and economic outcomes (Portes, 1999).

The National Assessment of Educational Progress (NAEP) was created in 1969 to examine the academic achievement of 9, 13, and 17 year olds in reading, math, science, and writing (Hedges & Nowell, 1998). The NAEP began tracking trend data in the scores of minorities and non-minorities in reading, mathematics, science, and writing. The trend NAEP has tracked changes in achievement scores since 1971 when it began testing 17 year olds (Jencks & Phillips, 1998; Thernstrom & Thernstrom, 2003). Further analysis into the trends of Black and White achievement was conducted by the National Center for Education Statistics in 1973. This study utilized a nationally representative sample of 9-, 13-, and 17-year-old students (Campbell, Hombo, & Mazzeo, 2000). Other data sources that have been utilized to analyze the test scores of Blacks and Whites are National Education Longitudinal Study of 1988 (NELS:88), National Longitudinal Survey of Youth (NLSY:80), National Longitudinal Study of the High School Class of 1972, and High School and Beyond (HSB:80, HSB:82). Each of these data sources served as studies of nationally representative samples of students from junior to senior high school.

Prior to the Supreme Court decision in 1954, the law aided in separating Black and White students' school environments. The Supreme Court decision in *Brown v. Board of Education* was pivotal in moving southern schools toward desegregation. However, this decision was not embraced or implemented immediately by some former Confederate states (Thernstrom & Thernstrom, 2003).

A few years after the U.S. Supreme Court decision in 1954 that school desegregation by statute was unconstitutional, several southern school districts began to publish the gaps in test scores of Black and White students. They used the lower test scores of Blacks to justify their opposition to school desegregation. They argued that Black and White children should not be educated in the same school because Blacks were not as capable as Whites. (Ogbu, 2003, p. 3)

The achievement gap has historically referred to the differences in achievement between Blacks and Whites. Research in the South during the 1950s supported the argument that Black children were not performing at the level of their White peers. A 1950 survey conducted in Florida on the math achievement of eighth grade students indicated that White students were performing above the national norm. This survey further revealed that African American students in Tennessee performed 2 years below the national norm (Weinberger, as cited in Ikpa, 2003).

The argument for desegregation was supported and disputed by various studies. In an unpublished dissertation, Samuels (as cited in Ikpa, 2003) found that first and second grade Black students attending a segregated school performed better than their peers attending a desegregated school. A study of the Norfolk Public School setting during a 6-year period, suggested that resegregating 10 elementary schools increased the achievement gap. The scores of students in these 10 elementary schools revealed an achievement gap as wide as 31 percentile points in 1995.

The historical disparities in the academic achievement of Blacks and Whites can be traced back to slavery. During slavery, education was denied to Blacks for fear that this would lead to dreams of freedom (Gundaker, 2007; Thernstrom & Thernstrom, 2003). Historically, attaining the rights to an education has been a struggle for African Americans. This quest for an education was suppressed by capitalism, European colonization, and cultural and political imperialism (Watkins, Lewis, & Chou, 2001). This suppression of an education was enforced legally through Black Codes. Black Codes were legal mandates enforced mainly in the South that prohibited schooling for Black slaves (Willie, 2003). The White male historically was the intended recipient for an education in America's first public schools (Allen, 2008). Within the sociopolitical site of knowledge and knowledge production, the issue of a school curriculum in need of transformation evolved. This evolution provoked several questions such as the following: What counts as knowledge? Who decides what knowledge is important? Why should African Americans be educated? (Watkins et al., 2001).

Before 1960, the issue of inequality was viewed primarily as one of race-based segregation for minorities and women and was linked to a combination of limited effort and ability. During this period, the educational system and curriculum contributed to the norm of oppression. The demographic trends during this time did little to oppose or demand change for this current caste-like system. This type of system reigned until the 1965 changes in immigration policies and Civil Rights sanctions (Portes, 1999). The Civil Rights Act pushed for the U.S. Office of Education to analyze the educational opportunities for students in the nation's public schools. A provision of this act required the U.S. Office of Education to measure the inadequate availability of equitable educational opportunities for individuals based on their race, color, religion, or national origin (Thernstrom & Thernstrom, 2003). The passing of the Civil Rights

Act of 1964 assisted in integrating the education system (Willie, 2003). Following this period a cultural revolution occurred that changed society and included more voices that demanded change for various human rights. The launching of Sputnik triggered a focus on excellence in education, and the issue of equity was suppressed by the nation's attention on external and internal threats. The external threat involved the fear of communism being imposed by the Soviet Union through their socialist approach to equity. The 1962 Cuban missile crisis threat spurred the federal government to launch social programs aimed to minimize the impact of poverty and disempowered groups. The internal threat involved the Civil Rights movement and the Anti-War movement, which jolted the nation into rethinking social justice and the connection between poverty and violence. This new focus was in opposition to President Johnson's social equity agenda (Portes, 1999).

Criticisms of the Achievement Gap

Many critics of the term "achievement gap" look not only at the achievement of individuals but refer to this disparity in achievement as a "preparation gap," an attitude gap, or a test score gap (Noguera & Wing, 2006). These critics look at societal norms and the structure of institutions. Many of these critics of the achievement gap criticize achievement as measured by high-stakes tests. Critics of high-stakes tests dispute that tests can accurately be gauged as an indicator of the knowledge level of African American students, due to factors such as anxiety and stereotype vulnerability that affect these students performance on test (Steele & Aronson, 1998). Lundy (2003) argues that the achievement gap narrative identifies white students' average performance as the standard to which black students must measure up to. Thus, this argument makes the assumption that the performance of white students is acceptable and their performance

becomes the norm. Some critics of the achievement gap as an issue of race rely on the notion of our transformation into a colorblind society. These critics utilize the example of state-wide math tests being devoid of bias (Thernstrom & Thernstrom, 2003).

Current Achievement Gap in Mathematics

After 400 years in the American education system, African American students have experienced little success through remediation or other educational reforms in closing the achievement gap (Allen, 2008). The achievement gap continues to be an issue for both African American males and females. However, the question arises, “When does this achievement gap begin?” There have been varied results on when the achievement gap begins.

Some recent work has found that students enter kindergarten, even high poverty students, without an achievement gap (Balfanz & Byrnes, 2006; Bali & Alvarez, 2004). This work further cites that most high poverty students enter kindergarten equipped with basic math skills and knowledge such as counting and basic shape recognition (Balfanz & Byrnes, 2006). Findings from a study of 56 kindergarten and first grade students in Chicago demonstrated no difference in the achievement of Black and White students in the area of mathematics calculations (Cooper & Schleser, 2006). The 1998 Early Childhood Longitudinal study demonstrated scores of 20,000 kindergarteners no significant difference was noted in the initial math scores of Black and White students when certain observable characteristics (i.e., age, mother’s age at time of birth, child’s birth weight, WIC participation, and SES composite measures) were controlled (Fryer & Levitt, 2004).

Jenck and Phillips (1998) disputed a gap developing after students enter kindergarten, instead arguing that the achievement gap between Blacks and Whites occurs before students

enter kindergarten and remains constant until adulthood. They attribute this gap to the lack of preschool intervention for African American students. In 1991, 40% of White students ages 3 and 4, attended preschool while only 31% of African Americans enrolled in preschool (Ikpa, 2003). Thermstrom and Thermstrom (2003) argued that students enter school with racial differences in intellectual development. This argument concludes that students enter kindergarten with certain skills and knowledge in place and schools can enhance or stifle this knowledge. Research conducted by the National Center for Education Statistics found racial differences in the achievement performance of 22,000 kindergartners at the beginning of the 1998-1999 school year. The results of this study showed that about 40% of Black students scored at the bottom quarter of mathematics tests given shortly after they enrolled in kindergarten (National Center for Education Statistics, 2000). A longitudinal study conducted of 2,300 kindergarten and first grade students in the area of mathematics demonstrated that mathematics achievement gaps existed for African American, high poverty, and female subgroups at an early age (Chatterji, 2005).

Despite disputes about an achievement gap developing before students enter school, conclusive research findings demonstrate that the achievement gap widens as students progress through school (Bali & Alvarez, 2004; Phillips, Crouse, & Ralph, 1998). A study conducted in the Pasadena Unified School District of scores over a 4-year period denoted a 5-point difference in the mathematics test scores of first grade Black and White students. By fourth grade, this difference has increased to a 7-point difference in favor of Whites. The Stanford 9 achievement data for California in 2003 showed that 29% of African American second graders scored proficient in the area of math, while 61% of White second graders demonstrated proficiency (Bali & Alvarez, 2004). A quantitative study of the effects of race and socioeconomic class was

conducted with third grade students in North Carolina. Findings from the state's standardized end-of-grade assessment revealed that the average mathematical scores for African Americans were the lowest of all subgroups (Hughes, 2003).

Although an achievement gap in mathematics exists for African American students during the primary years, this gap becomes an abyss by the middle school years. According to a study conducted in Philadelphia that targeted high poverty and minority students in three middle schools, more students fell further behind in math rather than maintaining or improving their mathematics performance. This study revealed that one third of students targeted gained more than 20 state percentile points in math on the Pennsylvania System of School Assessment (PSSA), while the other two thirds lost two to three percentile points, falling further behind the majority of the student population (Balfanz & Byrnes, 2006).

The achievement gap in mathematics for all races has fluctuated, with a narrowing during the 1980s and an increase in the 1990s. The National Assessment of Educational Progress (NAEP) has been the measuring stick to monitor the changes in the achievement gap. The NAEP revealed a decline in the gap between Blacks and Whites on math tests between 1971 and 1996. The gap narrowed significantly in mathematics during the 1970s for all age groups. This narrowing was shown by a dramatic improvement in math achievement for Black students with minimal progress for White students. In the late 1980s, math scores for Blacks improved by almost one standard deviation when compared to the growth of the White peers. Reading gaps widened in the 1990s while math scores (for 9 year olds) remained stable. "Except for nine year olds' math scores, Black cohorts entering school since 1980 have registered small gains or declines" (Grissmer, Flanagan, & Williamson, 1998, p. 191). "Even when Black gains were largest, they never came close to eliminating the gap" (Grissmer et al., 1998, p. 187).

The Elementary and Secondary Act proposed to improve the academic achievement of low-socioeconomic and African American students (P.L.89-10, 79 Stat. 27). The reauthorizations of this act in 2002 with *No Child Left Behind* continued to support closing the achievement gaps for low-income and minority students. The enactment of *No Child Left Behind* resulted in schools scrutinizing disaggregated standardized test scores and monitoring the achievement of all students. As scores were disaggregated the continued disparities in the achievement of African American students and their White peers persisted (National Center for Education Statistics, 2002). In an in-depth case study of a Caucasian math consultant, the mathematical experiences of African American students in North Carolina public high schools were investigated. This study researched the progress in mathematics from the *Brown vs. the Board of Education* era to the *No Child Left Behind Act*. The results of this study revealed that African American students' achievement in mathematics increased from 2001 to 2004. However, the achievement gap persisted, with Whites scoring more than 20% higher than African Americans in Algebra I, Algebra II, and Geometry, by the end of 2004 (Snipes & Waters, 2005). The National Center for Education Statistics (2005) reported stagnated mathematical progress for eighth grade African American students in Alabama. This report utilized the results from the National Assessment of Educational Progress (NAEP) in mathematics from 1990-2005.

Research studies have found a connection between race, social class, childhood factors, and math performance (Lubienski, 2002). Hughes (2003) found in a quantitative study of third grade students in North Carolina that ethnicity and socioeconomic status were found to influence students' mathematical achievement. The findings from the standardized end-of-grade (EOG) mathematics assessment revealed that African American students had the lowest mean mathematics scores and students receiving free and reduced lunch had a 71% probability of

achieving a low mathematics score. A study conducted by Muller, Riegle-Crumb, Schiller et.al. (2010) demonstrated the impact of racial and social class structures on high school students' placement into advanced mathematics classes. The results of this study of 48 racially diverse high schools revealed that the racial stratification of mathematics course taking patterns correlated with lower GPA's and rates of four-year college enrollment for these minority students. These findings suggested that schools analyze their internal capacity to meet the needs of minority students.

However, social class, residential community and parental education have been disputed as to their having a major affect on the achievement gap. In fact, Thernstrom and Thernstrom (2003) uncovered the fact that there was a higher gap (6%) on the NAEP assessment performance between Blacks whose parents were college graduates and Whites whose parents graduated from college. These findings further substantiated that low-income Black and White students have more similarities in performance than Blacks and Whites living in the suburbs. An achievement gap is shown to exist even when minority students attend more affluent schools (Hughes, 2003). A study of the results of the National Education Longitudinal Survey concluded that socioeconomic class is the greatest factor affecting students' mathematical achievement. The study findings demonstrated a variance in the mathematical knowledge attained by students between different high schools (Rumberger & Palardy, 2005). A study of the Shaker Heights schools, an affluent school district in Ohio, revealed that African American students scored lower than their White counterparts, at all grade levels, on proficiency test scores. These scores exposed larger differences in the areas of mathematics and science. On the sixth grade proficiency test in 1995, Whites scored 86% proficiency in math while Blacks scored 28%, a difference of 58% in favor of Whites. The eighth grade proficiency test scores in mathematics

revealed a 54% difference in favor of Whites (Ogbu, 2003). A quantitative analysis of third grade students' mathematics achievement on a standardized end-of-grade assessment in an affluent school district in North Carolina revealed an achievement gap in the scores of Black and White students. The results of this analysis demonstrated that White students had the second highest mean math scores in the district while Black students' performance reflected the lowest mean scores (Hughes, 2003).

Reasons for the Achievement Gap

The achievement gap that exists between the academic performance of minorities and non-minorities, as well as socioeconomically disadvantaged and advantaged students, is a reality that has left researchers pondering and hypothesizing its origin. Many scholars debate that this gap in learning is an intellectual gap that is attributed to intellectual inferiority. Herrnstein and Murray (1994) attributed the lowered performance of Blacks in school to their IQ, which has been fostered by inadequate genetics. A study conducted by Phillips, Brooks-Gunn, Duncan, Klebanov, and Crane (1998) was used to support the genetic argument. These researchers utilized data from the Children of the National Longitudinal Survey of Youth (CNLSY) and the Infant Health and Development Program to measure intelligence. The Infant Health and Development Program (IHDP) was created to examine and monitor the effectiveness of education and family support resources for low birth weight, and premature infants during their first years of life. The data focused on 1,626 African American and European American five and six year olds. The study utilized the Peabody Picture Vocabulary Test-Revised and the Wechsler Preschool and Primary Scale of Intelligence (WPPSI). The Peabody Picture Vocabulary Test-Revised (PPVT-R), a short-form IQ test, was administered to 315 children from the IHDP. This

test revealed a 25-point difference between the performances of Black and White children. The test measured verbal comprehension and vocabulary, and five-year-old students were asked to identify the picture that represented the meaning of a word. The WPPSI measurement showed an almost 2-point difference. Data from the CNLYS revealed a 17-point difference on the PPVT-R.

The genetic malfunction argument is augmented by subpar family socialization of socioeconomically disadvantaged Blacks. Many advocates of the family socialization aspect of Blacks conclude that the lack of White middle-class child rearing practices hinders an elevated IQ. Lareau (2002) found that both Black and White middle-class parents conform to a cultural logic of child rearing, which she calls “concerted cultivation,” by immersing their children in various organized activities in hopes of conveying vital life skills. An ethnographic study conducted by Lareau showed the effects of social class on child-rearing practices across racial boundaries. The results of this study showed that Black middle-class children were involved in more organized activities than White middle-class children, mainly due to their involvement in church. Middle-class boys were shown to be involved in more activities than girls. According to Bowles and Gintis (1976), the socialization aspect in and out of school coupled with cultural programs and informal learning contexts has a great impact on a child’s schooling success.

One of the major arguments presented for the achievement gap is that of social class. Sacks (2007) argued that schools cannot negate cultural and economic factors. He stated,

The contributions of schools themselves pale in comparison to the influences of a child’s family background, parents’ education, income, cultural resources, and other components of social class-in accounting for the educational achievements and outcomes of individual children. (p. 96)

The principal findings of the Coleman report revealed that the social and economic status of parents and families took precedence over most factors in accounting for students’ educational achievement. This report further exposed that the influence schools have on students’

achievement in comparison to their background and social context is minimal (Coleman, 1990). Researchers argue that the inequalities students bring to school related to their social class continue throughout their schooling and into adulthood (Coleman, 1990; Sacks, 2007). Bourdieu and Passeron (1990), in a term referred to as “habitus,” discussed how students’ perceptions and beliefs about society are shaped by their immediate environment. These perceptions affect these students’ attitudes, aspirations, and expectations. The socioeconomic divide in American society and education has an impact on students’ aspirations and opportunities. Students coming from vastly unequal social and economic conditions enter school aware of these disadvantages and carry this knowledge with them throughout their educational careers (Bourdieu & Passeron, 1990; Sacks, 2007). The American education system, which has often been referred to as the great equalizer, is now being more closely scrutinized for its contribution to reproducing the status quo. Some researchers have concluded that American schools and colleges reproduce, emphasize, and validate inequality. There have been research projects and studies devoted to examining how the institution of school authenticate and replicate the structure of privilege. The study of Berkley High School’s multifaceted school programs and curriculum is an example of how educational institutions contribute to social reproduction. This racially and economically diverse school reinforces merit-based selection, academic choice, and tracking, all of which favor the most culturally privileged and reproduces social class advantage (Noguera & Wing, 2006; Sacks, 2007). Fine and Burns (2003) critique the biases embedded in the ideology of meritocracy. These authors point out how the structural designs of school and society methodically hinder poor people and minorities from gaining material access to the meritocratic dream.

Critics of social class and genetic differences as a rationale for the achievement gap argue that Black culture, which is rooted in oppression and subordination, contributes to the achievement gap (Patterson, 2000; Thernstrom & Thernstrom, 2003). These critics argue that students develop an oppositional identity. Ogbu (2004) contends that oppressed minorities develop a sense of bitterness and resentment as a result of forced assimilation into the culture and ways of the dominate group.

Researchers attribute the continued achievement gap in the mathematics achievement of middle school students to several factors. These factors include weak and unfocused curriculum (Schmidt, 1999), shortage of skilled math teachers (National Commission on Mathematics and Science Teaching, 2000), lack of student motivation (Bishop & Mane, 2001), and disparities in opportunities to learn advanced mathematics (Raudenbush, Fotiu, & Cheong, 1998; Spielhagen, 2006). Inconsistencies and teacher bias were discovered in student placement into eighth grade Algebra, during a study of a large southeastern suburban district. This study revealed that a greater percentage of African American students were enrolled in the lower math rather than Algebra I, which affected their overall performance on the SATs (Spielhagen, 2006). Balfanz, Ruby, and MacIver (2002) concluded that the lack of implementation of reforms that directly impact classroom practice has contributed significantly to the continued achievement gap in the middle school grades. The overuse of cross-sections and national and state level comparisons that are not synchronized with classroom teaching and learning have hindered the development of adequate targeted interventions and fostered a continual achievement gap (Balfanz & Byrnes, 2006).

Females Gendered Journey

This section will begin with a focus on collective gender movements and conclude with the historical educational journey of African American females. Utilizing a review of major legislative acts, a connection will be made with the impact that these acts have on today's educational experience for females. This section will be divided into three subtopics: legislative movements, African American females gendered education, and current trends in gendered education.

Legislative Movement

The movement for inclusion and equitable treatment for females began in the mid-1800s. Early feminist movements and theories targeted White, middle-class females. Although feminist theories and movements battled against the oppression of women, the movement still excluded the plight of African American females. Collins concluded that the placement of African American women as outsiders became the definition of normative for Caucasian women (Collins, 1990).

Title IX, a major legislative act that targets gendered discrimination, evolved from the Civil Rights Act and feminist movements occurring during the late 1950s to the early 1970s (Valentin, 1997). The Civil Rights Act of 1964 included two sections that leading female activists used as a segue into the Title IX act. Title VI of the Civil Rights Act contained provisions that prohibited discriminatory practices that were based on race, color, or national origin. Edith Green, a representative from Ohio, proposed that this section be amended to cover sex discrimination and extend the Equal Pay Act. Furthermore, Rep. Green proposed to amend Title VII (which already included gender) of this act to include employees in educational

institutions. This proposal was met with much opposition from African American leaders, which stemmed from fear that amending the Civil Rights Act would dilute the coverage for African Americans (Valentin, 1997).

Title IX states, “ No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance” (Stromquist, 1993; Valentin, 1997). Title IX, the most comprehensive educational legislation to date encompasses education at all levels from kindergarten to college. This legislative act was signed by President Nixon and enforced as part of the Education Amendments in 1972. Title IX impacted women and girls’ roles in public and private education and the work force (Stromquist, 1993; Valentin, 1997).

A couple of years after the passing of Title IX, feminist groups continued to lobby for the removal of discriminatory practices in education. In 1974, the Women’s Educational Equity Act (WEEA) was passed into law. The WEEA intended to make education more equitable for girls and women. This act proposed the use of incentives and guidance to schools and community groups. When enacted, the WEEA provided funding to all levels of education (Valentine, 1997). The WEEA has been extended, amended, and reauthorized since its enactment. The purpose of the WEEA was to evaluate curriculum, textbooks, and other educational materials for equitable inclusion of females (Stromquist, 1993).

The Vocational Education Act was passed in 1976 with the intent of eliminating gendered biases, stereotyping, and discriminatory practices in secondary and postsecondary vocational education. This act mandated that states receiving federal funding develop and implement activities and programs devoid of sex discriminatory practices. One of the goals this act sought to accomplish was the training of females for male dominated jobs. The Vocational

Education Act required states to designate vocation education sex equity coordinators (Stromquist, 1993; Valentin, 1997).

