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Teachers' Perceptions of African American Middle School Girls' Interest in Mathematics and Science

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2016

Abstract

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by

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MA, University of Phoenix, 2005

BS, University of Arizona, 2002

Dissertation Submitted in Partial Fulfillment

of the Requirements for Degree of

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Leadership, Policy, and Change in Education

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Abstract

Research into African American female underrepresentation in science, technology, engineering, and mathematics (STEM) fields has become an area of interest due to the fact that a majority of African American middle school females do not possess the high levels of mathematics and science knowledge because of social and cultural barriers both inside and outside school that challenge their academic success. The purpose of this qualitative interpretative phenomenological study was to explore teachers' shared, lived experiences of teaching mathematics and science to African American middle school girls. Delgado and Stefancic's critical race theory, Pratt-Clarke's critical race feminism, and Baker-Miller's relational-cultural theory were used to guide this study. Research questions focused on the perceptions and experiences of teachers' lived experiences teaching mathematics and science to African American middle school females. Criterion, purposive, and maximum variation sampling techniques were used to recruit 10 teachers who have 3 or more years experience teaching African American middle school girls. Semistructured face-to-face interviews were the primary data collection source. First cycle and second cycle coding methods were used to support the analysis of this study. Findings suggest that there is a connection between a positive student-teacher relationship and academic success. The results of this study contribute to positive social change by providing empirical evidence policymakers and teachers can use to improve the mathematics and science instruction and practices that are needed to meet the needs of African American middle school females and reduce the underrepresentation and underachievement of African American females in mathematics and science.

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Dedication

This dissertation is dedicated to my family and friends who gave me the strength and encouragement I needed to complete this journey, especially my husband Kevin C. Best. In addition, I dedicate this dissertation to all African American middle school and high school girls and the teachers who dedicate themselves to their learning.

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I give thanks and praises to God Almighty, without his blessings, I could not have completed this journey.

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Chapter 1: Introduction to the Study

African American females are underrepresented in science, technology, engineering, and mathematics (STEM) related degrees and career fields (Brooks, 2011; Carnevale, Smith, & Melton, 2011). Studies have shown that possessing high levels of science and mathematics knowledge is essential to be successful in society (Brooks, 2011; National Math and Science Initiative, 2013). However, a large majority of African American middle school females are not doing well in mathematics and science (Farinde & Lewis, 2013; National Center for Education Statistics, [NCES], 2014). In a report conducted by the NCES, in 2011 and 2013, African American girls in Grades 4 and 8 had the lowest achievement scores on the National Assessment of Education Progress (NAEP) in both mathematics and science compared to all other female racial groups (NCES, 2014). In addition, this same report showed that African American eighth grade females had the lowest enrollment rate in algebra or an advanced mathematics course. An analysis of math and science teachers may provide some insight on middle school African American girls' interest or lack thereof in mathematics and science. This study was an attempt to explore teachers' shared, lived experiences of teaching mathematics and science to African American middle school girls.

By the year 2018, there will be approximately 2.4 million STEM jobs in the United States (Carnevale et al., 2011; myCollegeOption® and STEMconnector®, 2013; National Science Foundation, 2010). As the future of the United States becomes more dependent on STEM knowledgeable workers to maintain its competitive edge in the international arena and the fact that the current STEM workforce is ready to retire (Bayer

Corporation, 2012), it is clear that the United States needs to ensure that all students possess high levels of mathematics and science knowledge upon graduation to assist the nation in maintaining its competitive edge in the future.