Title IX, WEEA, and the Vocational Education Act sought to end gendered discriminatory practices and biases in education. These acts were led by feminist groups looking for equal rights. The need for alternative voices in feminist issues resulted in females such as bell-hooks, Patricia Hill Collins, and Gloria Ladson-Billings providing the African American perspective on feminist issues. Black feminists thought of reconceptualized race, class, and gender as interlocking systems of oppression that fall under the structure of dominance. This paradigm categorizes domination at multiple levels and notes that each individual has a unique personal biography (Collins, 1990).

African American Females Gendered Education Experience

During the 1900s, Black female education was impacted by societal and gender role expectations even with the Black community. These expectations influenced the reform movements for Black education, basing their rationale on middle-class views of gender roles. Many notable African American reformers, such as W.E.B. Dubois, promoted education for African American males while remaining neutral and almost silent on the issue of educating African American females (Watkins et al., 2001). Many Black reformers for education disputed the curriculum and purpose of Black females attaining an education (Meir, 1963). These educational reformers were divided into three groups, with each of these groups citing a varied yet distinct opinion about the education of Black females. One group advocated for an industrial education for Black females, noting the economic benefits. Another group rallied for an educational curriculum that balanced both academic and industrial education. The goal of this

type of education was to make Black females better-rounded and prepared for a range of domestic and public responsibilities. The third and final group lobbied for an expanded academic curriculum at all educational levels for Black females. This group was composed of premier female activist such as Lucy Laney, Mary McLeod Bethune, and Anna Julia Cooper. This group recognized that schools were the gateway for Black females to acquire versatility in acquisition of languages, mathematics, and philosophy (Werum, 1997).

Current Trends in Gender Education

More than 30 years after the passage of Title IX, females have progressed in receiving equitable opportunities in education. Reports from the U.S. Department of Education revealed that in 1994, 63% of female high school graduates were enrolled in college and earned 38% of the medical degrees and 44% of the doctoral degrees (U.S. Department of Education, 1997). The national Report Card on Gender Equity reported that in 1997 females earned more than half of the associate, bachelor's, and masters degrees (National Coalition for Women and Girls in Education, 1997). However, being given equal opportunities in education has not resulted in equity for women in certain areas of the educational arena (Valentin, 1997). The Department of Education (1997) reported that women earned only 17% of the PhDs in math and science, 14% of computer science PhDs, and 7% of the PhDs in engineering. The Department of Education conveyed that women continue to lag behind their male counterparts in their labor market earnings, earning 20% less than males with the same amount of education (Department of Education, 1997).

The Gender Gap in Mathematics

The aforementioned research demonstrated that the achievement gap persists for African American students. Research on the gender gap in math between males and females has shown mixed results with some evidence of a closing gap and other evidence of a continued gap (Tsui, 2007). Studies of gender differences in mathematical achievement offered insight into how mathematics is perceived by males and females and teachers of mathematics. These findings have suggested a difference in the actual math performance of boys and girls and their perceptions of mathematics (Forgasz et al., 2004; Tiedemann, 2000). Psychologists, researchers, and theorists have proposed many reasons for why the gender gap exists in math. These reasons include but are not limited to females' "perceptions" of mathematics as a male domain.

Theoretical and Conceptual Framework of the Gender Gap

A variety of reasons have been cited for why a gender gap occurs in math. These reasons vary from genetics to societal factors to psychological factors (Gallagher & Kaufman, 2005). Researchers have utilized four theoretical models and concepts to explain why the gender gap exists. The first theoretical model is the expectancy value theoretical model. Eccles and several colleagues are credited with this model (Eccles, 1994). The Eccles expectancy value theoretical model proposes that the value placed on mathematics affects students' performance. This model credits cultural factors (those perceived as male dominated occupations, cultural stereotypes about math, parents' and teachers' attitudes and expectations) with shaping students' value of mathematics. Furthermore, this model explores students' expectation of success in math as well as their short- and long-term goals as factors in their achievement. The expectancy value model links expectations of success with previous grades in mathematics, personal rationale for

performance in math, aptitude, and self-concept of ability (Aronson & McGlone, 2008; Eccles, 1994; Frome & Eccles, 1998). The gender stratification hypothesis scrutinizes societal factors based on gender and their impact on females' mathematics attitude and achievement. This hypothesis denotes that the inequity of math opportunities leads to a less positive attitude towards mathematics for girls, which affects their math performance on achievement tests (Baker & Jones, 1993). The social structure theory emerges from the psychological realm and calls to the forefront sociocultural factors on psychological gender differences. This theory looks at females' access to mathematics education and proposes that this access may be hindered by cultural and structural barriers. The social structure theory examines females' cultural roles such as caregivers, homemakers, etc. and how this role stifles their math development. Furthermore, this theory brings to the forefront social stereotypes of mathematics as a male domain (Eagly, 1987; Eagly & Wood, 1999). The final concept that psychologists and other researchers have viewed in relation to the gender gap in math is stereotype threat. The stereotype threat was introduced by Steele and Aronson. This threat arises from the widely shared belief that one group dominates another group in mathematics performance. This fear causes the subordinate group to perform poorly on formal or standardized math assessments (Aronson, Joshua, Quinn et. al., 1998; Spencer, Steele, & Quinn, 1999). In the area of mathematics, females often associate the math domain with males and demonstrate hesitancy to avoid failure in this area (Crocker et al., 1998).

Perception and Anxiety Related Factors

A pilot study was conducted to test mathematical instruments that assessed participants' perceptions of mathematics as a male domain. These instruments were piloted in Victoria,

Australia with 400 students in Grades 7 through 10. The findings revealed that overall both males and females viewed math as a neutral domain. However, males' responses on this instrument did indicate a stronger perception of mathematics as a male domain in comparison to their female counterparts (Forgasz et al., 2004). Several studies have found gender differences in attitudes and perceived usefulness of math (Catsambis, 1994; Frenzel, Pekrun, & Goetz, 2007). A German study of the attitude of 2,053 fifth graders (male and female) toward mathematics revealed that girls had a significantly more negative attitude toward math. Although the girls in the study recognized the value of mathematics, their confidence level was not as high as that of their male peers. Despite negative attitudes and confidence in math, the girls in this study achieved at a similar mathematical level as their male peers (Frenzel et al., 2007). In another study comparing the mathematics performance of males and females on the 2003 TIMMS and PISA assessments, boys consistently reported more positive attitudes about math. The study of TIMMS and PISA data was conducted in 49 countries. This study further demonstrated that girls had more anxiety toward mathematics, while boys confirmed findings of greater extrinsic and intrinsic motivation, self-concept, and less anxiety toward math (Else-Quest, Hyde, & Linn, 2010). Meta-analytic studies conducted in the United States support the argument that boys hold a more positive attitude toward mathematics in comparison to their female peers (Hyde et al., 1990). However, some researchers have noted that the attitude of African American females toward math differs from females of other races. African American females have a positive attitude towards mathematics, despite poor performance (Clewel & Anderson, 1991; Mickelson, 1990; Oakes, 1990). An interview with an African American sixth grade female student, during an ethnographic case study, revealed this student's high self-confidence about her ability, current

achievement, and future expectations in math. Additional findings in this study spotlighted this student's low performance in mathematics (Lim, 2008).

The gaps that exist between boys and girls in math were shown to grow as these students progressed through school. Chatterji (2005) found, in a study of kindergarten and first grade students, that boys begin school performing at a higher mathematical level in comparison to girls. By middle school, African American girls have been shown to perform better in mathematics as measured by their GPAs. This higher achievement in math was attributed to girls' attitude, educational aspirations, and placement in higher track mathematics classes (Mickelson & Greene, 2006). During the 1990 to 2003 period, surveys of the U.S. revealed that 11th and 12th grade male students were performing at 30 points higher than their female peers on the SAT Math test (National Center for Education Statistics, 2003). A look at the SAT mathematics data in 2006 revealed a continued 36-point difference in favor of males (College Board, 2006).

The gap in math performance favoring males has been shown to vary according to the difficulty level of mathematics. Results from the 2003 scores of the TIMSS and PISA data support the variation in math achievement for males and females. The TIMSS international test assessed five content domains in mathematics and assessed the attained curriculum. The content domains are as follows: Number, Algebra, Measurement, Geometry, and Data. This assessment demonstrated that boys and girls performed comparably overall, with girls performing higher than boys in the area of Algebra. The PISA international assessment is viewed as more application and assesses math literacy. The PISA assesses quantity, space/shape, change/relationships, and uncertainty. The results of the PISA indicated that boys performed better overall by 11 points (Else-Quest et al., 2010).

Studies, as well as some recent data from assessments, have shown that the gender gap in mathematics is declining in the United States (Else-Quest et al., 2010; Organisation for Economic Co-Operation and Development, 2004). A meta-analysis conducted in 1990 illustrated females achieving higher in math among the general population (Hyde et al., 1990). Scrutiny of statewide assessment data in 2005 and 2007 for Grades 2-11 revealed that the gender difference in mathematics achievement had been eliminated (Hyde et al., 1990). Five surveys of U.S. national and international fourth, eighth, and 12th graders, during a 13-year period, denoted that mathematical performance of boys and girls was comparable (Gonzales, Patrick, Guzman, et al., 2004; National Center for Education Statistics, 2003).

Research has moved away from the myth that targeted gender differences for girls' difficulties in math. Researchers are now looking at external factors that impact the mathematics performance of girls (Bol & Berry, 2005). Factors such as racism, socioeconomic class, and parental influence were scrutinized for their contribution to differences in mathematical achievement. A study of 410 African American male and female students was conducted through the Maryland Adolescents Development in Context Study (MADICS). Data were collected during these students' 8th and 11th grade year in school. Through the use of surveys, the study investigated the effects that racial discrimination had on boys in comparison to girls. Findings from the study concluded that discriminatory practices did impact the achievement of eighth and 11th grade girls and boys (Chavous, Smalls, Rivas-Drake, Griffin, & Cogburn, 2008). A three-level longitudinal study found that girls with low ability in math are impacted negatively by parental encouragement (Ai, 2002).

Gender and Educational Practices

Teachers attribute the achievement gap in mathematics to several factors. These factors were mostly external factors that did not include the teachers' role in the achievement gap. These factors included the curriculum, student work ethic, socioeconomic status, parental involvement, and societal influences. Student characteristics such as motivation and parental involvement were indicated as the leading predictors of student academic success (Bol & Berry, 2005).

Some elementary school teachers hold the belief that the mathematical skills of girls are substandard to boys. When average achieving girls and boys were compared, teachers perceived these girls to have more difficulty in logically processing mathematical skills (Tiedmann, 2000). Findings from a study of elementary and middle school math coaches revealed a strong belief in boys' competitive drive. These findings further reported that boys favor their own abilities for mathematical achievements while girls utilize curricular measures to further their mathematical abilities (Leedy, LaLonde, & Runk, 2003). Boaler (1997) reported that a competitive learning environment adversely affects the inquisitive learning style of girls.

A study of 52 third and fourth grade teachers in Germany exposed gender stereotyping in perceptions of mathematics achievement. In this study, teachers perceived girls to be less logical and possessing lower ability skills in math (Tiedemann, 2000). Teacher bias has been found in their interaction with males and females. It was found that some teachers are more accommodating for males, giving them more praise, remediation, and positive affirmation for responses. Furthermore, teachers utilize a dialogue in discussing ideas and concepts with males (Valentin, 1997). The AAWU report (1995) found that in lecture classes, teachers directed questions to male students 80% more often than to female students.

A study concluded that the traditional skills model does not accommodate the unique learning modalities of both boys and girls. This study suggested that classrooms utilize a curriculum that addresses the individual learning styles and behaviors of girls and boys (Geist & King, 2008). Research illustrates that girls excel more in mathematics classes that demonstrate no gender differences, offer less social comparisons and competitions, and fosters a more cordial environment (AAWU, 1995; Boaler, 1997). Teacher competence and training were found to be important in improving the math achievement of girls. A study of Chinese females found that there was not a gender gap in mathematics achievement. This was attributed to well-trained, competent math teachers at both the elementary and high school level, the curriculum, and high expectations (Tsui, 2007).

Research has shown that the instructional practices of teachers have a large effect on the mathematical achievement of students, particularly low achievers. A study of low-achieving math third grade students in New York illustrated that pre-teaching and re-teaching led to significant increases in Math Concepts, Math Problems, and Math Computation skills on the Iowa Test of Basic Skills (Lalley & Miller, 2006).

The policies, practices, and expectations of the institution can positively or negatively affect the achievement of African American students. The residual effects of slavery, Black Codes, Jim Crow, racism, discrimination, and social inequalities continue to plague African American students as they face institutionalized racist views about their intellect (Allen, 2008). However, some schools are finding success in educating African American males and females. The Kipp and North Star academies utilize a variety of approaches to foster and motivate achievement in African American students. These schools have modeled and created a climate of respect, care, and teamwork. Through the use of incentives (KIPP dollars), award assemblies,

and high expectations, African American students find success in school achievement (Thermstrom & Thermstrom, 2008). Shaker Heights school district utilizes alternative policies and practices that differ from conventional public school methods. The programs or approaches that are directly immersed into school practices are cooperative learning strategies, an Accelerated Schools Model program, Project ACHIEVE, and the Mehan's AVID program (Ogbu, 2003).

Identity Issues

“If White society has tried to do anything to Blacks, it has tried to keep us from being individuals--to deprive Blacks of the understanding that individuality is still operative beyond the racial structure of American society” (Ellison, 1970, p. 394). The idea of a collective identity is one that plagues African Americans and other minority groups. A collective identity is formed for minority groups from the collective history and experiences that they share. For African Americans, this connotation of a collective identity does not bring a sense of pride but is viewed in opposition because of its origin of oppression. In the school setting, some African Americans observe this oppositional cultural identity through their negative experiences with the curriculum and language used in schools. For these African Americans, the curriculum and European dialect are used to subordinate them to the dominant European group (Ogbu, 2003). African Americans who disapprove of the idea of an oppositional collective identity rebel against the norms of school and feel justified in these actions (Ogbu, 1978).

In contrast, some African American females disagree with the idea of being homogenously grouped with those African Americans who rebel against academic success. A qualitative study in California of eight college-bound senior African American female students

disclosed that these female students reacted in opposition to the dominant Eurocentric classification of Black students outside the realm of academic excellence. These female students successfully displayed a connection to their African American culture through their home life and peer associations as well as excelling academically. These African American females viewed the Eurocentric curriculum as the gateway to higher education (Horvat & Lewis, 2003).

Studies have shown that African Americans associate certain school behaviors with “acting White.” Upper elementary, middle, and high school African American students, from Shaker Heights identified certain characteristics exhibited by Black students as “acting White.” These characteristics were speaking standard English, talking intelligently/proper, dressing like Whites, participating in traditionally White dominated sports, and hanging out with mainly White friends (Ogbu, 2003). In a qualitative study conducted in a California high school, student interviews revealed that some African American students were labeled as “acting White” because of their academic success and enrollment in higher classes (Horvat & Lewis, 2003).

In the case of African American females, it is the intersecting and hemorrhaging of Blackness and femaleness that undermine academic achievement. Black females’ legacy of enslavement has led to the construction of a female identity that is ambiguous, somewhere, between male and female. Viewed primarily as sexual beings, transforming their sexual identity appears to be one of the primary goals of African American schooling. (Fordham, 1993, p. 141)

The issue of identity emerged in several studies about African American females. While attempting to find their place in the school setting, African American females battled against the double minority syndrome. These females were faced with being African American and female (Stevens, 1997).

Race is central in African American females’ identity. These students often struggle between “two hostile worlds,” a world of peer validation versus the world of school (Lim, 2008; Stevens, 1997). Lim (2008) documented findings that African American females often felt

conflicted over their social world and their desire for school success. African American female participants in a study in urban California were able to “manage academic success” by camouflaging their achievements in certain peer groups. One participant in the study revealed balancing between getting homework done and participating in social events such as parties with friends. This student was able to successfully navigate between the academic and social world (Horvat & Lewis, 2003). A study of African American middle school students found that African American females assimilated into an identity that was acceptable to peers and family members. This identity was in rebellion to racism and sexism in the school setting. The study found that most African American females resisted the Eurocentric norms of school and the directives of school officials (Stevens, 1997). Fordham’s (1993) study of Capital High School revealed two opposing identity formations for African American females. The lower achieving African American females in the study were found to be loud, disruptive, and seeking peer approval. The higher achieving females were described as exhibiting a “ghostlike” existence and status, a “nice girl” persona, obedience to school rules and officials, and alienation from activities associated with race. In opposition to the aforementioned study, some studies found that comfort with racial identity is important to academic achievement. In a study of eighth grade African American females it was found that African American females exhibiting low racial pride are targets for classroom discriminatory practices and low self-expectations for academic performance (Chavous et al., 2008).

Despite studies that show African American females as rebellious to Eurocentric norms, loud, silent, and peer-oriented, there are studies emerging that focus on the resiliency of African American females. Resiliency focuses on the process involved in a student making positive adaptations despite significant adversity (Luther et al. 2000; Masten, 1994). Researchers have

inquired that these adaptations be viewed beyond the normative/mainstream developmental structures of academic performance, behavioral conduct, and social competence and viewed through intensive, longitudinal, context-specific research (Masten et al., 1990, 1999; Garnezy et al., 1984; Wyman, 2003). Schilling (2008) performed a narrative longitudinal case study of an African American female student from grades four through adulthood. The outcomes of this study exposed several factors that contributed to positive youth development such as supportive relationships outside of immediate family, active agent in personal development and acclimatization and a confident attitude about ability to move beyond current situation. Other studies have investigated the impact race and social class has on student resiliency. These studies measure resiliency through normative structures such as academic performance. In a study conducted by O'Conner (1997), it was found that African American female students demonstrated resiliency in their awareness of how race and class impacted their education and career opportunities. These students recognized that social and economic mobility could be impeded by their race and class yet they continued to strive and excel in their academic classes. In a study of urban African American female students in California, Horvat and Lewis (2003) found that many of the participants equated academic success with college enrollment and upward social mobility. These participants viewed college as the segue to gaining material possessions and freedom and independence (Horvat & Lewis, 2003). Kaba (2008) proposed the African American female as the new model minority. Model minority is a term that characterizes groups that have overcome marginalization and other barriers to become prosperous, admired, and emulated. This proposal was derived from Kaba's analysis of the progress and resiliency of African American females. This analysis revealed that a higher proportion of African American females are enrolled in college in comparison to their African American male counterparts.

Other studies demonstrate the impact of self-efficacy on the academic achievement of African American females. Saunders et al. (2004) defined academic self efficacy as how a student perceives their academic competence or abilities. A study of 300 African American sophomore students in the Midwest illustrated that females showed a higher self-efficacy and placed greater value on completing school. The females in the study also maintained higher GPA's with 2.2 being the average (Saunders et. al., 2004). Bandura (2002) found that self-efficacy beliefs influence individuals' cognitive perceptions as well as their motivation and perseverance in difficult circumstances, the quality of their emotional life, and impact choices at critical crossroads that determine future aspirations. These self-efficacious beliefs are rooted in judgments of personal capabilities and collective action. There have emerged findings on the fluctuation of motivation as it correlates to the age of an individual. These findings revealed that many differences in mathematical attitude that favored males are stronger in the early years BUT diminish when these males reach 15 (Chouinard, Vezeau, Bouffard, & Jenkins, 2001). New emerging studies are also revealing females demonstrating more positive motivational beliefs about their competence in mathematics. In a study of 263 fifth and sixth grade girls and boys in Central Greece, it was shown that the girls in the study did not report less favorable capability and task perceptions in mathematics as compared to their male counterparts (Metallidou & Vlachou, 2007).

Summary

This literature review juxtaposed research findings on African Americans as females and as "African American" females. This double identity contributed to some of the findings being generalized about females and African Americans as a collective group. The research findings

specifically for African American females conclusively demonstrated that this group struggles with self-concept and identity within the school setting.

The review of the literature for African American females has revealed a variation in their mathematics performance. Findings were not conclusive about how much of a gender gap exists for African American female students in comparison to their peers. The variation in findings demonstrates that achievement for African American female students is context specific. Furthermore, the research findings differed in African American females' anxiety and perception of math. Findings demonstrated that African American females demonstrated a positive attitude toward mathematics despite their often low achievement. These findings were in support of new emerging studies on the resiliency of African American females.

The findings in the research were consistent in showing that an achievement gap persists for African American males and females in comparison to other ethnic groups. Furthermore, these findings demonstrated a fluctuation in the achievement gap from year to year. These findings demonstrated that despite numerous reforms, legislative acts, and research studies African American students continue to perform below their peers on most standardized assessments. Furthermore, the research revealed a need to reassess the term achievement gap through a lens other than academic achievement. This research revealed that this achievement gap may better be termed a preparation or opportunity gap. However, due to the current political policies and dialogue that center on the achievement gap, this narrative will continue to refer to the disparities in the achievement of various subgroups as an achievement gap.

CHAPTER III

METHODOLOGY

Introduction

The purpose of this study was to investigate the formal and informal curriculum as well as school practices that impact the mathematical achievement of African American middle school female students. The formal curriculum refers to the curriculum or courses that are offered in a school which often includes a state adopted textbook or program. The formal curriculum may also include participation in a state initiative geared towards improving mathematics skills. The informal curriculum refers to the messages and lessons students learn from the organization of schools. This curriculum includes extracurricular activities such as sports, band, clubs, and organizations. Furthermore, the study investigated the impact of social networks such as friends, culture or other variables that exert influence over the students investigated.

Limited attention has been spent on the resiliency and continued gains made by African American female students. This case study highlighted the experiences that African American females encountered in school and demonstrated how these experiences affected their academic achievement in mathematics. The examination of factors that contributed to the successful achievement in math for some African American female students was explored in this study. Furthermore, this study brought to life the voice of African American females and their perspective of school and social related factors that affected their mathematical achievement.

Case Study Methodology

The qualitative research design was chosen for this study to permit the voices of an underrepresented group to be displayed through a rich descriptive narrative. Qualitative research is an investigative, naturalistic process that encompasses multiple forms of inquiry that are best researched in the natural setting (Merriam, 1998; Creswell, 2007). The primary focus in this research was to gain firsthand knowledge of how African American female students were experiencing math in the school setting and how this experience assisted in their having success in this curricular area. Success is measured in not only academic outcomes but in efforts and progress made towards the normative definitions of academic success.

Due to the methodological approach of entering the natural setting of the participants and creating a narrative account of their school experiences, the case study was the most plausible research design. There are multiple characteristics and definitions of a case study. The case study can be most holistically defined as a practical inquiry and investigation of a single phenomenon within its real life setting. The complexities of this phenomenon or social unit are studied intensively and through the use of descriptive analysis. Case studies are used when boundaries of the phenomenon and setting are ambiguous (Merriam, 1998; Stake, 1995; Yin, 2003). Case studies can be grouped into three categories: particularistic, descriptive, and heuristic (Merriam, 1998). These categories demonstrate the array of characteristics within the case study research design, characteristics which vary from highlighting a general problem through investigating a specific instance to explaining the rationale of the problem (Merriam, 1998). This case study was a descriptive case study providing a detailed account of the experiences of African American females in a middle school mathematics classroom setting. These experiences are not culminated to form a general hypothesis however they do present basic information about the resiliency and

fortitude of these females. This descriptive case study encased an exploration into the educational arena in which little research has been conducted and upon which future theoretical frameworks and comparisons can be constructed.

The primary focus in this research was to gain firsthand knowledge of how African American female students are experiencing mathematics in the school setting and how this experience is assisting in their having success in this curricular area. This research was guided by the following research questions:

1. What strategies within the formal and informal curriculum are having an impact on the mathematical achievement of African American female students?
2. What are the classroom interactions occurring in a mathematics classroom among teacher, students, and peers?
3. What are African American female students' perceptions of their mathematical experiences within the school setting?

Several types of case studies emerge within the qualitative research design. The types of case study are ethnographic, historical, psychological, descriptive, interpretive, explanatory, exploratory, and evaluative (Merriam, 1998; Yin, 2003). This study could fall into several of the aforementioned categories for case studies. Based on the “what” and “how” nature of the research questions, this study could be either exploratory or explanatory. Furthermore, the challenging of current theoretical assumptions about the poor achievement of African American females in math could direct this study towards an interpretive case study. However, due to the lack of research in the area of positive achievement of African American females in mathematics, this case study will be a descriptive case study. Merriam (1998) stated that

“Descriptive case studies are useful in presenting basic information about areas of education where little research has been conducted” (p. 38).

Yin (2003) presented five components of a case study research design. These components are:

1. a study’s questions;
2. its propositions, if any;
3. its unit(s) of analysis;
4. the logic linking the data to the propositions; and
5. the criteria for interpreting the findings. (p. 21)

The study’s questions of “who,” “what,” “where,” “how,” and “why” guide the type of research study that will be conducted. The propositions highlight what should be examined within the scope of the study--where to look for relevant evidence. The propositions for this research included the impact of instructional practices, curriculum, resiliency processes, and the influence of external factors (peers, teachers, organizations, and extracurricular activities). A primary focus of the case study is the unit of analysis. The unit(s) of analysis centers on what the case is (who or what is being studied). Patton (2002) shares that the major concentration of data collection will center on the events that transpire for individuals in a setting and how individuals are affected by the situation. The unit of analysis for this research was African American female students. Linking data to propositions and criteria for interpreting the findings are both linked to the stage before the data analysis. These two components include pattern matching and setting the criteria for analyzing research findings (Yin, 2003).

The role of the researcher is important in case study research. There are several characteristics a researcher must possess before embarking upon case study research. These characteristics include communication, questioning and listening skills, tolerance for ambiguity, flexibility, sensitivity to the context and information gathered in the study, knowledgeable of the

issues being studied, and unprejudiced by personal biases or preconceived notions (Merriam 1998; Yin 2003).

The case study is contingent upon multiple sources of evidence to gain a comprehensive perspective (Patton, 1990; Yin, 2003). There are six commonly used sources of evidence/data collection in case study research: documentation, archival records, interviews, direct observations, participant observation, and physical artifacts (Yin, 2003). This case study research utilized interviews, direct observations, and physical artifacts as sources for data collection.

Selection of Site and Participants

The researcher chose the school site using a purposeful, and criterion-based, selection. LeCompte and Preissle (1993) found that “in criterion-based selection you create a list of the attributes essential to your study and then proceed to find or locate a unit matching the list” (p. 70). The criteria for site selection for this study included a middle school setting, site serving a Title I population, more than 20% African American student population, and gains in math based on AYP measures. The school site was selected based on permission from the Superintendent, data from the aforementioned criteria, and information from the district’s assessment coordinator. The Superintendent of the district was sent a letter to obtain permission to use the district for the study (Appendix A). The Superintendent consented for the district’s inclusion in the study during a face-to-face meeting. The district’s assessment coordinator was contacted following the Superintendent’s consent. The district’s assessment coordinator provided the researcher with assessment data for all schools containing middle school grade levels. There were a total of seven schools from which data was available. One school was omitted due to the fact that it was not a Title I school and the percentage of African American students attending

this school was less than 20%. Two additional schools were excluded based on their Grades 7-12 configurations, which omitted sixth grade data. The remaining four schools were categorized by race and gender before analysis of the data began. The researcher reviewed 5 years of AYP measures data using an Excel spreadsheet. The outcomes of the Excel data led the researcher to choose one specific school site. The African American female students in the school chosen had made the most gains during the 5-year period. Students' names were not on the data given to the researcher for review. Therefore, the researcher worked under the assumption that the African American female student population at the selected site had remained constant and the data reviewed each year reflected the same group of females. During the 2005 school year, 58% of the African American female students scored a 3 or 4 on the math section of the Alabama Reading and Math Assessment (ARMT). This percentage increased to 76% of 7th graders in 2006. There were 73% of 7th grade African American students showing proficiency in math during the 2008 school year. By 2009, 82% of the African American females reached the proficiency target. The principal of the middle school was contacted through e-mail to ask permission to use the school site.

The study focused on a middle school in a rural county in Alabama, containing Grades 6-8. The two elementary schools that feed into this middle school are both part of a state initiative aimed at improving students' mathematics achievement. However, Hulsey Middle is not a part of any initiative that focuses on improving mathematics achievement. Although Hulsey Middle School is not a part of the state's Math and Science initiative, it has met the criteria for Adequate Yearly Progress each year. This middle school has maintained state requirements despite being a Title I school with 73% of its students qualifying for free or reduced lunch. There are 23 certified staff members, two counselors, and two administrators within the student population of 400. The

demographics of the school site include a 65% Caucasian, 34% African American, and 1% Hispanic population. African American female students comprise 17% of the student population. Hulsey Middle School offers standard grade level mathematics courses and two advanced courses for seventh and eighth graders, Pre-Algebra and Algebra I. Hulsey Middle School has also included a Mathematics intervention class as part of their schedule for students who have not met the state requirements for mathematics.

The teacher participants for the study were all Caucasian females with teaching experiences ranging from 7 to 14 years. Two of the teachers' teaching experience had all occurred at Hulsey Middle, while the other teacher participant had transferred in from an elementary school and was beginning her third year at Hulsey Middle. The teachers in the study had all agreed to participate in a research-based practice of looping. Looping is an educational practice that keeps students and teachers together for two or more school years (Franz, Thompson, Fuller, Hare, Miller, & Walker, 2010). For the purposes of this study the teachers were referred to as Ms. Peters, Ms. Terry, and Ms. MacPhearson.

Ms. Peters

Ms. Peters taught sixth grade math and was a math major. She has taught 9 years, all of which were at Hulsey Middle. Ms. Peters demonstrated knowledge of mathematics and showed students various ways to arrive at the same answer. She has established expectations and procedures, as noted in students arriving to class and getting started on board work. Ms. Peters often made sarcastic and harsh remarks such as "You all don't need to recreate the Mona Lisa it's right there before you. You don't listen." Ms. Peters shared that she has embarrassed students publically in class for putting down on other students.

Ms. Terry

Ms. Terry taught seventh grade math and Pre-Algebra and was in her seventh year of teaching. Her background included teaching in an elementary school as well as teaching special education students. Ms. Terry had established rapport with students and was working to maintain procedures and control in the classroom. Numerous student outbursts and disruptive behaviors were observed in Ms. Terry's class. Ms. Terry was cognizant of the need to improve classroom management and had incorporated a positive behavior system with supports and incentives.

Ms. MacPhearson

Ms. MacPhearson taught eighth grade math and Algebra I. She was the most experienced of the teacher participants, with 14 years of experience, all of which were at Hulsey Middle. Ms. MacPhearson appeared to be very stern but had a passion for mathematics and student achievement. Her passion for math and student achievement was noted in her tutoring two students in Algebra during her planning period. She also initiated a peer tutoring program to assist her intervention students.

Participants

Student participants were chosen using a criterion-based sampling that included some aspects of maximum variation sampling. Administration and teachers in the study were informed of the criteria for student participants. The criteria included African American female students in Grades 6, 7, and 8 who were making progress in math as reflected in local school and AYP measures. The criteria included choosing students who reflected an array of academic abilities. Glaser and Strauss (1967) founded the concept of maximum variation sampling on the premise

that a theory could be more practical when grounded in widely diversified instances of the experience. Patton (1990, 2002) found that diversity within a small sample can reveal unified patterns that intersect across cases and develop their importance from having materialized despite the absence of homogeneity. The criteria for student participants included two commonalities: race and progress in math. The other criteria, student's measured ability level, required some variation within each grade level. The researcher utilized an observation rubric (Appendix B) when observing student participants. The rubric was used to assess various student interactions during the observation. The results of the rubric were reflected on a scale of *never* to *always* to demonstrate student interactions with the teacher and peers during the lesson observations.

Student participants were identified using administration and teacher recommendations. Nine students were selected from this information. The participants were grouped in three categories--high, middle, and at risk--based on classroom grades, standardized test scores, and district benchmark scores. The researcher utilized participants from Grades 6, 7, and 8 to analyze variations in teaching practices, experiences, and the formal and informal curriculum.

Permission to Conduct the Study

The researcher requested permission from the IRB for inclusion of human participants in the study. All participants at Hulsey Middle were given an informed consent prior to the beginning of the research study (Appendix C). Parents were given an informed consent form before students were observed. Participants were informed that information obtained in the study would remain confidential and their identities would be anonymous. Anonymity was ensured through providing the site, participants, geographical location, and any other personally

identifying information with a pseudonym in the study. Confidentiality was maintained through placing audiotapes, after transcription, and observation notes in a locked file. Interviews were conducted in a private area to ensure confidentiality for student participants.

Data Collection

The study was a descriptive case study. The data for this study were collected through multiple sources. These data sources included documents such as district/state policies, system-wide mathematics benchmarks, standardized achievement results, and individual student grades. The mathematics curriculum was investigated to determine whether there was an inclusion of activities to accommodate various learning modalities. Semi-structured interviews, classroom observations, and participants' journals were utilized as data sources.

The following table shows the methodology that assessed the study's guiding research questions.

Table 1

Methodology for Assessing Research Questions

Questions	Data sources	Analysis methods
What strategies within the formal and informal curriculum are having an impact on the mathematical achievement of African American females?	Observations, interviews, field notes, document (policies, curriculum, grades) audio-taped discussions	Coding and recoding to examine common themes, document analysis
What are the classroom interactions occurring in a mathematics classroom among teacher, students, and peers?	Observations, interviews, rubric	Coding and recoding to examine commonalities and conflicts
What are African American female students' perceptions of their mathematics experiences within the school setting?	Interviews, journal entries	Coding and recoding to examine conflicts and commonalities

The research design was a single embedded descriptive case study focusing on the aforementioned middle school. The unit of analysis for this case study was African American female students.

I observed the African American female participants during 30 classroom observations. These observations occurred during sixth, seventh, and eighth grade math classes. The participants at each grade level were spread out across math classes. Only two of the African American female participants were in the same class. Therefore observations spanned across periods two through seven with sixth period being a time to conduct formal interviews and informal conversations with the math teachers. The observations served the purpose of collecting data about students and their interaction in mathematics class as well as the general operating schedule of the mathematics class. An observation rubric was created to guide and structure observations (Appendix B). The classroom observations were 50 minutes and occurred over a span of 4 weeks. The formal structures in one of the classrooms made it difficult to interact with students during the observation. The other two classrooms were more intertwined with formal and informal structures, which allowed me to become more of a participant observer. As a participant-observer, I was able to enter the mathematics world of student participants and gain their trust while systematically keeping a written record of what was going on in the classroom (Bogdan & Biklen, 2003). Using the observation rubric, I examined the classroom discourse and noted the frequency with which students asked and responded to questions, interacted with peers, and worked independently. The analysis of classroom discourse also inspected teachers' responses to participants and patterns of interaction between the teacher and participants. I utilized field notes that were taken during classroom observations to note the commonalities and disparities that emerged between participants and classroom practices. I also observed

participants during class transitions and included these observations in my field notes.

Participants were also observed during lunch time, scheduled drills, and dismissal times. Some of the participants indicated that they were involved in extracurricular activities such as band and basketball. However, none of the participants attended any after-school sessions for these events during the 4-week observation period.

The interview protocol in case study research usually lends itself to a more open-ended and less structured format. This allows for participants to share facts as well as their opinions (Merriam, 1998; Yin, 2003). The semi-structured interview protocol was utilized for this research to allow me flexibility in engaging participants in conversation about observations and their viewpoints of formal and informal structures. I created semi-structured interview protocols for administration, teachers, and student participants (Appendix D). The interview protocol for students was piloted with three African American females ages 9-12 that are in my Sunday school class. I obtained verbal permission from their parents prior to the interview. The findings from the pilot led to me revising the interview protocol. I removed two questions that were redundant and added three additional questions. The teacher interview protocol was piloted with a sixth grade teacher from another school site. There were no revisions to this interview protocol after the piloted interview. The following participants were interviewed during the study: the principal and assistant principal, the teachers' for the student participants, and the nine student participants. Interviews with the school administrators and teachers were approximately one hour in length with student interviews being approximately 30 minutes.

Data Analysis

Interview information was audio taped and transcribed using verbatim transcription. The teacher participants in the study declined to have their interviews recorded. Two of the participants indicated that the tape recorder would make them more nervous therefore hindering the natural flow of conversation. The other teacher participant did not give a reason for declining to be recorded. Therefore, notes were taken immediately following the interview in order to capture as well as possible the words of the teachers. All parents and student participants agreed to participate in the study. However, one student participant withdrew from the study after the first week due to her parent changing her mind about the student's participation. This student was replaced with another eighth grade female assigned to Pre-Algebra. The student who withdrew from the study was rated as a high achiever by assessment measures and the only African American female in the Algebra I Class.

Classroom observations were conducted through direct observations. Field notes from direct observations were coded and analyzed for conflicts or reoccurring themes. Open coding was used. Documents such as student grades, district benchmark scores, and standardized test data were analyzed and used to track changes in student performance. A comparison of the students' current year and previous years' performance on report cards and district benchmarks were conducted. Students' individual report cards and district benchmark scores were monitored for performance during the first grading period and first administration of the current year benchmark. Other documents such as the math curriculum and policies were analyzed for consistency with findings in the literature.

The purpose of case study analysis was to gather inclusive, efficient, and thorough information about each case being studied (Patton, 1990). The data analysis for this research

included individual case analysis and transitioned to a cross analysis. The data collected for each individual student participant was analyzed for variations and consistencies. This information was then cross-referenced with the other student participants and coded for themes or categories that emerged. By presenting the case topically, themes were noted across the cases.

The observations and interview information provided rich data to capture the experiences of the females in the study. This research documented the stories of the African American female participants, their perceptions and attitude toward mathematics, and the value connected with mathematics. The general context of the classroom permitted these females stories to be portrayed in a real setting. The methodology utilized for this research has been deemed vital in analyzing students' mathematical experiences.

CHAPTER IV
ANALYSIS OF DATA

Introduction

This study focused on the math experiences of nine African American middle school female students, in Grades 6 through 8. Math experiences ranged from being enrolled in general grade level math to Pre-Algebra. There was only one African American student enrolled in the Algebra I class at Hulsey Middle and she withdrew from the study. Although the student was replaced, she was replaced with a student from eighth grade Pre-Algebra. This created a vacancy in data to report from a more advanced math setting. The report card grades, discipline data, district benchmark scores and standardized test grades for the nine female participants provided the preliminary information for analysis. The data analysis and findings represent the female participants' math experiences, perceptions of these experiences, and surrounding factors that have impacted these experiences.

The findings in this case study are reported by individual cases with themes based on cross-case analysis guided by the following research questions:

1. What strategies within the formal and informal curriculum are having an impact on the mathematical achievement of African American female students?
2. What are the classroom interactions occurring in a mathematics classroom among teacher, students, and peers?
3. What are African American female students' perceptions of their mathematical experiences within the school setting?

In analyzing the data, I focused on multiple sources of data and their commonalities and disparities in deriving the themes of this study. The analysis revealed the following broad themes: mathematical perceptions and institutional structures. In addition to the aforementioned themes a third theme emerged: examining the data-resiliency. For the purposes of this study, resiliency was defined as the ability to adjust, cope, and adapt positively to adversity and stress in life and achieve success (Ashford, Lecroy, & Lortie, 1997; Winfield, 1994). The resiliency and self-determination of the nine participants in this study resonated as a crucial factor in examining their academic achievements. In this study, resiliency is measured by school persistence and efforts to achieve. This theme was revealed in student observations and interviews as well as interviews with school personnel.

Figure 4 illustrates the definitions as used in this study and dimensions for mathematical perception and institutional structures.

Mathematical Perceptions Definition	Dimensions of Mathematical Perception	Institutional Structures Definition	Dimensions of Institutional Structures
Students' awareness of mathematics in general.	<ul style="list-style-type: none"> • Value placed on learning mathematics • Mathematical attitude • Connections with mathematics as a venue for future aspirations 	The available support systems that assist students in their mathematical achievement.	<ul style="list-style-type: none"> • Teacher influence • Program Influence • After-School Services • Scheduling

Figure 4. Definitions as used in this study.

The conducting of observations and interviews was intertwined throughout the study. However, interviews with students were not conducted until the majority of observations were completed. After completing observations and interviews, the raw data were assembled and a formal analysis began. Interviews that were recorded were transcribed verbatim. I systematically

began the analysis process for the field notes and interview transcriptions. The information from the participant journals was included in this analysis. In creating the narrative of each participant, I utilized their previous performance on local and standardized assessments as well as discipline information. The narrative case for each participant focused on their interaction with two areas, the formal curriculum and the informal curriculum. The formal curriculum narrative juxtaposed the participants' current and previous performance on AYP measures and local grading systems. The lens of the informal curriculum was scrutinized through participants' current and past discipline issues, their interaction with peers in settings outside the classroom, and participation in extracurricular activities.

Math Identities of Nine Individual Students

Figure 5 shows the participants' discipline infractions and academic achievement on standardized, a district assessment, and school grading measures.

Students	Teacher Label	Discipline		Grades		SAT 10 2009-2010	ARMT 2009-2010	Math Benchmark Fall	Math Benchmark Spring
		2009-2010	2010-2011	2009-2010	2010-2011				
Taquita	High	1	0	95/A	92/A	79-7	4	80%	80%
Gavonna	High	0	1	85/B	86/B	67-6	3	65%	71%
Marie	High	0	0	83/B	75/C	60-6	3	40%	46%
Samantha	Middle	0	0	86/B	80/B	69-6	4	65%	65%
Ramiya	Middle	0	1	81/B	85/B	50-5	3	60%	50%
Glenise	Middle	1	0	83/B	78/C	42-5	3	33%	32%
Jelissa	Low	1	9	63/D	71/C	26-4	3	60%	60%
Eugenia	Low	2	7	67/D	84/B 91/A	21-3	2	37%	50%
Doniqua	Low	1	6	65/D	68/D 83/B	21-3	2	35%	32%

Figure 5. Student discipline information and grades.

Case 1: Taquita

“I love math! It is one of my favorite subjects.” This statement from sixth grade Taquita characterizes her enthusiasm not only for math but for learning. Taquita is the only African American female enrolled in section seven of Math 6. This was a general mathematics course for sixth graders. There are 18 students in the class. Being the only African American female does not appear to bother Taquita because during classroom observations she interacted frequently with her peer group. She sat in the second seat from the front behind a Caucasian female and in front of an African American male both of whom she talked with during lesson observations. Taquita’s teacher, Ms. Peters, was highly complimentary of Taquita’s math skills. She stated, “Taquita’s strengths are she is confident and a good math student. She knows that she knows her math.” Taquita was the student rated as a high achiever by Ms. Peters. Taquita’s strength in math was reflected in her report card grades and performance on standardized assessments. Taquita’s report card grade in math was an A during her 5th and 6th grade school years. Her performance on the math section of the SAT 10 was the highest of all girls in the study. She scored in the 79th percentile and the 7th stanine on this assessment. Furthermore, she scored the highest score possible on the ARMT, a 4. The aforementioned assessments, coupled with her teacher’s appraisal, demonstrated that Taquita was a proficient math student.

Taquita could be characterized as social, polite, and a teacher pleaser. Ms. Peter’s stated, “She is very social.” Taquita was frequently observed talking with other students during class transitions and in the cafeteria. Her politeness was demonstrated in the cheerful greetings that I received whenever our paths crossed in the hallway as well as her interaction with the school’s clerical secretary when she entered the office to report that she was not feeling well. During one lesson observation, Ms. Peters drew a fence to demonstrate a math problem. Several students

commented on Ms. Peter's drawing inquiring as to what it was supposed to be. Taquita responded by stating, "I think your fence is beautiful."

She had no discipline referrals for the current school year. However, she did incur a discipline referral the previous year for vandalism. Taquita is not a part of extracurricular activities because Hulsey Middle only offers band as an opportunity for students in the sixth grade and she had no interest in band. She is however a member of the Junior Beta club. Taquita shared with me that she was inducted into this club in December and was a member of the Letterman Club in elementary school.