Research has shown that African American female students face barriers both inside and outside school walls that are negatively impacting their success in education (Bayer Corporation, 2012; Brooks, 2012; West-Olatunji, Pringle, Adams, Baratelli, Goodman, & Maxis, 2008). Both psychological and educational factors have explored why African American girls continue to be underrepresented in STEM and advanced placement (AP) mathematics and science classes. Conversely, two key factors that are consistent in the extant literature that undermine African American females success in education are race and gender (Cvenczek, Maltzoff, & Greenwald, 2011; Evans-Winters & Esposito, 2010; Farinde & Lewis, 2012; Ford, 2010; Kitts, 2009; Perry, Link, Boelter, & Leukefeld, 2012; Pringle, West-Olatunji, Brkich, Archer-Banks, & Adams, 2012; Reigle-Crumb, Moore, & Ramos-Wada, 2010; Shapiro & Willams, 2012).
According to Delgado and Stefancic (2012), racism is still very active in the educational system. The inequities and inequalities that persist in the American educational system stem from past racial beliefs regarding who has the right to be educated in the nation (Garrison, 2012; Kumasi, 2011; Martin, 2009). In addition, because of their gender, many African American females are subjected to sexist ideologies that contribute to the undermining of their success in education (Evans-Winters & Esposito, 2010). A first step in meeting the needs of these girls is to analyze the perspectives of teachers who have experience teaching them mathematics and science.

Background

The National Math and Science Initiative (2013), a public-private organization formed to address the preparedness and rigor of students taking college courses in math and science, reported that 92% of traditional STEM jobs that will be created by 2018 would require workers with at least a Bachelor's degree. These projections reflect that the economy is becoming more dependent on highly educated workers. Moreover, the report stated that the United States "may be short as many as three million high-skills workers by 2018" (National Math and Science Initiative, 2013, p. 1). Contributing causes that have been linked to the shortage of STEM workers in the United States are (a) STEM workers are needed in other occupations and are diverting to other non-STEM occupations that pay higher earnings and (b) people are no longer interested in STEM-related occupations (Carnevale et al., 2011; Wright 2013). Educational causes that have been linked to shortages of STEM skilled and competent workers are many; however, the primary causes are (a) students at the K to 12 level are not motivated to pursue STEM disciplines, (b) students are not being prepared for postsecondary STEM study, (c) there are not enough qualified teachers at the K to 12 level to teach mathematics and science, (d) there is inconsistency in state standards in mathematics and science curricula in the United States, (e) there is a lack of federal government support, and (f) students are not interested in STEM (Center on Education and Work, 2008; National Governors Association, 2011; National Science Foundation, 2010; U. S. Congress Joint Economic Committee, 2012).

The NAEP sets three achievement levels in mathematics and science that are governed by the National Assessment Governing Board performance standards: (a) basic-student demonstrates below the achievement level, (b) proficient-student demonstrates competency over challenging subject matter, and (c) advanced-student demonstrates superior performance. These achievement levels measure what students should know and be able to do at each grade level (NCES, 2013). In a study conducted by the U. S. Department of Education (2012) on sex and racial/ethnic group differences in educational preparation and achievement, they reported that in 2011, only 18% of fourth grade and 14% of eighth grade African American females scored proficient in mathematics. The rates for science showed even lower scores with fourth grade, eighth grade, and 12th grade African American females scoring 11%, 8% and 4% respectively. This same study reported that only 69% of African American females graduated from high school in 2011 (U. S. Department of Education, 2012). The low scores in mathematics and science achievement for African American females during middle school years may be a key factor in their future academic and career choices.

Recently, two factors have been identified as primary causes that contribute to the underrepresentation of African American females students in STEM: (a) There is a lack of quality science and mathematics education programs in poorer school districts and (b) minority and female experienced and competent workers and students are being overlooked and underrepresented in STEM fields and classrooms, especially the African American female (Carnevale et al., 2011; myCollegeOption® and STEMconnector®, 2013; U. S. Department of Education, 2012). These data may indicate that the focus in

classrooms in poorer school districts is being placed in areas other than in mathematics and science instruction. In addition, these data might also indicate that minorities and females are not exhibiting the high levels of interest and skill in mathematics and science at the standards that society and standardized testing suggest are necessary to be competitive in STEM-related fields.

Studies have shown that students begin to show interest, or lack of interest, in mathematics and science in early primary school (Epstein, 2007; West-Olatunji et al., 2008). By the time students reach upper primary school age, research has shown that many who are interested in science and mathematics have lost their interest. In addition, research has shown that some students, especially females, begin to lose interest in mathematics and science during middle school (American Association of University Women [AAUW], 2010; Girl Scouts Research Institute, 2012; Science Daily, 2008; Zembar & Blume, 2011). According to Girl Scout Research Institute (2012), the lack of interest in mathematics and science for girls during middle school may be because (a) girls are interested in careers where they are helping others such as "teaching, child care, and working with animals" (p. 4), and/or (b) girls believe in the stereotype that boys are better at math and science than girls. In addition, the results of a new study conducted by Lavy and Sand (2015) on the effects of teachers' gender biases on boys' and girls' academic achievement and enrollment in advanced math and science courses in middle school through high school found that teachers' biases had a positive effect on boys and a significant negative effect on girls. Levy and Sand attributed these findings to teachers showing favoritism toward boys and demonstrating stereotypical biases toward girls in

math and science. For African American and Hispanic girls, the lack of interest may also stem from (a) not having exposure to STEM, (b) lack of adult support, (c) low academic achievement, and (d) awareness of gender biases in STEM fields (Girl Scouts Research Institute, 2012; Science Daily 2008). Some researchers, on the other hand, asserted that the gap in academic achievement in mathematics and science between girls and boys may be due to biology, hormones, genetics, and other sociocultural factors such as (a) parents supporting boys more so than girls and (b) the lack of teacher support in the classroom (Zemblar & Blume, 2011).

A view of the literature illuminated both psychological and educational factors that attribute specifically to the low performance of African American females in mathematics and science: (a) lack of quality education and unqualified teachers in mathematics and science (Bayer Corporation, 2012; Christensen, Knezek, & Tyler-Wood, 2014; Farinde & Lewis, 2012), (b) racial and gender stereotyping (Bayer Corporation, 2012; Cvenczek et al., 2011; Evans-Winters & Esposito, 2010; Hill, Corbett, & St. Rose, 2010; Farinde & Lewis; 2012; Kellow & Jones, 2008; Shapiro & Williams, 2012; Perry et al., 2012), (c) schools that do not offer AP math courses, and low enrollment in algebra or other advanced mathematics courses (Farinde, & Lewis, 2012; NCES, 2012), (d) positionality and low expectations by school personnel (West-Olantunji et al., 2008; West-Olatunji et al., 2010), (e) lack of role models and mentoring (Borum & Walker, 2012), and (f) standardized testing and grades (Pringle et al., 2012; West, 2013). Although the U. S. Department of Education spends between $2.8 billion and $3.4 billion annually on STEM education (U.S. Department of Education, 2013),

many African American females are not prepared in mathematics and science, compared to all other racial/ethnic and gender groups.

Problem Statement

African American female students face many barriers both inside and outside school walls that are negatively impacting their success in education (Bayer Corporation, 2012; Brooks, 2012; West-Olatunji et al., 2008; West-Olatunji et al., 2010). Numerous studies have shown that possessing high levels of science and mathematics knowledge are essential elements necessary to be successful in our society (AAUW, 2010; Bayer Corporation, 2012; Brooks, 2011; Carnevale et al., 2011; Center on Education and Work, 2008; Hill et al., 2010; myCollegeOption® and STEMconnector®, 2013; National Math and Science Initiative, 2013; Reigle-Crumb et al., 2010). Nevertheless, a large majority of middle school African American girls are not doing well in mathematics and science.

African American females in Grades 4 and 8 had the lowest achievement scores in both mathematics and science on the 2011 and 2013 National Assessment of Educational Progress, compared to all other female racial groups (NCES, 2014). In addition, the same report showed that African American eighth grade females had the lowest enrollment rate in algebra or an advanced placement mathematics course. In a longitudinal study of fifth grade African American females, West-Olatunji et al. (2008) concluded the "positionality of school personnel that influence instructional practices and the learning environment" (p. 225) were the greatest restrictions middle school African American girls face regarding their current and future aspirations as mathematics and science learners. However, a longitudinal study conducted by Robinson-Cimpian,

Lubienski, Ganley, and Copur-Gencturk (2014), regarding teachers' perception of math proficiency of elementary school boys and girls, found that teachers' conditional underrating (i.e., differences in girls "academic performance and teachers' ratings of [the girls] behavior" (p. 1275), of girls' mathematical skills and performances are due to the girls' behaviors the teachers deemed were inappropriate. The above studies have suggested that educators are using other factors, rather than performance, to evaluate African American middle school girls in mathematics and science. These factors may be negatively adding fuel to the undermining and underrepresentation of African American females in AP mathematics, science, and STEM-related courses. In commenting on the study conducted by Robinson-Cimpian et al., Penner (2014) argued that the focus on teacher biases masks the larger societal roles that are contributing to the undermining and underrepresentation of girls' performance, specifically in mathematics and science. Penner's suggested there are other factors besides students' academic performance and teacher biases that are being used to evaluate African American middle school girls' mathematics and science abilities, which are contributing to their underrepresentation and underachievement in these subjects.