Taquita lives with her mom and her stepdad and no other siblings. During informal conversations, Taquita talks about her biological father and the fact that he has a wife and four other children. She discussed being able to spend time with him on the weekends. Taquita's teacher, Ms. Peters, stated that Taquita's confidence in her math abilities made her feel that she probably has more supportive structures at home. It was apparent that Taquita had a very strong relationship with her mom and had certain values from home that had been instilled. During the interview, Taquita revealed that she usually goes to her mom for help with difficult math problems because she knows that her mom will help her. When asked would she skip math class for a day, Taquita was emphatic in her response that she would not skip because of the consequences that she would receive from her mom.

Case 2: Gavonna

Gavonna was a seventh grade student enrolled in Math 7. This was a general seventh grade mathematics course. She sits at the front of the class near a Caucasian female and an African American male with whom she occasionally interacts. There are 28 students in this math

section of which six are African American females. Gavonna's teacher, Ms. Terry describes her as attentive and easy to catch on. She also states that Gavonna demonstrates the most capabilities in her academic performance. Gavonna is the student rated as a high achiever in math by her teacher. Her performance in math on her report card was a B both this year and the previous year. She demonstrated proficiency in math on the ARMT assessment with a score of 3. Her SAT 10 scores revealed her total math performance at the 67th percentile ranking and the 6th stanine. It was apparent that Gavonna was more fond of the Language Arts area, as evidenced by her standardized assessment performance in this area and her entering the interview with a book. She scored the highest score possible on the ARMT in Language Arts with a rating of 4. Her SAT 10 score in total reading was in the 92nd percentile ranking and the 8th stanine. Gavonna shared with me a book that she was composing and had four chapters completed.

Gavonna currently had one office referral for a minor disruption on the bus. However, during class observations, she never demonstrated any disruptive behavior and worked well with her peers. During the first observation, students were allowed to choose math partners. A male student chose Gavonna and she assisted him with his math work throughout the observation. Although I observed Gavonna interacting with peers during lesson observations by assisting them with their math, she ate lunch in the cafeteria alone. Gavonna shared with me during lunch one day that she mostly sat alone in the cafeteria because she does not have friends. Her interaction with peers at class transitions was almost nonexistent. During her interview with me, Gavonna made the following statement about her relationship with others:

I don't really have a lot of friends and most of my friends are in older grade levels than me and I'm not . . . I'm really the shy person with if I don't really like to hang out in social groups that much; I'm a really nice person if you let me but it kinda the friend relationship started in third grade where all my . . . I had a friend that she like she pretended to be my friend cuz she felt like pity for me and I'm the kind of person I guess I threw myself in school because school when you're studying . . . when you're focused

on work you really don't have to worry about what people are saying. And I'm a really self-conscious person. I've . . . I hate being ridiculed cuz I use to be ridiculed when I was little and I still am so I'll stick my nose in a book and I'll just read all day. Most people that'll watch tv. If I find something interesting like I'll go on websites that have like 70 chapter books on it and I will sit there in my room with my cell phone on the internet and just read, read, read. Yeah then, I'll text people like occasionally. I've text people over a thousand times but mostly if it's face to face you can tell if someone is lying or if their being fake with you. I'll text you but like most of the time I would rather sit back have a book in my hand; and just be reading. Cuz I've read the whole Twillight series in like 4 weeks; like I took like a few chapters a day and all of that. And I read that in like four weeks. I'm on the second book in this series and I just . . . like books are like kinda my outlet of when I don't have friends, so school is kinda my outlet when I need . . . when I'm in school and my friends are here and if I don't feel like they're really wanna be my friend or something I will go and grab a book or grab some work and start throwing myself in it just to get away.

Gavonna described herself as a nerd who likes school even when she's not doing well.

She shared with me that her math grade had dropped to a D on her 2-week progress report. This lowered grade had affected her participation in the school's Student Idol contest. Although, Gavonna described herself as shy she shared that she does like to rap She stated, "Last semester everyone found out I could rap and all that stuff and so at the end of class, Mr. Brewster would come in and he'd put a beat on and we'd be rapping off of it in class." Gavonna did not let her self-proclaimed shyness hinder her from participating in school clubs and extracurricular activities such as Drama Club, marching and concert band, SGA, and Jr. Beta.

Gavonna lived with her mother and an older brother. It was evident that Gavonna's mother was strict and had high expectations for her academic performance. Her being removed from the Student Idol contest because of grades was a testament to her mother's expectation of good grades in school. During her interview, when asked what she would say to a friend who wanted her to skip math class, Gavonna responded,

I would tell them boo for you. I'm not skipping because if my mother ever found out I skipped I'd get in trouble. It's not worth it getting in trouble with the school for skipping the class and getting in trouble at home.

Although it appeared that Gavonna's mom was strict, it was also apparent that she had a close relationship with her mom. During the interview, she shared how she helps her mom with cooking and they go shopping together. She had very little to say about her older brother but did mention how she calls her granddad sometimes for help with difficult math problems.

Case 3: Marie

Marie was an eighth grade student enrolled in Pre-Algebra. She was the student replacing the Algebra student who withdrew from the study. Marie was identified as the highest of the other African American females enrolled in eighth grade Pre-Algebra. She had maintained a B average in math both this year and the previous year and did not require enrollment into the math intervention class. Marie's performance on standardized assessments represented that she had some knowledge of math concepts. Her performance on the ARMT math assessment was rated a three and her SAT 10 scores revealed that she was in the 60th percentile and 6th stanine.

Marie was talkative and interacted frequently with the teacher during lesson observations. She was observed asking questions, modeling math problems on the dry erase board, and seeking assistance from peers when needed. Marie was compliant during most observations but she was also observed talking during a quiz and making statements to get her peers to laugh. For example, during my first observation Marie raised her hand and when the teacher called on her she responded, "I'm ready to go." This is in reference to the teacher's earlier comment for Marie to "Let's go" when she was talking with a peer instead of working. Marie was called on frequently to model math problems or answer questions and she often gave the incorrect response. Marie often gave excuses when she answered a question or solved a math problem incorrectly. For example, when she incorrectly solved a homework problem she responded, "I

just noticed that I wrote it down wrong.” On another occasion when solving a problem incorrectly Marie responded, “Oh I wrote that wrong. My bad.” Her teacher, Ms. MacPhearson, stated, “Marie likes to get attention even if it’s negative. She’s a character. You will notice that.” I observed her often asking mundane questions just to get a reaction from the teacher, such as “Do we have to write the work” (this is after the teacher has just stated show all work), “So all we have to do is the graph” (after the teacher has just stated that the graph is the work), “Can we have 0/1” (following the teacher’s demonstration of the correct answer).

Marie’s somewhat disruptive behavior was reflected in the two discipline referrals that she had incurred both this year and the previous year. Her referrals for the current year were for Disorderly Conduct and Other Unacceptable Conduct. Her previous behavior infractions included Threat and Harassment and Other Violations. Although there was a previous discipline history, Marie was not observed interacting negatively with peers in class or during transitions. She was observed being focused and working independently during independent work time.

Marie was a member of the Junior Beta Club, FBLA, and Drama. She had a desire to be on the softball team but did not make the team. During her interview she stated,

Um I don’t play softball. Well I do play but I didn’t make the team for some reason. I didn’t try out this time. You have 10th, 9th, 8th, and 7th, trying out for 15 slots. So everybody cannot outshine.

She interacted and talked with the other two eighth grade participants, Glenise and Doniqua, during class transitions and in the cafeteria. Marie shared with me before the interview that she lived next door to Doniqua and Jelissa.

Marie lived with her mom, two older sisters, an older brother, and her brother-in-law. During the interview when I asked Marie how she used mathematics at home, she stated,

Cuz my mom um she was a dropout so sometimes she don't . . . she don't know how to go like over numbers and stuff like that; when she trying to add up when we grocery shopping so I'll tell her like how much and stuff.

Marie also stated that her sister's husband is the one she goes to when she is struggling with a math problem at home. Although her mom did not complete school, it was apparent that good grades and respectful behavior were an expectation. Throughout the interview, Marie responded with yes and no ma'am. She also reported that her grades had better be good on her progress report or she would be in trouble at home. Unlike some of the other girls in the study, Marie shared that she did not own a cell phone because her mom said that she did not need one.

Case 4: Samantha

“Samantha is very outgoing; vivacious. At the beginning of the year she would raise her hand to reiterate what I said . . . what you're saying is. . . .,” states Ms. Peters with a smile. Samantha was a sixth grade student rated as a middle math achiever by her teacher and school staff. Although, Ms. Peters states, “Of the three girls in the study, Samantha shows the most focus and consistency.” She was enrolled in regular sixth grade mathematics and was the only African American female in a class of 27. Samantha sat at the very back of a row of five students. Her location in the classroom and her presence as the only African American female did not appear to break Samantha's focus or confidence. During lesson observations she frequently raised her hand to answer questions. She was compliant with directives and went the extra mile in class assignments. For example, during a lesson observation, Ms. Peters informed students that they would not have to draw the circle for the notes to represent the percentages. However, Samantha drew the circle and filled in all the information needed and not just the

answers. Samantha was also confident in her ability to do the math. The following excerpt from her interview demonstrated this:

I: Okay. Samantha, do you consider yourself a good math student?

R: Yes

I: Tell me why.

R: Because um I can get like the answer faster than someone else can and I can help em.

Samantha's academic performance reflected her confidence and teacher commendations about her math abilities. Samantha scored the highest score possible in math on the ARMT, a 4. Her math performance on this assessment and the SAT 10 was better than her reading performance. Samantha's scores on the SAT 10 in math were the second highest of the nine participants. She scored in the 69th percentile and 6th stanine. Her report card grade was maintained at a B for both this academic school year and the previous school year.

By normative standards, Samantha represented the model student. She had no discipline referrals this year or the previous year. She interacted well with her peers, participated in class, and was a member of the band. Samantha also chose to join in the school-wide Student Idol contest and sing a song with her brother.

Samantha lived with her mom, dad, and eighth grade brother. Samantha was one of the students that Ms. Peters discussed how the supportive home structures had contributed to her performance in mathematics. During the interview, Samantha discussed using her mathematics skills for assisting her mom with cooking at home. It was apparent that Samantha had a close relationship with her brother as evidenced by their dual participation in the school-wide Student Idol competition. Samantha also shared that it is her brother who gives support and assistance when she is struggling with a math problem at home.

Case 5: Ramiya

Ramiya is a seventh grader. She was currently enrolled in Math 7 where she sat at the front of the class. This was not an advanced mathematics course. She was one of four African American female students in this section of Math 7. There were 28 students in the class. Ramiya sat beside a White male student with whom she never interacted during lesson observations. Although, she had one discipline referral this year for disorderly conduct, Ramiya was one of the quietest students during lesson observations. She was the seventh grade student that her teacher characterized as a middle achiever. Her math performance, as measured by report card grades, was a B for this current school year and last year. Ramiya's performance on standardized assessments, however, did not correlate with her local school grading measures. During the previous school year, Ramiya scored proficient on the ARMT with a score of 3. She also scored in the 50th percentile ranking and stanine 5 on the SAT. Her spring math benchmark data results showed that Ramiya had mastered 50% of the math standards. This was a decline from the 60% mastery that she demonstrated in the fall.

Ramiya was a responsible student, as evidenced by her being assigned as a Library Assistant during the first period of the day. She was friendly and interacted positively with her peers during class transitions and lunchtime. Ramiya shared with me about her homeroom's participation in an ice cream party because of their participation in a schoolwide fundraiser. She tried out for the school's basketball team and made the team. However, due to her inability to stay for the first practice, she was removed from the team. Ramiya shared with me that she was going to try out for the team again next year.

Ramiya lived with her mother, stepdad, and two younger male siblings. In her journal, she shared that she gets to visit her dad sometimes on the weekend. Her interview response

revealed a positive relationship with her stepfather. When asked how she used math at home, Ramiya stated, “I try to outsmart my stepdad with different problems.” Although Ramiya shared that her mom did not have much patience when it came to helping her with homework, she still solicited her mom’s help when she was struggling with a math problem. During one of my visits, Ramiya shared that it was her birthday. She stated that she planned to celebrate her birthday with her family. Ramiya later shared this in her journal about her birthday: “Today is my birthday! I’m so happy, this weekend I went to get my nails done. Then I got my toe nails done too! I am gonna get ice cream and cake. It will be a good day too.”

Case 6: Glenise

Glenise was an eighth grader. She was enrolled in eighth grade Pre-Algebra. This class had 23 students. Eighth grade Pre-Algebra was offered for students not taking Algebra I. Glenise sat in the second seat from the front in this class. There were seven African American female students in this section of Pre-Algebra. Glenise had a twin brother in the Pre-Algebra class. Her teacher, Ms. McPhearson, shared what she had noticed about the siblings’ interaction outside of class. Ms. McPhearson stated, “Glenise and her brother do not help each other outside of school. For example, if one of them is absent from school, the other will not share with them what they have missed or the homework assignment.” Glenise was the student identified as a middle-achiever in math. Her grades in math have dropped from the previous school year from a B to a C. Despite this fluctuation in grades, Ms. McPhearson praised Glenise’s math performance noting that she was a student who was not afraid to ask questions or ask for help. The analysis of Glenise’s performance on last year’s standardized assessments revealed that her performance in math was better than her reading performance. Glenise scored in the 42nd percentile ranking and

5th stanine on the SAT 10 in total math. Her performance on the math section of the ARMT revealed an overall rating of 3. She demonstrated partial proficiency in reading on the ARMT with a score of 2. Furthermore her SAT 10 reading scores were in the 20th percentile ranking and 3rd stanine.

Although there was a discipline referral incurred the previous year for excessive tardiness, Glenise's teacher from last year commented on her report card that Glenise was "a pleasure to have in class." Glenise was observed engaging in a confrontation with another female peer in the cafeteria. During this observation she stood up from her table and yelled across the cafeteria to the other female student, "What you gonna do?" The altercation was apparently over a male student because the other female replied, "I don't even like him. You can ask him." Upon which the other female goes to a male student and he walks over to Glenise and shares that he doesn't like the other female student. At this point, Glenise sits back down and began talking to other students at the table.

Glenise was very social and interacted with peers in the hallway, bus, and cafeteria. During class transitions she was observed talking and laughing with friends as they went to their lockers. Her interaction with peers, however, was not always viewed as positive in these settings. One day as the classes were transitioning, Glenise shared with me that she had been horse playing in the hallway and would probably receive a discipline referral to the office. When I spoke with the assistant principal, he confirmed that a teacher reported that Glenise and a male student had been horse playing in the hallway but he had not received an official discipline referral. On another occasion as I was preparing to leave the building at the end of day, Glenise and three other students were sitting in the office. She and the other students had been brought back to the school by the bus driver for disruptive behavior. While asking Glenise about the

incident, she began crying, sharing that she was trying to break the fight up between two other students and was not involved in the physical part of the disruption. The assistant principal confirmed this but added that Glenise was brought back to the school for leaving her seat and not allowing the driver to take care of the situation.

During her interview, Glenise shared that she played basketball. Her participation in this extracurricular activity did sometimes affect her academic performance. Glenise shared the following about her participation in basketball:

It really don't affect me that much but if you like get home late from a game that usually affect me a little bit cuz you have to stay up a little more extra time like past your bedtime. I'm a say like mines like 9:00 and if we don't come home til like 11:00 and you have homework to do that usually affects me a little bit cuz you have to stay up more and do your homework.

Although basketball was the only extracurricular activity or club that Glenise was a part of she did share an interest in joining the Future Business Leaders of America (FBLA) club through her statement "I'm probably gonna be in FBLA. I'm a bring my money tomorrow."

Glenise lived at home with her mom, her twin brother, and an older sister. During her interview, she chose her older sister as the person whom she asks for help when she is struggling with a math problem at home. Although Glenise was being reared by only her mom, it was evident that manners and good behavior were an expectation. This was evidenced by the numerous yes ma'ams that she responded with during the interview. The expectation of good behavior was reinforced by her being visibly upset from the previously mentioned bus incident. During this incident I asked her what would be her mother's reaction when she arrived at the school to pick her up. Through her tears she shared that she was going to be in a lot of trouble and would probably be placed under punishment.

Case 7: Jelissa

Jelissa is a sixth grade student. She has an older sister, Doniqua, who was also a part of this study. Jelissa and her sister's mom had recently passed away and they were living with an aunt. She and her sister came to the Tannasa School District in the middle of the previous school year. Jelissa had two older brothers, one of which attended the high school next door. Jelissa's other brother was an adult who was employed at a car manufacturing plant. Jelissa talked with me at great length one day as I sat in the library about how much she missed her mom. During this conversation, she shared how her dad had never really taken an active role in her life. She stated that her Dad was supposed to come and pick up her and her sister for Christmas but had not. Jelissa confided in me about how hard it had been for her and her sister once her mom had gotten sick. She further shared that she was grateful to her aunt for stepping in to raise she, her sister, and two brothers after their mom passed away.

This was Jelissa's first year at Hulsey Middle. During an informal discussion, I learned that her transition to Hulsey Middle had been a difficult one. This conversation focused on her poor choices in peer relations earlier in this school year. Jelissa discussed one particular student they called "Big Head" who would always get she and her sister in trouble. Jelissa's struggles with transitioning to Hulsey were reflected in the nine discipline referrals she received during the current school year. These referrals included threats and harassment, intimidation, disorderly conduct, disrespect to an employee, fighting, and minor disruptions on the school bus.

Jelissa was enrolled in section three of regular sixth grade mathematics. She sat at the very front of a row situated in front of the teacher's desk. She was the only African American female enrolled in this mathematics section. Jelissa was very quiet and withdrawn during classroom observations. She rarely interacted with peers and stated during her interview, "Like

I'm trying to change my life around and quit . . . like talking 'bout people and everything.”

Jelissa was the only African American female in a class of 23 students. She sat at the front of the room and often looked back during lesson observations to see if I was watching her. Jelissa had been classified as the low math achiever and often appeared bored and disengaged from the lessons. Despite her classification as low she was not receiving math intervention services through an assigned class and had maintained a C average on her report card grades in math. Jelissa's standardized assessment scores reflected a variation in her math performance. On the ARMT, she demonstrated proficiency with a rating of a 3 in math. However, on the SAT 10 she scored in the lower percentile ranking with a 26th percentile ranking and the 4th stanine. Jelissa was, however, making progress because her teacher, Ms. Peters, and the assistant principal shared that she had been receiving interventions through a Student Support team for her initial struggles in academics and behavior. However, both were elated to share that Jelissa had been called into a meeting with the Student Support Team for them to share with her that she had met all of her goals both academically and behaviorally. She would no longer receive accommodations or interventions for academics and behavior. When I asked Jelissa how this made her feel, she smiled and said, “I'm glad I'm doing better. My sister doing better too.”

Jelissa was not a part of any clubs or extracurricular activities. However, she referred to working with the counselor as being in like a club. During the interview Jelissa shared this,

Like it's this club with Ms. Donahoo. It's like we come in here and its African American Black girls and so like it's the girls who like that they wanna talk with her and get out of trouble and the girls who think they got . . . like she tried to keep us from holding grudges.

She credits this class with assisting her in getting along better with her peers. Although Jelissa was transitioning into Hulsey Middle from another school setting, she felt that she had made lots of friends. The following excerpt from our interview confirms this:

I: Would you say you have lots of friends here?

R: Yes ma'am

I: Cuz I know you are coming from a different school. So you have made a lot of friends?

R: Like yes ma'am. Cuz like everybody like respect me cuz like my cousin he over there at the high school. Like every girl wanna date him and stuff. Like they wanna be my friend just to get to my cousin.

Case 8: Eugenia

Eugenia was a seventh grade student who represented the deviant side of African American females. During my first two attempts at classroom observations, she was assigned to the school's Detention class for bringing a cell phone. Her teacher, Ms. Terry, felt that the influence of peers had affected Eugenia's behavior. I observed Eugenia in the cafeteria being extremely loud with a group of African American females. During lesson observations, Eugenia would enter the classroom loud and talkative. She made inappropriate comments to peers and the teacher and frequently blurted out during lessons. The following example from a lesson observation personifies this: *Eugenia enters the room*: "Ms. Terry you haven't been here in forever. I couldn't stand that substitute Ms. Miles. I swear I couldn't." Also during this same observation, before class began, Eugenia stated to another African American female student, "I don't want to be on the team if she is on there. I am going to end up hitting her in the face with a bat." These comments were typical and transpired during several lesson observations as well as class transitions.

Eugenia had seven discipline referrals for the current school year for violations such as offensive touching, indecent exposure, defiance or disrespect, disorderly conduct, and possession of a communication device. There were multiple referrals for defiance or disrespect. Eugenia's

behavior had increased from the previous year where she had received only two referrals to the office for failure to follow instructions and intentionally hitting others. However, during the interview she was very polite often answering with yes ma'am.

Despite the numerous class disruptions and office visits, Eugenia had maintained her academic performance in math as measured by the school's report card. Her current report card grades were a B in seventh grade math and a C in the math intervention class. This was an increase from her last year's performance in math, which was a D. Her previous year's performance on the SAT 10 and the ARMT were not complimentary of the grades she was currently receiving on her report card. She tied for the lowest slot of all nine participants on these standardized assessments with a rating of 2 on the ARMT and a score in the 21st percentile and 3rd stanine on the SAT 10. Eugenia was the student identified as a low math achiever by her teacher and school administration.

Eugenia was one of six African American females enrolled in Math 7. There were a total of 27 students in the class. She sat beside an African American female and a Caucasian female in this class. She frequently talked and laughed with the African American female seated beside her in the Math 7 class. This is the class where Eugenia was most disruptive. The math intervention class had a smaller student population with 21 students. Eugenia was one of five African American females in this class. She sat beside an African American female and behind an African American male, with whom she interacted frequently during lesson observations. She also assisted this peer with class assignments. Although Eugenia demonstrated disruptive behavior in the math class, she participated frequently, asking and answering questions. Her responses to most questions were correct.