Although there is a plethora of scholarly journals and articles written about African Americans and their educational experiences, most of the literature is quantitative and focuses on the African American male, African American female postsecondary education, or the history of African American education. Little attention in the research literature, especially in mathematics and science, has been given to the teachers who are held accountable for educating African American middle school girls. Possessing high-

level of science and mathematics knowledge are essential components necessary to be successful in our society. Conversely, middle school African American girls continue to exhibit poor performance in mathematics and science (U. S. Department of Education, 2013). In order to understand the phenomenon of the continued underachievement and underrepresentation of African American females at the middle school level in mathematics and science, the knowledge of the teachers who are charged with their education is needed. Teachers spend 7 or more hours a day with students over 9 or more months a year. Their pedagogical knowledge about mathematics and science coupled with their insight into this phenomenon has not been thoroughly investigated. Their voices and knowledge are a necessary first step in understanding why African American girls continue to be underrepresented and underachievers in mathematics and science. Furthermore, teachers' voices regarding this phenomenon may provide solutions to reduce and ultimately end the underrepresentation and underachievement of African American middle school girls in mathematics and science.

Purpose of the Study

The purpose of this study was to explore teachers' shared, lived experiences of teaching mathematics and science to African American middle school girls. Analyzing teachers who have experience teaching mathematics and science to African American middle school girls can offer valuable insight to assist other educators and policy makers in developing significant support and improve conditions that may be helpful in changing the underrepresentation and underachievement of African American females in mathematics and science in the United States.

Research Questions

1. How do teachers describe their lived experiences of teaching African American middle school girls?
2. How are teachers' lived experiences with African American middle school girls who have lost interest in mathematics and science different from those students who have not lost interest?
3. How do teachers with experience teaching African American middle school girls perceive themselves impacting these girls interest in mathematics and science?
4. How do teachers perceive their teaching and learning experiences as contributing to African American middle school girls' interest in mathematics and science?

Conceptual Framework

The conceptual framework for this study was Delgado and Stefancic's (2012) critical race theory, Pratt-Clark's (2010) critical race feminism, and Baker-Miller's (1976) relational-cultural theory. Non-African Americans perceive the barriers and challenges in education for African American females differently. Critical race theory posits "race and races are products of social thought and relations" (Delgado & Stefancic, 2012, p.8), and that people of color, because of their oppressions, can better communicate matters that are not realized by their white counterparts. Critical race feminism builds on the premise of critical race theory. It focuses on the voices, experiences, roles, and

multiple identifiers of women of color under the intersection of gender and race. Relational-cultural theory suggests that human relationships are essential across our lifespan, especially for girls (Belgrave, 2002). How others perceive and interpret the interest of African American females is essential to this study.

Delgado and Stefancic's (2012) critical race theory and Pratt-Clarke's (2010) critical race feminism were used to illuminate how the race and gender of African American middle school girls may impact teachers teaching practices. In addition, these theories were used to explain how teachers perceive their experiences with African American middle school girls and may impact these girls' academic success in mathematics and science and informed Questions 2, 3, and 4. Baker-Miller's (1976) relational-cultural theory was used to show a correlation between student-teacher relationships and the academic performance of African American female students and informed Questions 1, 2 and 3. The theoretical framework guiding this study is further explored in Chapter 2.