Eugenia was very social and interacted with peers frequently during class transitions. She participated on the girls' softball team and planned to try out for cheerleading in the spring as well as join the English club. Eugenia shared that she was going to try out for basketball next year.

Eugenia shared during her interview that she has two older brothers who heavily influenced her math performance. She stated, "My brothers, when I was little, they would um teach me how to do their math. Like when they taught me I would be mad at them." Eugenia lived at home with her mom and two older brothers. She discussed how she helps her mom in figuring out how much money is owed for bills. Her participation in extracurricular activities provided evidence that her mom provides financial support for her schooling interests but showed little support for other areas of the school curriculum. For example, when I asked her if she had gotten in trouble for being placed in Oscar she stated that her mom did not care that she was in Oscar.

Case 9: Doniqua

Doniqua was an eighth grade student enrolled in Pre-Algebra and a math intervention class. She sat in the last desk in a row of three during both classes. There were 29 students in the Pre-Algebra class and she was one of five African American females in the class. The math intervention class had an enrollment that fluctuated but averaged about 16 students. Doniqua was one of four African American females in this class. Doniqua and Jelissa were sisters. Doniqua was more reserved during conversations, as compared to her sister. During formal and informal conversations she never talked about her home life or any difficulties that she was experiencing in school. She was very nervous during the interview and gave limited responses.

Doniqua interacted frequently with her peers during lesson observations but rarely raised her hand to participate, ask questions, or interact with the teacher. The classroom and inclusion teacher and a peer tutor frequently assisted Doniqua during math class. Her grades, placement in a math intervention class, and standardized assessment performance revealed that math was somewhat of a struggle for Doniqua. She maintained a D on her report card for Pre-Algebra but had shown great progress in the math intervention class and received a B on her second 9-weeks report card. Doniqua's scores on the standardized assessments were tied for the lowest of the nine participants. She scored in the 21st percentile and 3rd stanine on the SAT 10. Her performance on the ARMT demonstrated struggles with proficiency as she rated a 2. Doniqua was the student classified as a low math achiever by her teacher and school officials. Her teacher, Ms. MacPhearson, stated, "Doniqua's hindrance in math comes from her not knowing her basic multiplication facts. Although she is low, she does her homework every night." Doniqua's math teacher from the previous year stated that low test scores had contributed to the low report card grades. During Doniqua's interview she told me, "I don't like math that much."

Doniqua, just like her sister, had struggled with the transition to Hulsey Middle. She currently had six discipline referrals for defiance and disrespect, threats, harassment/intimidation, defiance, fighting, and other unacceptable conduct. The previous year, Doniqua had received only one discipline referral for disrespect. Doniqua never demonstrated any disruptive behavior during lesson observations. During informal observations, she was observed talking and laughing with peers. She sat with a group of African American females in the cafeteria. Doniqua shared during her interview that she was not a part of any extracurricular activities. However, she expressed a desire to be on the basketball team and when asked why she was not on the team she stated, "I want to play basketball. You have to take a physical and I hadn't had a physical."

The Formal Curriculum

Hulsey Middle School has made great efforts to create a school environment that is conducive for student learning. The institutional structures consist of the supports that the school has made available for students to strengthen their achievement in mathematics. These institutional structures consist of class scheduling, teacher assignments, and resources. Hulsey Middle School mathematics courses consisted of three levels: skills, regular, and enrichment. Students are assigned to one of these levels based on their mathematical performance. This institutional structure of dividing students by mathematical abilities is very similar to tracking or leveling (Oakes, 1985; Ogbu, 2003). The participants in the study were all tracked or leveled into either skills or regular mathematics classes. Their entry into these classes was based on their performance on local and state assessments. Administrators shared during the interview that the criteria for seventh graders to be placed in Pre-Algebra was a 4 on the spring ARMT assessment, an A average in math on their report cards, and an 80% on the teacher-generated Pre-Algebra readiness test. Pre-Algebra was offered as an advanced mathematics class for seventh grade students. There was not any of the seventh grade participants recommended for the study enrolled in Pre-Algebra. All seventh grade female participants were enrolled in regular seventh grade mathematics. There were not any African American female students enrolled in the Pre-Algebra class at Hulsey Middle. There was only one African American female student enrolled in the Algebra I class.

Hulsey Middle School also has several supports in place for students who are struggling with mathematics. The school has incorporated into their schedule a mathematics intervention class. This class is scheduled for students who are experiencing academic difficulties with

mathematics. During my interview with the Assistant Principal, I was informed of the criteria for the mathematics intervention class:

For the math intervention, we look at their data. Um . . . their testing data if they fall in the at-risk range which is a 2 or below on the ARMT and SAT we look at the stanine score. They're what 3 or below um and they have a history of poor performance in the classroom as well. They definitely fall into that category and we try to set them up with math intervention class.

Two of the participants, Eugenia and Doniqua, were a part of a mathematics intervention class.

Students assigned to the mathematics intervention class received a double dosage of mathematics each day with their grade level mathematics class and the skills-based intervention class.

Although Jelissa was rated as a low achiever, she was not required to enroll in the mathematics intervention class. Her performance on the state-based ARMT test was part of the decision to not enroll her in the mathematics intervention class. Jelissa had scored a 3 on the mathematics portion of this assessment and the criterion for mathematics class intervention was a 2. The student-teacher ratio was lower in the mathematics intervention classes to allow for more one-on-one support. The average number of students enrolled in intervention fluctuated between 14-21 students. The intervention class also incorporated the Study Island program, a computerized skill-based program that tracked students' progress through the program. Study Island covered the basic skills for each grade level and students were able to work at their own pace until mastery of a skill was accomplished. Study Island was just one part of the intervention class; more in-depth teacher modeling and peer tutoring were also a part of this class. During one lesson observation, I observed Eugenia in seventh grade mathematics intervention. Eugenia worked on Study Island using the Activ-votes. During this lesson, students were allowed to work out mathematical problems using their calculators before entering their answers into the Activ-votes. This particular lesson focused on finding the area of various geometrical shapes. Eugenia

appeared to grasp the concept as she demonstrated the steps for finding the area to a male student seated in front of her. On a different occasion, I observed Doniqua during her eighth grade mathematics intervention class. There were six peer tutors who were enrolled in the Algebra I class there to assist students with inequalities. Doniqua was assigned a Caucasian male tutor. During this session, the tutor provided Doniqua with one-on-one assistance telling her what she should do next. Doniqua appeared to be attentive and grasped the concepts being presented because she worked independently when the tutor went to assist another student. Student enrollment in mathematics intervention class was not fluid. Once a student was placed in the mathematics intervention class they remained there for the entire year, even if their grades reflected that they were now getting the mathematical concepts. For example, Eugenia, the seventh grade student rated as a low achiever, had received an A on her report card grade for the mathematics intervention class all year long. Classroom observations also demonstrated that she was competent in achieving the skills presented in intervention class. In fact she was often observed assisting other students during this class. Both students' mathematics grades were higher in the intervention class than their grade level mathematics course.

Additional supports that Hulsey Middle offered for students that were struggling with mathematics were Response to Instruction (RtI), Student Support Team (SST), after school tutoring, mathematics bell ringer work in all classes, and bi-weekly progress reports. The Response to Instruction (RtI) is a system-wide strategy initiated at the classroom level to ensure that all students maximize their learning potential. Ms. Terry discussed during her interview keeping an at-risk intervention notebook for students scoring 2 or below on the ARMT. She shared that this notebook includes intervention strategies that are used with students struggling in mathematics. These are some of the interventions that Ms. Terry uses as part of her RtI process:

“Students who are struggling receive small group instruction with me or Ms. Scales. They also receive modified or accommodated test and assignments.” Students who continue to struggle after receiving RtI intervention strategies are then referred to the Student Support Team. The Student Support Team at Hulsey Middle consisted of the assistant principal, counselor and two classroom teachers. Doniqua and Jelissa were both receiving intervention strategies from the Student Support Team (SST). However, both Ms. Peters and the assistant principal shared with me that during one of the recent SST meetings the team met with Jelissa to share that she had met both her academic and behavior goals for the year. Jelissa’s academic goal in mathematics was to raise her report card grade to a C. Her behavior goal consisted of reducing the numbers of referrals to the office. When I later asked Jelissa her feelings on meeting the academic and behavior goals set she smiled and replied, “I’m glad I’m doing better. My sister is doing better too.” Doniqua, however, continued to receive support strategies throughout the study. Both teachers and administration shared about the after school tutoring services offered at Hulsey Middle. Ms. Terry taught mathematics to students in the After School Program 2 days per week. Although some of the female students in the study would have benefitted from the additional instruction offered during the After School Program, none of the participants took part in it. During the principal’s interview, she shared why she thought that some students did not stay:

We have after school tutoring um through Title I two days a week; it’s not every day. The Title I funds only pay for the teachers providing the service, it does not include transportation and um . . . I think this has a great impact on participation by some students.

During the interview with the assistant principal, I asked what had contributed to the success of African American female students in mathematics. This is what he shared,

Um just we’re constantly looking at math as a whole. And everybody’s benefitting from it because that’s our focus. You know so um it’s just bringing those best practices um

being a school-wide focus. Your non-math teachers are teaching bell ringers. They're concentrating on the graphs and the maps and all the things that they can do to help out.

The bell ringer work was also discussed in some of the student interviews. Samantha discussed seeing mathematical concepts in science and Social Studies. She stated,

Um like what we did in Ms. Peter's class how we did the running of the decimals. We sometimes have to do that in science. We do math stuff too in Social Studies when we do the bell ringer work.

The classroom structure is similar to what Goodlad (2004) characterizes as flat, with the teacher being the focal point and students often being passive recipients. During the classroom observations, I noted the implicit curriculum, spotlighting the size of student groups, the nature of activities in progress, and what the teacher and focus participants were doing (Goodlad, 2004). The three classrooms included in the study held similarities and differences. Each classroom structure was similar in that all students were expected to listen as teachers modeled or demonstrated the process or lesson objective. However, the amount of demonstration varied among the three classrooms. Another similarity was the general structure of the class day with bell work, bell work review, introduction to the new lesson, and student practice. This structure was very similar to the structure that Stigler and Hiebert (1999) found in their study of schools in the United States. These authors found that across the United States most classes typically followed the structure of a warm-up activity, homework check, distribution of worksheets, student practice, teacher monitoring, teacher demonstration of challenging problems and a quick review with an additional homework assignment. Below is an excerpt from a typical day in all three classes.

Classroom A: Sixth Grade Class

Students enter the room. The teacher informed students that they have bell work and they were to get started. The following bell work was written on the board: 1.) 66 is what % of 275; 2.) What is the quotient of $\frac{3}{4}$ divided by $\frac{1}{8}$? 3.) Chart showing the words Fraction, Decimal, and Percent. Students were given the fraction $\frac{1}{4}$ and the percentage of 10%. Students' task was to find the decimal for these values. 4.) Word problem with multiple choice. Students worked independently on bell work. Teacher reviewed the board work asking how many students got each problem correct. The bell work goes into the students' notebooks when it is completed. The teacher instructs students to take out two pieces of paper and label it. The teacher instructs students to write the word perimeter and measures on their paper. The students comply with the teacher directives. The teacher asks, "What does perimeter measure?" Students raise their hands to respond. The teacher writes an example on the board: $P = 2l + w =$. The teacher writes the steps on an active slate, which displays the information on the Promethean board. The students follow along with the teacher writing the steps on their paper. The teacher shares two more examples in the same manner. The students follow along. Students respond or have verbal interaction when the teacher asks a question about the process. The teacher informs students that this will definitely be seen on the ARMT test. The teacher asks students questions about preparing for the test. The students give various responses about test preparation. The teacher assigns students homework. The bell rings.

Classroom B: Seventh Grade Class

Students enter the room. There are three daily math graphing problem displayed on the Promethean board. The teacher tells students to make sure that they have the problems written

out. Students complete the problems and review the answers. The teacher explains to students that they will work with pi and writes $\pi = 3.14$ on the white board. The teacher instructs students to write five words down. The words are circumference, diameter, radius, center, and pi. Students write the words down. The teacher writes $c = \pi * d$ or $c = 2 * \pi * r$. The students are instructed to copy this information. The teacher draws a circle and labels the center, radius, and diameter. The teacher demonstrates how to find the circumference of a figure with a diameter of 8. The teacher uses the calculator on the Promethean board to model the answer. Students follow along inputting the information into their calculators. The teacher does two more examples in a similar manner. The teacher asks if there are any questions. There are no questions from any students present. The teacher writes other problems on the board and tells students that she wants them to work each problem out on their own. The teacher tells students that it is very easy if they use their calculators. Students begin to work. The class assignment consists of the following problems: Find the circumference if $r = 72\text{yd}$; $r = 14\text{in.}$; $r = 79\text{ft}$; $r = 120\text{in.}$ The teacher writes the formula on the board again. Students work independently until the bell rings. Students are assigned their homework for the day.

Classroom C: Eighth Grade Class

Students enter the room and begin working on bell work, which consists of four problems displayed on the Promethean Board. The four problems are: 1.) $4(x+3) = x$; 2.) $5(x+2) = 30$; 3.) $6+6(2t-1) = 3+12t$; 4.) $3(2d +7) = 39$. Students demonstrate how they solved each problem by coming up to the dry erase board to write the steps for each of the four problems. The teacher models problem number one on the dry erase board and students follow along and check their work. The teacher instructs students to take out their homework and pass it forward. Students

comply. The teacher instructs students to take out paper and prepare to take notes. The teacher instructs students to open their mathematics book to page 345. The students comply. The teacher writes the following example on the board $x + 2 < 5$. The teacher writes the statement, “Variable must be on the left side” on the white board and instructs students to add this to their notes. Students write the information in their notes. The teacher writes this statement, “Get rid of the # by the variable. The variable has no friends.” Students add this information to their notes. The teacher explains that they will practice some problems then have some problems for their class assignment. The teacher calls on student to answer a question about how to solve $x + 3 < 8$. Student responds, “Get rid of the 3. The teacher responds, “How do we do that? How do you know we do that?” Student explains her answer more. The teacher repeats this procedure for the next three practice problems. The teacher assigns students problems 13-22 on page 348. The teacher orally gives the directions, “Write the problem exactly as it is written in the book. Show what is being added or subtracted. Show final inequality.” Students begin to work independently. The teacher walks around and monitors providing assistance and feedback to students who struggle with the assignment. The bell rings. The teacher dismisses class with the girls exiting on the first bell. Students are informed that they should complete any unfinished parts of the class assignment for homework.

The examples of a typical day in each focus classroom are very similar to what Stigler and Hiebert (1999) found in their study of classrooms in the United States. Each class period consisted of completing bell ringer work, review of this work, guided practice of focus concept, independent practice, and a homework assignment. All classes in the study utilized technology with the Promethean board, Activ slates, and clickers. Each classroom followed the Glencoe textbook series, with some incorporation of a computerized program called Study Island during

math intervention class. The differences in the classroom included the teacher's delivery of instruction, control of the classroom, and expectations for student learning. Furthermore, a variation was noted in the amount of technology that was used in the classrooms. Some of the classrooms utilized technology throughout the class observations to present information and allow students to input answers to mathematical problems. However, classroom use of technology was mainly for communication, a pedagogical strategy, rather than for content exploration of concepts.

The formal curriculum for each classroom consisted of instruction being planned from the textbook and the state course of study requirements. Each classroom also incorporated the ARMT Buckle Down practice book. This was a practice book designed to assist schools in meeting the standards of the state. The practice book was divided into units such as Number and Operations, Algebra, Geometry, Measurement and Data Analysis, and Probability. The teacher participants in the study each felt that the curriculum was augmented more when technology was included in the lesson. Ms. MacPhearson, the eighth grade mathematics teacher, shared this during her interview, "The inclusion of technology like the Elmo and Promethean board are typical math strategies that I use in all lessons. Students get to use the clickers and Study Island, which is an internet-based program." In addition to technology, mathematics lessons were supplemented with manipulatives, math games, small group instruction, and cooperative learning groups. These additional activities not only enhanced the curriculum but assisted with student engagement. There was a discrepancy noted between the teacher participants' ideas about engaging mathematics activities/instruction and student ideas. During the interview, when asked to describe a math lesson that had been successful in student engagement, I received the following responses:

I try to use manipulatives when I can but I'm kind of old school and by the time I explain how to use it they have missed the concept. I try to call on different students and involve them as much as I can. During the probability unit there are lots of opportunities for hands on lessons. I use a lot of thinking outside the box skills. I think I engage them just by my teaching style. I pull students in through conversation. (Ms. Peters)

I believe just allowing them to use the Smart board and the slate helps with engagement. They love to live the shapes that we are starting to use. Lessons on two-dimensional versus three dimensional objects are more engaging because of the geometric perspective. (Ms. Terry)

I engage them with projects. When we were studying volume, I gave students 5x7 index cards and instructed them to create a container to see which would have the largest amount of rice. The students were allowed to be as creative as possible. (Ms. MacPhearson)

However, the female participants in the study, when asked what they liked best about their mathematics class, shared things like math games, working with friends, using the clickers, and using their calculators. Two of the participants, Doniqua and Gavonna, were unsure about what they liked best about their mathematics class. Doniqua, when prompted, reluctantly shared that she likes the clickers. However, she had no concept about mathematics projects stating, "I ain't never did one," when asked did math projects help her learn math better. Gavonna, on the other hand, focused on the class distractions and a particular occasion when the science teacher came into their mathematics class. Gavonna responded to the question by saying,

It's . . . my math class is fun it's because we get stuff done we'll like the last semester everyone found out I could rap and all that stuff and so at the end of class, Mr. Brewster would come in and he'd put a beat on and we'd be rapping off of it in class. But also out math class is interesting cuz we learn all this stuff and I . . . I feel like it's a challenge cuz people are talking around me and I'm trying to learn to ignore everyone talking and so I can get a grasp of what's happening on the board. And I feel like it's . . . it's kinda like seeing if I can focus enough in class and not get distracted by everything else that's going on around me and I feel like that helps me if I can block everything out. Cuz when I get out there in the real world you're gonna have to block everything out anyway so its kinda like preparing me for that.

Informal Curriculum

The informal curriculum, which is often referred to as the hidden or implicit curriculum, refers to the messages that schools give students through the social and physical settings they provide for learning (Goodlad, 2004). This study included looking at the informal curriculum through the lens of peer and teacher interaction as well as extracurricular activities. In this study, the informal curriculum was measured through classroom and informal observations as well as student interviews. One aspect of the informal curriculum noted during lesson observations was the classroom environment. The classroom environments I observed at Hulsey Middle were reflective of the typical mathematics classrooms in the United States (Stigler & Hiebert, 1999). Each of the classroom environments consisted of student and teacher desks, commercial made posters on the walls, and a board at the front of the classroom. The arrangement of students' desks varied between the classes, with Ms. Peters preferring to align the desks in traditional rows. Both Ms. Terry and Ms. MacPhearson had desks grouped together to facilitate more cooperative group activities. All of the classrooms studied were devoid of displayed student work or areas set up for hands-on exploration of mathematical problems. The classrooms were neutral and bland, lacking conveniences that would make the environment more comfortable (Goodlad, 2004).

During each day of lesson observations, I noted the amount of interaction incurred between the focus participants and the classroom teacher, from which I was able to deduce who was doing what and what was being achieved (Goodlad, 2004). I also observed the volume of interaction between the nine participants and their peer group. The observation rubric used measured this interaction on a scale of *never* to *always*. The rubric measured both on task and off task behavior of the participants during lesson observations. For the most part, participant

interactions were positive. One thing that was noted was that all participants never or rarely worked with the teacher one on one. Two of the participants, Jelissa and Eugenia, who were rated as low achievers in the area of mathematics never or rarely worked with the teacher one on one during lesson observation. I found this to be surprising because these participants had been rated as low achievers in mathematics by the teachers. The other participant, Doniqua, who was also rated as a low achiever, was observed once during lesson observations sometimes working with the teacher one on one. Doniqua also received lots of one-on-one support from two different peer tutors during the mathematics intervention class.

Very few of the participants asked questions related to the lesson content during observations. When questions were asked by participants they were usually questions to clarify the teacher's expectation for the assignment. For example, participants asked questions like, "If we did this would we have to show our work on another sheet," "Would the ARMT testers prefer if we do a subtraction problem or just show our work," "Do you still want us to use our calculators?" Two of the participants, Eugenia and Marie, often asked questions, it appeared, to get a reaction from the teacher or the class. For example, during one lesson observation Eugenia repetitively asked the teacher to repeat words asking questions like "did you say hi or pi," "what was that word you said again cir . . . what." As mentioned earlier in the overview of each participant's math identity, Marie often asked simple questions to statements that the teacher had just verbalized. It appeared that most participants were more comfortable asking questions to the teacher one on one during independent work. I observed Taquita, Doniqua, Ramiya, Samantha, and Glenise each asking questions about items on a test or quiz.

Most of the participants demonstrated on-task behavior and were not observed causing classroom disruptions. Eugenia and Marie were the only participants observed causing classroom

disruptions. Although both students were sometimes disruptive during lesson observations, they only received verbal warnings or reprimands from the teacher. Neither student was ever removed from the class for disruptions. Eugenia was often observed being disruptive, while Marie engaged in disruptive behavior only during two lesson observations. During lesson observations, Eugenia was often observed blurting out answers, interrupting peers, or verbalizing inappropriate statements. The teacher often ignored Eugenia's disruptions. There was only once when I observed the teacher asking Eugenia if she needed to take a trip to see the assistant principal after numerous interruptions and Eugenia telling a classmate to "shut up." Classroom distractions were noted as an issue from several of the participants. Two of the participants discuss this in their journals. Gavonna wrote in her journal:

Dear Journal,
My math class has a lot of distractions. There's lots of talking and joking around. People in my class really don't take math as serious as they should. It's a good thing I learned how to block it out because sometimes it is hard not to laugh and get sucked into their conversations. I feel math class comes before socializing.

Ramiya's journal reflected her displeasure with distractions and conflict in the classroom. She wrote:

Today so far has went by good until I got in Ms. Terry's class. Some of my friends are arguing about different stuff. They was really arguing about one hitting three in their throat. I really don't like math at all and this didn't help.

Other participants during their interview talked about the impact of classroom distractions on learning mathematics. Glenise stated,

Sometimes when Ms. MacPhearson step out the classroom or she is still in the classroom there's some students talking across the room. I'm not gonna say no names though. But it's like some . . . like the person sitting beside me; then the person sitting on the other row in the front seat and they gonna yell they name across the room and so that distracts me during working on math homework or math problems she give us.

I also observed Glenise being distracted by these classroom disruptions. She often stopped working to laugh or snicker at a classmate who was yelling out or engaging in inappropriate banter.

Although student participants verbalized that they learned mathematics best when working with peers, student grouping for mathematics work was rarely observed. The observations in which I noted students interacting with peers about the lesson were very sporadic and peer conversations were brief: usually a question about the assignment expectations or asking for materials to complete an assignment. I did however observe both Gavonna and Eugenia assisting peers with a class assignment and, as mentioned earlier, Doniqua received assistance during two observations from a peer tutor. Marie was observed whispering the answer to a student as they were demonstrating on the dry erase board. Most of the participants were observed interacting with peers in a very social manner during class transitions, lunch, or a scheduled emergency drill. With the exception of a few incidents, most of the participants' interaction with peers was positive. Eugenia was the only participant observed frequently making rude comments towards her peers.

Mathematical Perception

The participants' mathematical perception refers to their awareness of mathematics in general and the value that they place on learning mathematics. Muhammad (2003) stated that Black students' perception of mathematics is weak as a result of their not seeing themselves in the mathematics curriculum or in the sphere of mathematics as a whole therefore leading to these students adopting a laissez-faire attitude towards mathematics in general and their own performance. There has been a correlation between perception in one's ability and one's

academic performance. The participants in the study each had a perception about mathematics in general. During the interview, when asked what comes to mind when the word math is spoken, most participants gave answers related to mathematics or mathematical concepts. Participants gave responses such as numbers, calculations, pi, division, multiplication, adding, subtracting, equations, and fractions. Some participants associated mathematics with their teacher, the mathematics work in class, or having fun in mathematics class.

Several of the participants viewed mathematics as a male domain. I gauged this through their response of who they would most likely ask for help if they were struggling with a mathematics problem at home. Five of the participants stated that they would ask a male figure to help them with difficult mathematics concepts. Participant responses ranged from their asking their grandfather to their brothers or brother-in law. When I asked Marie why she would not ask her sister for help she responded, “Cuz every time I ask her she like I don’t remember that stuff so . . . my brother-in law he remembers. He’s **very** (emphasis on very) good in math.” I overheard Doniqua stating that the male tutor was really smart in math, during one of the classroom observations. Later during her interview, I probed her more about this statement and Doniqua’s response was, “I wish I was as smart in math as he is.” When I asked her what led to her perceiving him as smart in mathematics, she stated, “Because he is in Algebra I.” Ms. Peter’s also saw mathematics as a male domain. During her interview she stated, “Boys are perceived to be better at math therefore they live up to it. The girls don’t want to be perceived as brainy so they hold back.” Although several of the participants viewed males as being able to grasp mathematical concepts more, they still perceived themselves to be good at mathematics.

Dimensions of Mathematical Perception

The girls in the study gave a variety of responses for factors that contributed to their mathematical performance. These factors can best be divided into two categories: external and internal. Forty percent of the participants credited external factors for their mathematical performance. These external factors included the teacher (cited by three of the participants (Eugenia, Samantha, and Taquita), their parents (Taquita), and their participation in an extracurricular event such as band. Sixty percent of the participants credited internal factors for their mathematical performance. These participants' responses reflect how resilience was embedded in their thought processes. The participants' responses that reflected internal fortitude included responses like, "I moved to the front and now I pay attention more and get better grades;" "By paying attention in class, doing my homework, turning it in on time, and studying for my tests;" "I believe what contributed is years of information. You can kinda take the information from past years and apply that to the math now cuz like you okay I know this stuff; so if I know half the stuff this subject is talking about the other half I have to get and apply that to what's going on that you already know and I feel that kinda helps with new learning stuff." Jelissa cited her working through the problems she was having with the teacher and being placed in Oscar as factors that assisted her in getting on track and becoming more focused. She also discussed her current location at the front of the room as assisting her in doing better in Ms. Peter's class. The participants' belief in self correlates with resilience theorists viewpoint that individual effort surpasses the disadvantages impacting some students' chances of success (Evans-Winters, 2005).

Value of Learning Mathematics

The participants in the study all saw the value in learning mathematics. I assessed their perception of mathematics being a valuable tool through their responses to interview questions about never having to take another mathematics class again, skipping mathematics class, and use of mathematics in other areas besides school. When asked how they would feel if they were told that they would never have to take another mathematics class again, six of the nine participants voiced disappointment, with some stating that they would be angry. Taquita stated,

I would probably be rolling my eyes and smacking my lips. I would be mad. I would be like what kinda mess is this. What I would be mad. Cuz I like math and I know I hadn't learned everything I need to about math.

Eugenia also articulated her anger at the possibility of no more mathematics saying, "I would be mad. Because like I would still want to do math because I love math." Gavonna, the self-professed nerd voiced her unhappiness about this despite her sometimes poor performance in this area:

Okay most people would jump for joy but I'm a nerd and even if it's not my best class I would be like that's not fair cuz if I don't ever have to take another math class how will I know if I missed something that I needed like if I didn't know how to convert fractions and all that other stuff; how am I suppose to go out there and find a job or to do something and I have no idea what their talking about. I would probably be the maddest person in the world if I skipped. . . . If I had to miss any class but math class is a vital subject that you have to go through and I'd be really mad if I didn't have another class.

Jelissa, whose mathematics scores fell in the at-risk range, was against the cancellation of mathematics class. She stated, "Like I'd be mad. Cuz math is bout my easiest class now. Cuz I still struggle in science and everything but I'd find a way. I either get a textbook. . . . I would find a way to do it." The participants who voiced elation or indifference about never having to take another mathematics class represented each range in ability.

Although some participants were not very enthusiastic about mathematics or their mathematics class, all participants interviewed stated that they would not skip the class for a day. The participants each gave various reasons as to why they would not skip the class with some participants fearing punitive repercussions and others verbalizing the need to know the mathematics content. Ramiya, Gavonna, Marie, and Jelissa all feared the punitive repercussions that result from skipping mathematics class whether those consequences came from the school or home level. The other five participants all would attend class to expand their mathematical knowledge. Glenise shared, “Um I’d say that’s a bad thing cuz you gon need to know how to learn math.” Samantha discussed how skipping mathematics class would bring down her mathematics grade and how she would miss the lesson that Ms. Peters was sharing. Although Eugenia was often disruptive in mathematics class, she responded that skipping mathematics class would not be an option for her: “I wouldn’t listen. Because you still need math to know . . . you would still need math when you get out of school and if you skip math you might miss something.”

Eleven participants in the study knew ways that they used mathematics in their everyday lives. Participants’ responses included using mathematics during shopping, cooking, and assisting with home repairs. Jelissa discussed how she assists her uncle. She stated,

Like my uncle em they always fixin on stuff and everything so like they was like how long do we need this and I’ll get the thing (indicating a tape measure) and I . . . I help em measure stuff.

Some participants even discussed how they assisted their parents with mathematical tasks like adding up the bills or calculating the totals for groceries. As indicated earlier, Marie discussed how she assists her mom during trips to the grocery store. Although all participants were not

mathematics enthusiasts, they all demonstrated their awareness of the value of mathematics during the interview and classroom observations.

Mathematics and Future Aspirations

The “college bound culture” has changed significantly over the last 30 years, shifting towards a greater representation of women and minorities (Sacks, 2007). The participants in the study saw the need for a college education and expressed plans of furthering their education through postsecondary schooling. When asked what their plans were after they graduated from high school, all participants stated, “Go to college.” Most of the participants had an idea about what postsecondary school they would attend while some were still undecided. Information about whether participants’ decision to go to college was based on parental pressure or expectation did not evolve from journal entries, informal, or interview questions. However, participants in the study like Jelissa and Doniqua who have little social or cultural capital depend on the school to guide them through the college preparation process (Noguera & Wing, 2006). School personnel were aware of their role in communicating college to the participants. Ms. Peters stated,

Our school talks about college quite a bit. I don’t know how much is being absorbed. A local manufacturing plant has affected students’ outlook. I can’t tell whether racial demographics make a difference in college outlook. But I can tell you who is poor and who is not. College is probably not talked about as much in the homes of students who are poor.

Both administrators and teacher participants talked about actual tools that Hulsey Middle had incorporated to raise college awareness for their middle school students. One of these tools was a college readiness test called Explore that was administered to eighth grade students. Ms. Terry shared that the college readiness test asked students about what area they felt they needed more

help with. She shared that math was overwhelmingly the subject picked even with the students who had an A. Another tool was a career interest survey that was utilized as an early detection method for students' career interests. The career interest inventory was given to all students in eighth grade and targeted students in seventh grade. Seventh grade students who showed an interest in early detection of career choices were given the interest inventory. These seventh grade students were able to communicate this interest to the counselor who administered the test. There was a seventh grade career clusters class that was available to a different set of students each semester. This class was an optional class for students who had taken the interest inventory to identify their career interests. School personnel also talked about how they communicated to students the importance of college for future jobs in the job market. One administrator stated,

I can definitely say that we are trying to get them not only prepared for college but prepared for the work force and some of these better jobs. A lot of times we use college for that reason I mean we use that in the example of getting a better job. So we use college from that standpoint to convey to the kids like you gonna have to go to school to get these better jobs.

The participants in the study were aware that college was the venue or gateway to economic mobility (Sacks, 2007). All of the participants voiced plans to have careers that required some postsecondary schooling. Some of the participants' career plans included jobs focusing on mathematics. For example, Taquita, Jelissa, and Samantha voiced plans about becoming mathematics teachers and Eugenia planned to be an accountant. Other participants verbalized that mathematics skills would be needed for their jobs even though they were not planning mathematical job careers. Gavonna recognized that her plans to be a singer would still necessitate math skills. During her interview she stated,

Um, well my aspiration right now is to sing or be an actor but I feel sometimes . . . I feel it does have to do actually with math cuz when you're pouring in all that money you have to learn how to manage it to be able to get all your stuff you want and still have money to

pay off like a mortgage or anything like that. So I feel any job mostly will have to do with math.

Mathematical Attitudes

Research is inundated with studies on females' attitude towards mathematics. Most studies show that girls generally are not favorable toward mathematics. The attitudes of the participants in this study toward mathematics fluctuated between one end of the spectrum to the other, with some participants verbalizing an indifference toward the subject. During the interview when asked the question, "Do you consider yourself a good mathematics student," four of the nine participants had a positive view about their mathematical ability. Taquita stated, "I love math. It's one of my favorite subjects. I just think I get it more than most of my classes but I do well in my other ones but I just get math the most." Although Taquita is a participant rated as a high achiever, other participants rated as at-risk achievers also held a positive attitude toward mathematics. Jelissa, an at-risk achiever, reflected on how her attitude toward mathematics had changed. She shared, "I was like I never keep up mess in her class and like I used to hate math and fail math and everything and now I'm doing good." Jelissa's attitude toward mathematics shows a correlation between the effects of achievement on mathematical attitudes. On the other hand, Ramiya, a middle achiever, was emphatic in her dislike for mathematics. She made statements during the interview like,

Math gives me a headache when I do it a lot. When I was younger it was easier. Now when I don't get it I get frustrated. If I never had to take another math class I would be happy because math is not a good subject."

What really resonated throughout the interviews was the participants' attitude toward mathematics as it related to their accomplishments. Most of the participants' attitudes were more favorable when they perceived themselves as understanding mathematical concepts and the

subject in general. For instance, Doniqua, the eighth grade student rated as a low achiever, had this to say during her interview, “I like math sometimes. When I get the subject I do. I liked it when it was easier like 1+1.” Ramiya, the seventh grade student who was emphatic in her dislike for mathematics also stated that her attitude toward mathematics fluctuates. She stated, “I like math sometimes. It depends on what we are doing. Like I did good on a test I took on probability. My grades have gone up and down.” The attitude toward mathematics for Marie, an eighth grade high achiever, also shifted with comprehension of the target concept. When asked did she consider herself a good mathematics student, Marie stated,

Um so so. Some things I can um . . . I can just go right in and I get it but some things it takes me a little bit more time to get. Some . . . with negative numbers and equations sometimes I get it.

Resiliency

Resilience is situated under the spectrum of internal and external circumstances and evolves through a process (Evans-Winters, 2005). The participants in the study each exhibited some resiliency characteristics. The resiliency process for most individuals evolves as an outcome of their surroundings and educational habitat. Several characteristics are exhibited by students who are said to be resilient, one of which is grades. Despite circumstances and current achievement, grades are a significant factor for the most resilient students. Students personifying resilience are conscious of the grading system and are constantly endeavoring to do better in school or a particular class (Evans-Winters, 2005). Two of the studies’ participants, Doniqua and Jelissa, both were faced with some very difficult obstacles. It was evident that both participants were struggling to adjust to their environment at Hulsey Middle as well as living with their aunt after the death of their mother. In spite of these problems, both participants were focused on

improving their academic achievements. Doniqua, who throughout the study voiced her dislike of mathematics, demonstrated a resilient attitude in wanting to improve her mathematics grades. She wrote in her journal: "I just made a 77 on my test. I can do better but I thought I made an 80 or higher." Jelissa, whose standardized test scores reflected non-proficiency in the area of mathematics, was also determined to improve her grades in this area. During the interview, she stated, "You saw my progress report? I had one D and that was English and the rest of em was A's. I got an A in math. I been working to pull my grade up." Several of the participants demonstrated a resilient attitude toward their mathematics grades. During lesson observations, participants were observed receiving feedback from previously taken quizzes or tests. Following teacher feedback, participants were observed showing expressions of jubilation or gloom. When Marie was shown her test grade from the previous day, her facial expression demonstrated that the outcome was not what she had hoped for. I observed a peer, seated across the room, asking her what she had received on the test. Marie signaled with her fingers an 87. Later, during our interview, I asked Marie about this particular observation and why did she appear to be upset with an 87. This is what Marie replied, "I thought I did better. I'm trying to pull my grade in Ms. MacPhearson's class up and I needed to make an A on that test to pull my grade up before progress reports go home." Throughout the study it was obvious that grades and improving their grades was a focus for all participants. The following excerpts demonstrate this.

During her interview Taquita had this to say about her mathematics grades,

I would say . . . I would say my grades in math they were probably the highest. I keep my grades up by just working hard and um keep on moving. I skip the questions I don't know on a test and come back to it to at least try to work it out.

I observed Taquita working hard on a mathematics test during one lesson observation. She was one of the last students to turn her test in.

In reference to her mathematics grades, Samantha responded as follows: “My math grades are good. I think I had a B and I pulled it to a C and I pulled it back to a B.”

Gavonna wrote in her journal:

Dear Journal,

It is February 1 and I know I haven't written in a while but I'm starting again. I have been working hard to bring up the math grade that I dumbly let drop 2 grades from a B to a C. I have turned in every class assignment and homework assignment and made sure I passed every test. Hopefully I brought it up.

Ramiya shared during her interview,

At the beginning of the year I was making bad grades in math. Then I moved to the front and now I pay attention more and get better grades. I also do homework as soon as I get off the bus.

Glenise wrote the following in her journal:

In math today we took a quiz on the clickers. It appear on the clickers instead of on the screen. I think I did good. I have been working hard in math to bring my grades up. Once that it said finished we are able to turned them off then put them back where they belong.

The aforementioned examples from lesson observations, interview dialogue, and journal entries demonstrate how the participants in the study have an embedded resiliency characteristic when it comes to mathematical achievement as measured by grades.

Another aspect of resiliency for students is building relationships with adults and feeling that those adults support their academic endeavors. A resilient student is aware of the support systems and resources that are available to help them achieve their goals (Evans-Winters, 2005). Resiliency through the exploration of external supports was measured for the participants in the study through their participation in lessons and willingness to ask for help. During the interview, Ms. MacPhearson made the following statement about the eighth grade focus participants:

They are not afraid to ask questions. They also are not afraid to say I need help. I have noticed this with the African American female students in general that I teach. The African American females will seek help more than any other group. In fact Glenise is trying to get into my intervention class and she doesn't need it. Dr. Lindsey (the school's

principal) said that the parent of one of my African American female students called to see if she could get in my intervention class but Dr. Lindsey told her that her child did not meet the criteria.

During lesson observations, as gauged by the observation rubric, six of the participants (Glenise, Taquita, Marie, Eugenia, Doniqua, and Samantha) often or always participated directly with the teacher during the lesson. This participation included raising their hands to answer a question, joining in for choral responses, or volunteering to model a mathematics problem on the board. Although the other three participants' classroom participation was not as frequent, they did sometimes participate in the lesson. As mentioned previously, the participants in the study were rarely observed asking the teacher questions during the lesson. However, several participants verbalized that the teacher was a resource that they used and would recommend to a friend struggling in mathematics. These participants saw the teacher as a vital support for their academic success. Glenise shared that what she liked most about her mathematics class was having Ms. MacPhearson again. During the interview she stated,

Because she's the best teacher. She will um . . . she will follow you through the steps of the math problem if you have trouble with it and um and once she explain it more I'll and then you'll most likely be able to get the problem better.

Ms. MacPhearson was aware of her role as an external support agent because she shared this during her interview,

Students who don't perform well on their test can come back during fourth or sixth period. Then I can work with those who are not getting it in small group. I am not looking for accuracy but the process that students use to get the answer. So that I can help them if they are going wrong.

During her interview, Jelissa shared how she had come to see her teacher Ms. Peters as a support agent and not someone who was out to get her. This is what Jelissa shared, "Ms. Peters like she use to be hard on me like every time I do something like she use to always call my name and I use to get mad. Now I know she wanted me to get math." I probed Jelissa a little more during the

interview asking her why she never raised her hand to ask for help in the class or what does she do when she needs help and this is what she responded:

I be shy sometimes. Sometimes if she (referring to Ms. Peters) see me don't raise my hand, she call on me, But if I was having lots of problems I would raise my hand and ask for help or I would just walk up there.

Samantha, in one of her journal entries, described some difficulties that she was having with a mathematical concept and what she did to figure it out. Her journal entry read as follows:

I need a little bit of help in area like I need help like here's a example: Bellwork. I think we had to do 8×12 how did she make it 8×12 . I don't know how to do that like get the area like if we had a wired(I think she means weird)shape and we had to find it how do you know where to put the line. I got it now.

After reading this entry, I asked Samantha what helped her get it now. She shared that she had asked Ms. Peters for help and she helped her figure it out.

The participants in the study demonstrated varying levels of resiliency, with some participants relying more on their internal fortitude and others building a relationship with a trusted adult support system. Some students in the study cited resources like calculators, websites, or a trusted friend when struggles were encountered with a mathematical concept. Regardless, of whether the support or help was coming from outside or within, each of the participants had set goals for their academic achievement in mathematics and was striving to improve their skills to reach these goals. Despite the numerous factors that these participants could have used as excuses for their struggles with mathematics, they all persevered and did not engage in self-defeating phrases like "I just can't do it." Many of the participants recognized their struggles with mathematics but were determined to overcome these struggles and increase their achievement (as measured by grades) in this area.

CHAPTER V

SUMMARY AND DISCUSSION

Introduction

The rationale for this research is the limited number of studies that focus on the positive achievement of African American female students in mathematics. Currently, research is inundated with studies that show the achievement gap between African American students and other racial groups. Furthermore, research is plagued with studies highlighting the gender gap in mathematics between males and females. During the review of the literature on the achievement gap, numerous research studies focused on the dilemmas facing African American males and how schools were missing this target group (Schotts Foundation for Public Education, 2005). Seldom, was there the extensive research focusing on how schools impact the achievement of African American females. Moreover, few studies have explored African American female students' perceptions of their everyday school experiences (Wiggins, 2007). This subgroup was somehow immersed within the discussion of African American achievement in general. The review of the literature for females revealed a gap in targeted research for African American females. Lubienski and Bowen (2000) discovered that a vast part of research addresses gender issues in mathematics; however, there are a small number of studies focusing on the influence of socio-cultural factors such as race and class on females' learning experiences in this field. The research findings revealed that the double impact of being female and African American changed the dynamics of a study. In fact, Lim (2008) found that the intersecting of race and gender issues in mathematics education was very complex.

The purpose of this study was to analyze the impact of various factors on the mathematical achievement of African American females. The factors most closely assessed were those relating to the institution of school. This research scrutinized both the formal and informal curriculum's impact on participants' achievement. The formal curriculum was viewed through the lens of the curriculum that was offered and taught at Hulsey Middle. The informal curriculum embraced an array of factors such as peer and teacher influence, peer and teacher interactions, and participation in extracurricular activities. This research also sought to study participants' resilience in the area of mathematics. Each of the participants demonstrated an adaptation to the circumstances and conditions of the school environment. The most resilient participants in the study were able to observe, disengage, and critically assess the negative behaviors of peers (Evans-Winters, 2005). The study examined the effects of internal and external factors on the participants' mathematical achievement.

This research contributes new knowledge about African American females' perception of their mathematics experiences and shows how both internal and external factors contribute to their achievement. This study adds to a much needed area of research data that proves that African American females are showing resiliency in their quest to continually improve academically. After conducting the analyses of this dissertation and considering the limitations of studies conducted on the intersection of race and gender effects on mathematical achievement, it is my opinion that internal resiliency factors such as persistence and confidence in self are key to continuous improvement in mathematics. In fact, it is my assertion that these factors supersede the impact of external factors such as the institution and home life. These factors of persistence and confidence are closely linked to Bandura's motivational theories. Bandura (1993) found that efficacy beliefs influence individuals' thought patterns, motivation level, and behavior. He

concluded that those individuals exhibiting a firm belief in their efficacy, through perseverance and initiative, find ways of exerting some control even in less conducive environments that stifle opportunities. In addition, these analyses challenge current research and policies on school-related factors as the key to student's academic success. Resiliency characteristics in students directly affect their mathematical achievement in spite of sometimes poor teacher expectations or limited home support (Connell, Spencer, & Aber, 1994).

The findings from this research challenge the cultural ecological theories of Fordham and Ogbu that associate successful academic achievements with "acting White." The categorizing of the African American peer group homogeneously as deviants of academic excellence has contributed to the limited research examination of their heterogeneity and the variant effects and influences peers exercise on the academic endeavors of African American students (Horvat & Lewis, 2003). These findings suggest that African American students can successfully navigate the academic and peer world. The females in this study maintained peer relationships and managed academic responsibilities. These female students kept their focus on academics during class time and utilized transitions for socializing with peers. The burden of "acting White" was not a factor or dominant force in the participants' peer relationships or their racial identity (Horvat & Lewis, 2003).

Achievement for this study was measured not only by grading measures but also by student and teacher perception of participants' mathematical abilities. This research considered the influence of teacher bias and expectations in local grading measures. Sacks (1999) questioned the validity of standardized tests as an indicator or predictor of students' academic success. Although standardized test results were utilized heavily by Hulsey Middle, this study only reviewed these test results for comparison. The research also noted the variation between

standardized testing measures and found a discrepancy between what standardized test scores reflected and local school grading measures. This disconnect was most evident in that the two students scoring partially proficient were passing their mathematics classes with a B and C, respectively. The discrepancy was also between the two standardized testing measures, ARMT and SAT 10. All participants in the study scored significantly lower on the SAT 10 versus the state ARMT test. Females' performance on standardized mathematics tests are often affected by various factors, including test format (Sacks, 1999), test anxiety (Else-Quest et.al., 2010) and the perception of mathematics as a male domain (Crocker et.al., 1998). The highest percentile ranking scored on the Sat 10 was a 69. On the other hand, two of the participants scored the highest mark possible on the state ARMT test. I also found an incongruity in teachers' ratings of students as high, middle, and low. The sixth grade participant rated as a middle achiever by her teacher had received the highest score possible in mathematics on the standardized ARMT test and had one of the highest scores from participants in the study on the SAT 10. The two seventh grade participants rated as high and middle achievers had received almost identical grades on their report cards and on state standardized measures. The eighth grade student used to replace the Algebra I student was rated as high by her teacher but her classroom grades were lower than those of the student ranked as a middle achiever. Five of the participants had increased their mathematics grade from the previous year with one of the participants improving from a D to a B in mathematics.

The following examination will link the findings and the discussion to the research questions that guided this study. The goal of this research is to identify the factors that are having the greatest impact on the mathematical achievement of African American females. In doing so, this research proposes to present the African American female as the new resiliency model.

Findings Related to Research Questions

Research Question 1: What strategies within the formal and informal curriculum are having an impact on the mathematical achievement of African American female students?

Findings from the formal curriculum revealed a very traditional classroom arrangement with rote daily class operations. Hulsey Middle School utilized a district adopted mathematics textbook and augmented this with state test preparation booklets such as the “ARMT Buckle Down” practice book. Scheduling, resources, teacher looping, and intervention were identified as having the most impact on the African American female students’ mathematical achievement from the viewpoint of administrators and teachers. Conversations with school personnel were flooded with accolades about the scheduling of the fourth period mathematics intervention class for students. The mathematics intervention classes, coupled with the After School Program, were felt to be beneficial in improving the achievement of students who were struggling in mathematics. School personnel all reported the implementation of these two venues when asked what was making a difference in closing the achievement gap. In both of these settings, students were given more one-on-one assistance due to the lower number of students in each program. The three female students, Jelissa, Eugenia, and Doniqua, who were identified as low achievers in mathematics, were not a part of the After School Program. Eugenia and Doniqua were both enrolled in the mathematics intervention class. However, Jelissa, who received neither mathematics intervention nor assistance from the After School tutoring program, was making great strides in her mathematical performance.

Hulsey Middle School’s curriculum placed heavy emphasis on scoring high on the state standardized mathematics test. Standardized test scores were used to schedule students in advanced and intervention classes. The intervention class curriculum consisted of a computer-

based skills program, Study Island, which reinforced the skills that would be assessed on the state standardized test. Administration, teachers, and students all felt the pressure of doing well on the state standardized test. Statements from interviews and classroom observations reinforced this need to do well on the state test.

Resources such as technology, manipulatives, and mathematics projects were identified by the teachers as having the most impact on student engagement and learning. All teachers and administration were proud of the incorporation of the Promethean boards into the curriculum. The female participants in the study were also complimentary of technology's impact on their mathematical achievement. Participants all voiced enjoyment of using the clickers/Acti-votes to enter their responses to mathematics problems or quiz questions. However, lesson observations yielded minimal student use of technology, with the teacher being the primary operator of the Promethean board. Student demonstrations were done on the classroom's dry erase board. Evidence from observations supports the conclusion that technology was used primarily as a communication tool. The occasional use of clickers by students was to take classroom assessments or practice skills for a future assessment. There was little evidence that technology was enhancing students' ability to learn mathematics content.

Although school personnel saw external factors such as the intervention class, technology, after school tutoring, home support, and the student support team as instrumental in impacting the achievement of their African American female students, the students themselves focused more on their internal abilities as affecting their mathematical achievement. The majority of student participants identified factors such as studying more, paying attention in class, taking notes, and sitting at the front of the class as having the greatest impact on their

mathematical achievement. The participants who did not identify these factors credited their teacher as having the greatest impact on their mathematical achievement.

The informal curriculum encompasses the messages that schools give students through extracurricular activities offered, opportunities for social interactions, and the physical environment (Goodlad, 2004). Hulsey Middle offers several extracurricular opportunities for females such as band, cheerleading, softball, and basketball. The middle school also offered a variety of clubs in which students could participate such as FBLA, Junior Beta Club, and Drama Club. Several of the female participants in the study were a part of these clubs and felt that these clubs affected their academic achievements. Glenise even discussed during her interview the balance of school work and participation on the basketball team. There were three of the nine participants, Jelissa, Ramiya, and Doniqua, who did not participate in any extracurricular activities or clubs. However, their nonparticipation in this aspect of the school's curriculum did not appear to affect their mathematical achievements. Three of the participants, Taquita, Samantha, and Gavonna, discussed during their interview how their interest in extracurricular activities was helping their performance in mathematics and future career goals.

The participants each interacted with peers during class transitions and non-structured class time. These peer interactions never appeared to focus on mathematics or any school work. The informal conversations observed with peers included banter about males, other female students, or upcoming school events. As mentioned earlier, Eugenia was the only participant frequently observed interacting negatively with peers. Although Glenise was witnessed in an unpleasant conversation with a peer during lunch, teachers and administration voiced that this was not characteristic behavior. During after school hours, conversations about mathematics or assisting peers with homework were not the norm for most of the participants in the study.

Furthermore, the participants in the study were rarely observed assisting or cooperatively working with peers during mathematics class. This was disheartening because most participants in the study voiced that they learned mathematics best when given the opportunities to work with peers.

In sum there was not a correlation between what school personnel identified as the strategies within the formal and informal curriculum that was impacting students' mathematical achievement and what the student participants identified as pertinent strategies that enhanced their achievement. Technology was the single common factor identified by both students and school personnel and the research did not yield direct evidence (observations) of technology's impact.

Research Question 2: What are the classroom interactions occurring in a mathematics classroom among teacher, students, and peers?

The findings from the research revealed that the frequency of classroom interactions varied among teacher, students, and peers. The findings from the observation rubric revealed the following interactions for participants. The three participants rated as high achievers always worked independently during class observations and rarely worked with the teacher one on one. The identified middle mathematics achievers were often found working independently and required very little assistance from the teacher. Surprisingly, those participants rated as low or at risk achievers were observed almost always working independently on assigned tasks. Those students rated as low achievers were rarely observed working with the teacher one on one, even in the intervention class. Research has shown that struggling students benefit from one-on-one teaching instruction as well as time for skills to be pre-taught and retaught (Lalley & Miller, 2006). However, the strugglers in this study were still able to maintain academically without the

additional one-on-one instruction. In fact, the limited teacher support was never mentioned as a problem in student interviews or informal conversations. Zahoric (2001) found that learning is maximized when questioning is done by the pupil rather than the teacher. The three participants labeled high achievers infrequently asked questions, with a total of 15 questions being asked by these participants across all lesson observations. However, this was almost as many as the other six participants combined. The other six students collectively asked a total of 23 questions. The questions asked by all participants reflected procedural type questions, clarifying directions, or due dates for assignments (Zahoric, 2001). The influence of peer groups and peer pressure impacts student academic engagement and performance in schools across the United States (Ogbu, 2003). As mentioned earlier, the distractions caused by peers in the classroom were an issue for some of the participants. The high achieving participants in the study were found interacting with peers about the lesson more frequently during class observations than the other study participants. The exception to this generalization was Eugenia and Doniqua who were observed giving and receiving math assistance from peers. The participants in the study all during lesson observations raised their hands to participate in the lesson. Their participation included answering questions, explaining problems, and defining mathematics terms. There was not a variation in the amount of participation across ability levels.

The interaction observed between teacher, peers, and students did appear to impact the participants' mathematical performance. Students received feedback from the teacher when responding to questions or explaining a mathematical problem. This feedback included affirmation, clarification, or diagnostic, which are all instrumental to enhancing student performance. Affirming feedback assists students in confirming that they are on the right track, while clarifying and diagnostic feedback aids in rerouting misconceptions that students may have

about a concept. These types of feedback reinforce the expectations for their performance on a task (Price, Handley, Millar, & O'Donovan, 2010). The students appeared to use teacher feedback to correct their work or gain a deeper understanding for future assignments.

Furthermore, the participants themselves voiced that they learned mathematical concepts better when allowed to work with peers. The observations that yielded student interaction with peers about the mathematics work (peer tutoring) also revealed what appeared to be higher levels of student engagement as evidenced by students' continuous interaction with their peer and the assignment.

Research Question 3: What are African American female students' perceptions of their mathematical experiences within the school setting?

The female participants in the study all viewed their mathematical classroom experiences positively. The participants were highly complementary when talking about the things that they liked best about their mathematics classrooms. Female participants' perceptions of their mathematical experiences were evaluated from their interview responses using a three-prong process: the perceived value held about mathematics, their mathematical attitude, and their perception of mathematics as a venue to future aspirations. All of the participants in the study saw the value of learning mathematics. This value was gauged by participants' responses to interview questions. Even those participants voicing a dislike of mathematics still perceived the usefulness and value of this academic area. Tiedmann (2002) found that perceptions of the usefulness of mathematics were not linked by gender-related learning outcomes. The nine participants in the study unanimously agreed that they would not skip mathematics class for a day. Also, each of the participants knew that mathematics was universal and could verbalize ways that mathematics was used in their everyday lives. Most participants' responses to their

everyday mathematics use was linked to home tasks or responsibilities such as cooking, shopping, or assisting with building things, which is expected based on middle school mathematics content. Participants' perception of the value of mathematics was also gauged by their response to never having to take another mathematics class again. More than half of the participants agreed that this would not benefit them because there was a need to know mathematics for future career goals.

All of the participants in the study verbalized during the interview that they planned to go to college. Career goals for these participants included teaching, acting, athletics, accounting, and singing. The females in the study realized that mathematics would be needed as part of their secondary career. However, none of the participants appeared to realize that their current mathematics tracks were not for college bound students. Sacks' (2007) research on college bound students revealed that African American students are often labeled during their transition from sixth to seventh grade depending on their standardized test performance and teacher recommendation. Hulsey Middle's current criteria for placing students in advanced, skills, or regular mathematics reflects the aforementioned labeling system. As mentioned earlier, none of the participants in the study was taking an advanced mathematics course. Advanced mathematics was not an option for the sixth grade participants. The only mathematics course offered for these students was Mathematics 6, which was designed for sixth graders. The seventh grade participants were all taking regular seventh grade mathematics versus the Pre-Algebra that was offered to students on the advanced track. Participants in the eighth grade were all taking Pre-Algebra versus Algebra I, which was offered to students on the advanced track. School personnel and participants both agreed that participants had not met the criteria for Pre-Algebra or Algebra. However, the participants never verbalized how their current enrollment in regular mathematics

class would affect their future college aspirations. Research has shown that there is not a large representation of African American females in advanced mathematics classes (Tucker, 2000). There were a limited number of African American students as gauged by the initial observations of the Algebra I class. During observations of the student who withdrew from the study, it was noted that there were three African American males in the class, one African American female, 18 White males and 6 White females. There were a total of 22 students in this class, which shows that African American students made up less than 20% of the advanced Algebra I class. This percentage is 16% below the 34% of African American students enrolled at Hulsey Middle. White students in the class represented 72% of the population, which reflects a slightly higher percentage of the school's 65% White population. Observations of the seventh grade Pre-Algebra class were not possible because there were no seventh grade African American female students recommended for the study enrolled in Pre-Algebra. This led to the assumption that there were not any African American females enrolled in the Pre-Algebra class.

“Student motivation and the attitudes that students display toward learning profoundly affect patterns of achievement” (Noguera, 2008, p. 101). Although the participants were complimentary of their experiences in the mathematics classroom, their attitude toward the subject of mathematics did not reflect this high praise. The participants in the study did not all have a positive attitude toward mathematics. Less than half of the participants in the study verbalized liking mathematics. Those who liked mathematics were not limited to the high achievers. Students whose performance in mathematics was considered at risk by their teachers also held a positive attitude toward the subject. There was a correlation found in students' responses to their attitude toward mathematics as it related to their comprehension of a target concept or their achievement in this area. The majority of the participants shared that their

attitude toward mathematics had gotten better as they have gotten older. Even those who voiced not liking mathematics responded that their attitude was better now. Participants' rationale for their improved attitude included understanding the concepts more, their teacher making it easier, and because their grades were now better. There were only two participants who shared that their attitude toward mathematics had stayed the same. The research also revealed that participants' attitudes toward mathematics were affected by their attitude of the mathematics class and the teacher. The participants in the study all had positive attitudes about their mathematics teacher. The one participant who discussed conflicts with the teacher earlier in the year was very positive in her comments about the teacher and the class.

Findings on Resiliency

Resiliency characteristics are encased within three categories: academic competence, conduct or behavior in school, and interpersonal or social competence (Garmezy et. al 1984; Masten et al 1999). The findings from this study were mainly manifested in academic competence. Although most of the participants in the study were able to successfully navigate the conduct expectations of the school, researchers have acknowledged social competence and the ability to sustain quality relationships as vital components of resiliency (Hurtes & Allen, 2001). Most of the participants in the study maintained healthy relationships with their peers and teachers.

Resilience also encompasses self-reliance, directness, independence, and persistence in the school setting (Schilling, 2008). The goal of the self-empowerment theory of achievement is that students help and motivate themselves to learn mathematics. Self-empowered students realize that they control their academic learning and their success or failure is determined by

their academic efforts (Tucker, 2000). Several of the participants in the study noted internal efforts as the determinant for how they overcome problems in mathematics. These participants communicated doing things like studying more, paying attention, taking good notes, or sitting at the front of the class as factors in helping them overcome their mathematical struggles. During the study, students not only celebrated their successes in mathematics but they also analyzed their failures. Students exhibiting a high sense of self-efficacy view challenges as an opportunity to expand their knowledge and skills. They perceive mistakes as an opportunity to learn and evaluate their capabilities by personal improvement rather than competitive comparisons with the achievements of peers (Bandura, 1993). Several participants commented that they knew they could do better in mathematics or that they were working to bring their grades up. The teachers of the participants complimented the African American females on not being afraid to ask for help. Teachers also noted that because of the lack of home support for some participants, their success would be determined by their inner fortitude and persistence. All of the females in the study exhibited some aspects of characteristics associated with educational resiliency. Resiliency characteristics are characteristics such as goal oriented, recognize the importance of grades, participate in school activities, and pursue assistance and resources for academic areas (Evans-Winters, 2005). I found the most resilient students in the study to be not those who were excelling academically but those who continued to strive for academic excellence despite numerous obstacles. Several of the participants were being raised by single parents: Gavonna, Glenise, Marie, Ramiya, and Eugenia. Marie also had the obstacle of a mom who was a high school dropout. Jelissa and Doniqua had several obstacles to juggle such as the passing of their mom the previous year, their new living arrangements with their aunt, and transitioning to a new school. Despite these numerous home factors, each of these girls appeared to be cognizant of

their grades and had set goals for their future. Resiliency research has found that external sources of support are important. These support factors include participation in an afterschool program or a strong connection with a supportive adult (Schilling, 2008). The findings of this research provided limited glimpses of external supports through an afterschool or other outreach program. However, some of the participants' verbalization of their reliance on their teacher when a problem in mathematics occurs demonstrated a comfort and connection with this external support agent. Research also shows that resiliency traits are context specific and subject to alterations. The supports offered by Hulseley Middle were noted; however, I found the biggest contributor to these participants' mathematics achievement was their resilience, persistence, and determination to constantly improve.

Implications

Implications for Middle Schools

This research holds several implications for middle schools. The findings revealed that Hulseley Middle school battles the pressures set forth by national policies mandating that adequate yearly progress is shown by all students. However, despite a 73% free and reduced population this school has determined that "failure is not an option." By incorporating research-based practices such as looping, employing teachers who are qualified and competent in the area of mathematics, ensuring smaller class sizes, and providing intense intervention to strugglers (Noguera, 2001, 2003), this middle school continues to meet the annual yearly goals set forth by "No Child Left Behind." Closing the racial gap and promoting educational equity continues to be a goal for all American schools.

Schools have been deemed the equal opportunity venue for students to become productive citizens. However, schools have to be mindful of not becoming institutions for reproducing and reinforcing social inequalities (Noguera, 2008; Noguera & Wing, 2006; Sacks, 2007). Hulsey Middle and other middle schools must be mindful of reinforcing privilege for the more advantaged through tracking and heavy emphasis on merit and grades. Hulsey, like many other middle schools across America, must move away from viewing standardized tests as the sole indicator of a student's merit and viewing those who score poorly on these tests as deficient, incapable, or at-risk (Sacks, 1999). This study demonstrates for all middle schools that achievement is not just measured by a student's test scores, grades, or poor performance on both; instead, achievement also includes the measure of resolve and determination to continuously improve one's performance. The nine participants in this study each demonstrated such resolve, even though by normalized standards, the meritocratic grading system, and comparative measures to other racial groups, their mathematical achievement may appear adequate at best. Implications of this research revealed that middle schools should assess and reassess hidden biases in student placements into advanced track mathematics classes. These hidden biases are often manifested through heavy emphasis on standardized mathematics test scores which, by design, alienate minorities and females. Further, the lack of alignment between NAEP, ARMT, and SAT-10 indicate poorly aligned state expectations compared to national expectations for middle school students. Middle schools should inventory the number of minority and female students that are in their advanced track classes and note if current practices are unintentionally excluding some students. It would be advantageous for Hulsey Middle and other middle schools to reassess the criteria used for placement into advanced mathematics classes and brainstorm

additional ways that students who may not perform well on testing measures may gain access into advanced classes.

The implications of this study for middle schools further allude to the need to nurture resiliency qualities in students. Before this can be done, however, middle schools must first acknowledge that resiliency is a factor in school achievement, thus requiring the need for radical school-wide reform and professional development sessions on resiliency. These professional development sessions should be mandatory and conducted school-wide with staff on identifying and capitalizing on resiliency characteristics in the students that they teach. This would open the door for additional dialogue about student achievement beyond the grading system. The inclusion of a curriculum of resiliency would be beneficial for middle schools. This curriculum would accentuate the positive attributes that students bring to school and capitalize on the vast array of experiences of all students and not just the privileged few (Adams, 1997).

Furthermore, student interest inventories should be administered and analyzed constantly. This would allow staff to become more familiar with the untapped areas of potential in their students. Middle schools must research ways of providing additional resources such as teacher mentors, peer mentors, assemblies for recognizing students who improve academically, counseling sessions on college entry requirements, and after-school tutoring and youth development sessions with transportation provided.

Implications for Middle School Mathematics Teachers

Strutchens and Silver (2000) found that there are several instructional practices utilized by teachers that impact the mathematical achievement of African American students. Their study revealed that the incorporation of manipulatives, real-life mathematics problem solving, and

collaboration enhanced student achievement. These findings are similar to what the nine participants voiced were the things that they would change about their mathematics class. The participants in this study all shared that they learned mathematics better through hands-on activities and collaboration with peers. The students' perception of the way they learn mathematics best holds heavy implications for middle schools and mathematics teachers. Middle school mathematics teachers who desire to maximize and/or provide equitable learning opportunities for all students must push past a traditional teaching mind set toward a more holistic method of teaching. This holistic method includes peer collaboration, small group re-teaching, individualized plans for students, incorporation of technology, and hands-on problem solving. The teachers in this study recognized the importance of varied instruction and were making strides in individualized plans for students (through RtI intervention notebooks) and incorporating more technology (Promethean boards and Acti-votes). However, the teachers at Hulsey Middle should continue to research ways of implementing more student simulations and demonstrations with technology. These teachers should capitalize on students' enjoyment of technology researching ways of effectively teaching content concepts with technology and pedagogical strategies. The use of the Promethean board and Activ-slate can be extended from just communication tools to discovery tools for students to enhance their mathematical skills and knowledge. In order to do this, teachers at Hulsey Middle and other middle schools must enhance their knowledge of how technology relates to the pedagogy and content. Some of the mathematics teachers at Hulsey Middle integrated more computational calculator usage into the curriculum, which evidenced their movement from a focus on computational skills to more of an emphasis on problem solving (Lubienski, 2002).

Policy Implications

Policymakers and researchers are investigating solutions for improving the achievement of African American students (Ogbu, 2003). This quest has turned our schools into test-driven accountability machines (Sacks, 1999). As our federal government moves from “No Child Left Behind” to ensuring that our students “Race to the Top,” several policy revisions and initiations must be considered. There is a need for a change in the discourse about racialized achievement from a focus on who’s to blame to all stakeholders acknowledging their responsibility and role in improving achievement (Noguera, 2008). This change in discourse will include a paradigm shift in the way we think about the achievement gap.

The findings from the literature reviewed for this research demonstrate a discrepancy in the outcomes of the NAEP assessment, which is given nationally, and our state’s ARMT assessment. These findings hold implications for mathematics educators and future policies in this area. The current policy allows for some states to incorporate minimum mathematics standards requirements, while the national standards are much more rigorous and demanding. These findings imply that current policies should consider the alignment of state and national mathematics standards in order to maximize students’ mathematical knowledge and opportunities. This research has divulged approaches that may assist in ensuring that African American females are not overlooked in the disaggregating of data or in plans for new policy implementation. These approaches include revamping the accountability measure to include additional achievement information beyond standardized test scores. This achievement system would be more portfolio based, in which students’ achievement would be measured against their own individual improvement and performance versus the current normative standards. A second implication for policy revision revealed through this study was in the area of student labeling or

tracking. There is a need for a policy that deems it illegal for schools to allow access to advanced mathematics class solely on standardized test scores. This current practice not only reinforces the privileged but it also fails to tap into the hidden potential that some students possess but is not reflected on graded measures. Thirdly, policy implications revealed from this study is the need for a continuous push toward equipping schools and students with the tools necessary for successful navigation in the 21st century. This includes funds for schools to incorporate more technology, problem solving, and critical thinking techniques as well as opportunities for students to be more innovative.

Recommendations for Further Study

The recommendations for further study are not suggested as prescriptions but as stepping stones for future study and dialogue. This research demonstrated that African American females are an overlooked “model minority.” These females have persevered despite marginalization, limited educational opportunities and various obstacles. There is a need for additional research on educational resiliency in African American females. The findings in this research were limited to one middle school with a study sample of nine participants. This limits the generalization of these findings. Furthermore, this case study was conducted over the span of several months. There is a need for more longitudinal case studies to be conducted monitoring the progress of an identified group of African American females. This would assist in showing if resiliency characteristics persist and are innate or demonstrate that resiliency is heavily affected by external resources. Although the participants all exemplified resilient characteristics through their conversations, there is a need for additional research showing the fruition of this resiliency through high school completion, college attendance, and successful merger into the job market.

This study set forth to demonstrate the impact of the institution on African American females' mathematics achievement and found that there are things within the institutionalized context of school that affects African American females' perceptions and attitudes toward mathematics. There is a need to show how educators continue to address the unique issues faced by African American females (Somers, Owens, & Piliawsky, 2008).

Summary

The goal of leaving “no child behind” provides a segue for educators and policymakers to inventory their commitment to equity. Gains have been made in closing the achievement gaps between minority students in some schools, but there is still much more room for improvement in other schools. Accountability pressures and federal mandates have pushed schools, districts, states, and society as a whole to a focus on test scores, which completely obliterate the human factors involved in learning mathematics. The research conducted in this study provides insight and perspective on an often overlooked subgroup--African American females. While disaggregating the data may show how African Americans are performing as a subgroup on required standardized measures, it does not show the individuality of African American females. Recognizing the fact that African American females normally do not perform well on standardized mathematics measures, a multimodal means of evaluating their achievements should be considered as well as evaluations from more than one individual (Tucker, 2000). This research sought to look beyond standardized test scores and grading measures and move toward analyzing the total school mathematical experience for African American females. In doing this, the silenced voice of these females was brought to life.

This research sought to demonstrate how structural factors in schools impact students' mathematical achievement--particularly African American female students. These structural factors consisted of the curriculum, resources, and the school staff themselves. Embedded within these structural factors were additional considerations such as biases in performance expectations for certain groups, limited opportunities for academic acceleration beyond the basic mathematics curriculum, and grouping students homogeneously based on achievement. This research found that the institution can shape students' attitudes, perceptions, and future chances for academic growth. Educators are cautioned to refrain from utilizing cultural theories and explanations as rationales for their thinking about academic achievement (Noguera, 2008).

The initial goal of this research was to show how institutional factors impacted the achievement of the participants in this study. While analyzing the data, the internal fortitude and perseverance of these students emerged thus adding the aspect of resiliency. Also, in exploring the data, consideration was given to viewing achievement through a lens different than the traditional grades lens. This research demonstrates a need for additional studies in the area of resiliency as it relates to African American females. The resiliency research will add much more insight into how individual students learn and what motivates them to set goals for future learning. Through this research, I saw African American females determined to improve their mathematical performance and confident in their own abilities to improve. Despite being placed in regular track mathematics classes these students all still aspired to a college-bound future. Mathematics educators and schools should assess who is being placed in the more advanced mathematics classes and who is being left out. These placements into these classes are indicative of schools' views on equity. Schools that are committed to providing all students with an equitable education aimed at preparing them for future success will continuously scrutinize their

criteria for placement in advanced classes. When such scrutiny is done, schools will truly become the great equalizer for students and not just a reproduction of our current society.

This research recognizes the political danger in relying solely on resiliency factors as an indicator for academic success. In doing this, one rules out other factors such as the impact of low expectations, a lack of opportunity for advancement, or limited exposure to detrimental aspects of the curriculum. These are all elements that could impact the role that resiliency plays in academic success. Furthermore, a sole reliance on resiliency could lead to the institution taking an apathetic view about their role in students' achievement and placing the responsibility of achievement or lack of solely with the students. Instead, the resiliency argument does not propose to replace the role that schools play but instead suggests ways that resiliency factors can augment a student's chances for academic success. Through the research, I found that resiliency does not just encompass academic fortitude and perseverance but includes independence, initiative, a strong sense of self, and social competence (Schilling, 2008). Educators must be careful not to stifle the hidden potential of many future inventors with the over emphasis on data driven instruction.

It is important that African American female students are noticed as a rising new minority model for resiliency and mathematical excellence. Mathematics has been viewed as the "gatekeeper" for future life opportunities and upward mobility thus making it imperative that the institution of school provide African American females and all students with the keys to enter the realm of college with the mathematical knowledge needed for success.

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APPENDIX A
REQUEST TO CONDUCT STUDY

100 Hilltop Lane
Alpine, AL 35014
(256)268-0976 or (256) 375-0780
adrychat@aol.com
achatman@tcboe.org

Dear :

I am writing to request the use of the school system in a study that examines the mathematical achievement of African American females. The research will utilize a case study approach that focuses on successful strategies used by middle schools to close the achievement and gender gap in math. I am requesting to conduct this in-depth study in one middle school in the county.

I am conducting this study as part of my doctoral dissertation in the Department of Instruction Leadership, Policy, and Technology Studies at The University of Alabama. This case study includes interviews, classroom observations, and data analysis at the selected school site, if this is agreed upon by both you and the principal. There will be 30 classroom observations of three classes (1 sixth grade class, 1 seventh grade class, and 1 eighth grade class). Nine African American female students of varying math performance levels will be selected as primary participants. Interviews will be conducted with the administration, the three classroom teachers, and the nine student participants. I will analyze the standardized test scores (SAT and ARMT), district math benchmark scores, and report card grades for the focus student participants. Student participants will also be asked to share their math experiences in a journal. I will ask the principal to share data with me about the focus student participants' discipline, report card grades, and the current curriculum used in math, and any district policies that relate to math.

In short, I am looking for a middle school that has successfully employed strategies to close the gender and achievement gap in math as measured by standardized achievement and school related data.

If you have any questions or concerns, please do not hesitate to contact me. I appreciate the time and consideration that you have given to this request.

Sincerely,

Audrey Chatman
Doctoral Candidate, The University of Alabama

APPENDIX B
OBSERVATION RUBRIC

Observation Rubric

	Never	Rarely	Sometimes	Often	Always
Student participates directly with teacher during the lesson					
Student asks questions to the teacher about the lesson					
Student works one-on one with the teacher					
Student interacts with peers about the lesson					
Student worked independently					
Student demonstrates off-task behavior					
Student disrupts class					

Legend:

- Never = 0 occurrences
- Rarely = 1 occurrence
- Sometimes = 2-3 occurrences
- Often = 4-5 occurrences
- Always = 5 or more occurrences

APPENDIX C
INFORMED CONSENT STATEMENTS

INFORMED CONSENT STATEMENT (Administrators)

Institutional Factors that Affect the Mathematical Achievement of African American Females

Dear Potential Participant:

You are invited to participate in a research study conducted by Audrey Chatman, doctoral student at The University of Alabama, Department of Instructional Leadership. I hope to learn what strategies (within the formal and informal curriculum) are having an impact on the mathematical achievement of African American female students. You were selected as a possible participant in this study because of your leadership and guidance in a school that has achieved mathematical success with African American female students.

If you decide to participate, there will a 45-60 minute interview conducted at a time that is convenient for you. The interview will be audio-taped. You will also be asked to share information about selected students test scores, grades, discipline information, the math curriculum used and system policies relating to mathematics.

There are no known risks or discomforts associated with your participation in this study. This study will show the positive mathematical achievements of African American female students and will add positively to the body of research on African Americans and females. However, I cannot guarantee that you personally will receive any benefits from this research.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. All audio recorded information will be stored in a locked file. Upon completion of this study audio recorded information will be destroyed. Participants' identities will be kept confidential by providing you and the school site with pseudonyms.

Your participation is voluntary. Your decision whether or not to participate will not affect your relationship with the school system or your middle school. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time without penalty.

If you have any questions, please feel free to contact Audrey Chatman at (256) 268-0976 or (256) 375-0780. You may also contact Dr. Natalie Adams, research advisor, at (205) 348-8283. If you have any questions regarding your rights as a research participant, please contact Ms. Tanta Myles, The University of Alabama Research Compliance Officer, by calling (205) 348-8461 or toll free (877) 820-3066. You will be offered a copy of this form to keep.

Your signature indicates that you have read and understand the information provided above, that you willingly agree to participate, that you may withdraw your consent at any time and discontinue participation without penalty, that you will receive a copy of this form and that you are not waiving any legal claims.

Participant Signature

Date

Researcher Signature

Date

Please indicate your preference to be audio recorded during the interview by checking one of the boxes below.

Yes, I agree to be audio recorded during the interview.

No, I do not wish to be audio recorded during the interview

INFORMED CONSENT STATEMENT (Teachers)

Institutional Factors that Affect the Mathematical Achievement of African American Females

Dear Potential Participant:

You are invited to participate in a research study conducted by Audrey Chatman, a doctoral student at The University of Alabama, Department of Instructional Leadership. I hope to learn what strategies (within the formal and informal curriculum) are having an impact on the mathematical achievement of African American female students. You were selected as a possible participant in this study because of your direct interaction with African American female students.

If you decide to participate, there will be ten observations of your mathematics class and a 45-60 minute interview. The observations will last the duration of the class period. The interview will be audio-taped and conducted at your school during a time that is convenient for you.

There are no known risks or discomforts associated with your participation in this study. This study will show the positive mathematical achievements of African American female students and will add positively to the body of research on African Americans and females. However, I cannot guarantee that you personally will receive any benefits from this research.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. All audio recorded information will be stored in a locked file. Upon completion of this study audio recorded information will be destroyed. Participants' identities will be kept confidential by providing you and the school site with pseudonyms.

Your participation is voluntary. Your decision whether or not to participate will not affect your relationship with the school system or the middle school. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time without penalty.

If you have any questions, please feel free to contact Audrey Chatman at (256) 268-0976 or (256) 375-0780. You may also contact Dr. Natalie Adams, research advisor, at (205) 348-8283. If you have any questions regarding your rights as a research participant, please contact Ms. Tanta Myles, The University of Alabama Research Compliance Officer, by calling (205) 348-8461 or toll free (877) 820-3066. You will be offered a copy of this form to keep.

Your signature indicates that you have read and understand the information provided above, that you willingly agree to participate, that you may withdraw your consent at any time and discontinue participation without penalty, that you will receive a copy of this form and that you are not waiving any legal claims.

Participant Signature

Date

Researcher Signature

Date

Please indicate your preference to be audio recorded during the interview by checking one of the boxes below.

Yes, I agree to be audio recorded during the interview.

No, I do not wish to be audio recorded during the interview

INFORMED CONSENT STATEMENT (parent for under age 19 child)

Dear Parent/Guardian:

It is being requested for your child to participate in a research study conducted by Audrey Chatman, a doctoral student from The University of Alabama, Department of Instructional Leadership. I hope to learn what your child experiences in the math classroom and how these experiences affect their math achievement. Your child was recommended for this research by her principal. Your child was also selected as a possible participant in this study because she is an African American female student that has improved in math as measured by state test, district assessments, and school report card grades.

Your child's anticipated participation time will be six weeks. Your child's participation will involve my observing your child in the math setting, her journaling about her math experience when I am not observing, and a thirty minute interview. The interview will be audio-taped. I will also review your child's standardized test results from the SAT and ARMT, their district benchmark scores, report card grades, and discipline records.

There are no known risks or discomforts associated with your child's participation in this study. This study will show the positive mathematical achievements of African American female students and will add positively to the body of research on African Americans and females. However, I cannot guarantee that your child personally will receive any benefits from this research.

All information provided by your child will be confidential. Your child's name will not be disclosed in the study and your child's school has been given a fictitious name for the study. All audio recorded information will be stored in a locked file. Upon completion of this study audio recorded information will be destroyed.

Your child's participation is completely voluntary. Your child may choose not to answer any questions that make her feel uncomfortable. Participation may be discontinued at any time. Refusal to participate will involve no penalty or loss of benefits to which your child is otherwise entitled.

If you or your child have any questions about this study, you may contact Audrey Chatman at (256) 268-0976 or (256) 375-0780. You may also contact Dr. Natalie Adams, research advisor, at (205) 348-8283. If you or your child have any questions about your rights as a research participant, please contact Ms. Tanta Myles, The University of Alabama Research Compliance Officer, by calling (205) 348-8461 or toll free (877) 820-3066.

By signing this document, you give your consent for your child, _____, to participate in the study.

Parent/Guardian Signature: _____ Date: _____

Researcher's Signature _____ Date: _____

Participant Assent Form (under age 19)

Dear Potential Participant:

We are doing a study to show what helps some middle school African American female students do well in mathematics. We are asking you to help because we do not know very much about what students your age experience in the mathematics classroom setting.

If you agree to be in our study, we are going to ask you some questions about your thinking in the subject of mathematics. For example, we will ask you do you consider yourself a good math student? The answers that you give to these questions will be audio-recorded. The recorded information will be stored in a locked file. When the study is over the recorded information will be destroyed. We will also observe you during ten of your math classes. You will be provided a journal to write about your math experiences when you are not being observed.

You can ask questions that you might have about this study at any time. Also, if you decide at anytime not to finish, you may stop whenever you want. If you decide to no longer be in the study it will not affect your grades or your relationship with the teacher or your school principal. Remember, these questions are only about what you think. There are no right or wrong answers because this is not a test.

If you sign this paper, it means that you have read this and that you want to be in the study. If you do not want to be in the study, do not sign the paper. Remember, being in the study is up to you, and no one will be angry if you do not sign this paper or even if you change your mind later.

Signature of Participant _____ Date _____

Please put a check mark in the box below to show if you agree or disagree to be audio-recorded while I ask you questions about your math experience.

Yes, I agree to be audio recorded.

No, I do not wish to be audio recorded.

APPENDIX D
INTERVIEW PROTOCOLS

Administrators

- 1.) Background information. Years experience; Years experience as an administrator at the focus school site.
- 2.) What mathematics courses does your school offer?
- 3.) What does your school utilize to teach math?
- 4.) How does your school assess mathematics?
- 5.) What does your school data indicate about the achievement of African American female students in math?
- 6.) One of the major purposes of No Child Left Behind (NCLB) is to decrease the achievement gap. What reforms, strategies, or methods has your school implemented that assisted in decreasing this gap in mathematics?
- 7.) How does your school address math deficiencies for students struggling in mathematics?
- 8.) How does your school motivate students who aren't necessarily good in math?
- 9.) What criteria is used for student placement in advanced mathematics?
- 10.) If a student is failing a math course, what supports are available to assist this student in mathematics?
- 11.) What factors influence African American females' math achievement in your school?
- 12.) What system policies exist in the area of mathematics? How have these policies affected the math program at your school?
- 13.) What types of feedback are students given about their mathematics performance?
- 14.) Describe the strengths of your math program/curriculum.
- 15.) What would you identify as areas of concern in the mathematics program/curriculum?
- 16.) What population in your school needs the most help in math? Why?
- 17.) How does your school show students that mathematics is important?
- 18.) To what degree do you talk about college to your students?

Teachers

- 1.) How many years have you been teaching?
- 2.) What is the student/teacher ratio in your math classes?
- 3.) How many mathematics classes do you teach per day?
- 4.) Research shows that student engagement is one of the greatest factors that contribute to student learning. Describe a math lesson that you have taught that you would characterize as successful in student engagement?
- 5.) Describe a student who you would identify as successful in mathematics?
- 6.) What math strategies are incorporated in a typical mathematics lesson?
- 7.) What formal and informal assessments are used to assess math?
- 8.) How is data from standardized tests utilized?
- 9.) How often are students mathematics abilities assessed?
- 10.) What supports are in place for a student who fails math?
- 11.) What criteria do you use to determine if a student is achieving in mathematics?
- 12.) What have you noticed are strengths in the math performance of African American female students?
- 13.) What are some areas of concern that you have noted with the performance of African American female students in mathematics?
- 14.) Has any African American female student voiced any concerns about her math performance to you?
- 15.) How do you show students that mathematics is important?
- 16.) How do you motivate students who aren't necessarily good in math?
- 17.) To what degree do you talk about college in your school?

Students

- 1.) State your name and grade level.
- 2.) What comes to mind when I say the word mathematics?
- 3.) Do you consider yourself a good math student? Why or why not?
- 4.) How do you best learn mathematics?
- 5.) Does math come easy to you? If yes, why do you think it comes easy to you? If no, how do you think teachers could help you be a better mathematics student?
- 6.) Would you say your attitude towards math has improved or gotten worse as you've gotten older? Why do you think that is so?
- 7.) What do your friends say about math?
- 8.) How do you use math at home?
- 9.) If you were struggling with a math problem at home, who would most likely help you figure it out?
- 10.) How do you use math in your everyday life?
- 11.) What do you like most about your mathematics class?
- 12.) If you could change one thing about your math class what would it be?
- 13.) Suppose a new student came to your school and asked you about your math class. How would you describe your class to him/her?
- 14.) Do you see yourself in 10-15 years from now having a job that requires you to use mathematics skills? Why or why not?
- 15.) What are your plans after you graduate from high school? What do you see yourself doing 15 years from now.
- 16.) Suppose you had a friend who was struggling in math? What advice would you give him/her?
- 17.) What would you do if you had a friend who suggested that you skip Mr/Ms.(insert name of teacher) Mathematics class for the day? Why?
- 18.) What if you were told that you would never have to take another math class again? What would be your attitude towards this statement? Why?

APPENDIX E
IRB APPROVAL

IRB Project #: 10-02-392

UNIVERSITY OF ALABAMA
INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS

I. Identifying information

	Principal Investigator	Second Investigator	Third Investigator
Names:	Audrey Chatman	Dr. Natalie Adams	
Department:	Instructional Leadership		
College:	College of Education	College of Education	
University:	The University of Alabama	The University of Alabama	
Address:	100 Hilltop Lane Alpine, AL. 35014	102 Rose Administration Building	
Telephone:	(256) 375-0780/(256)268- 0976	(205)348-8283	
FAX:	(256)315-5335		
E-mail:	adrychat@aol.com	nadams@bamaed.ua.edu	

Title of Research Project: Institutional Factors That Affect the Mathematical Achievement of African American Females

Date Submitted: October 25, 2010
Funding Source: N/A

Type of Proposal New Revision Renewal Completed Exempt

Please attach a renewal application

Please attach a continuing review of studies form

Please enter the original IRB # at the top of the page

UA faculty or staff member signature: [Redacted]

II. NOTIFICATION OF IRB ACTION (to be completed by IRB):

Type of Review: Full board Expedited

IRB Action:

Rejected Date: _____

Tabled Pending Revisions Date: _____

Approved Pending Revisions Date: _____

Approved-this proposal complies with University and federal regulations for the protection of human subjects.

Approval is effective until the following date: 12/4/2011

Items approved: Research protocol (dated _____)

Informed consent (dated _____)

Recruitment materials (dated _____)

Other (dated _____)

Approval signature: [Redacted] Date: 12/10/2010



Audrey Chatman
100 Hilltop Lane
Alpine, AL 35014

Re: IRB#: 10-OR-392 "Institutional Factors that Affect the Mathematical Achievement of African American Females"

Dear Ms. Chatman:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

Your application will expire on December 4, 2011. If your research will continue beyond this date, complete the relevant portions of Continuing Review and Closure Form. If you wish to modify the application, complete the Modification of an Approved Protocol. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, complete the appropriate portions of the Continuing Review and Closure Form.

Please use reproductions of the IRB approved stamped consent forms to obtain consent from your participants.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,



Carriann T. Myles, MPA, JCMS
Director & Research Compliance Officer
Office of Research Compliance
The University of Alabama



152 Rose Administration Building
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Tuscaloosa, Alabama 35487-0117
(205) 348-8461