Nature of the Study

Analyzing the perceptions of teachers who have experience teaching mathematics and science to African American middle school females requires careful interpretation of the experience (Smith & Osborn, 2008). The hallmark of interpretative phenomenological analysis (IPA) is exploring how individuals make sense of their experience (Pietkiewicz & Smith, 2014; Smith & Osborn, 2008) and "how they experience what they experience" (Patton, 2002, p. 107). This approach allowed me to explore and gain a better understanding of how people, in the course of their everyday lives, experience the

phenomenon under study. The focus of IPA was to gain an understanding of what an experience is like from the participants' point of view (Smith & Osborn, 2008). The assumption of this framework is that there is an essence to be shared in an experience (Patton, 2002). Although the philosophies of Husserl, Merleau-Ponty, Heidegger, and Satre provided the foundation for IPA, IPA is the practical application of their work within a research framework and the process for developing an understanding of personal life experiences.

Data were collected in the form of recorded interviews and field notes with math and science teachers who have 3 or more years' experience teaching African American middle school females. A minimum of two semi-structured interviews, one face-to-face and one through email for participants who could not attend a second face-to-face interview, was conducted with each participant. Recorded interviews were transcribed verbatim and converted into text files. After each interview was read and transcribed, they were electronically sent to each participant for verification. Once all transcriptions were verified, they were uploaded into QDA Miner Computer Assisted Qualitative Data Analysis Software Program (CAQDAS). The QDA Miner software program was used to code and store the interviews of each participant and my field notes. This software program was chosen for this study because it can maintain and organize data generated through the data collection process. In addition, the QDA Miner software program allowed me to create visual graphics of the data to assist in developing a list of statements about how the participants experience teaching mathematics and science to African American middle school females. Descriptive coding, In Vivo coding, and value coding

was used to initially frame and classify information. Pattern coding was then used to narrow the data into smaller numbers of categories and themes to develop interpretations of what the data is revealing (Miles, Huberman, & Saldana, 2014). This was an iterative process and was ongoing throughout the analysis of the data. Once saturation of the data collection process was reached, a holistic view of the themes was done to look for patterns amongst the data. Selected excerpts from the data were used to support the phenomenological themes of the study.

Definition of Terms

The following terms are used throughout this study:

Advanced placement (AP) curriculum/course: A curriculum or course that promotes higher-order thinking, engages students, reduces discipline problems, and builds students capacity to learn (Campbell, 2012).

African American female (girl): Refers to a woman or girl of African descent. A female person having origins in any of the black racial groups of Africa (NCES, 2007). The terms *African American, Black,* and *students of color* are used interchangeably in this study.

Achievement gap: In education, this refers to the disparity in academic performance between groups of students (Education Week, 2011).

STEM: The acronym for science, technology, engineering, and mathematics (Bayer Corporation, 2012; U. S Congress Joint Economic Committee, 2012).

Underrepresented: Describes populations who have lower representation than the population as a whole (Towns, 2010).

Underrepresented minority (URM): Refers to Black [African American], Latina/o, Native American, and Southeast Asian American students (Museus & Liverman, 2010).

Assumptions

The primary assumptions of the study were that teachers would answer questions honestly during the interviews, would understand the questions, and would have the appropriate knowledge base to respond to the interview questions accurately. In addition, I assumed that the voluntary aspect and purposeful sampling strategy would identify participants who can reflect and articulate their experiences honestly.

Scope and Delimitations

The purpose of this study was to explore teachers' shared, lived experiences of teaching mathematics and science to African American middle school girls. Since teachers are one of the primary gatekeepers of middle school students, making sense of their lived experiences will help to inform further studies.

My study sought rich, in-depth information from a diverse group of participants. A purposeful sampling approach was used in the selection of participants. First, criterion sampling was used to ensure that participants meet the predetermined criterion (i.e., years of experience and experience teaching African American middle school females). Next, maximum variation sampling was used to allow me to purposefully select participants who met the required criteria to provide valuable information to identify patterns. For this study, the sample size was 10 teachers who have a shared common perspective regarding teaching mathematics and/or science to middle school African American girls. Patton (2002) stated that a small sample size is best used when researchers are seeking in-depth,

information-rich data. Therefore, this sample size was small enough to acquire the in-depth, information-rich data I was seeking, yet large enough to accommodate different perspectives regarding the phenomenon under study.

Transferability of the findings in this study may inform future research regarding African American middle school females' interest in mathematics and science. Furthermore, the knowledge gained in this study will provide educators and policymakers with insight into what teachers perceive is the interest level in mathematics and science of African American middle school girls. In addition, this information may be helpful in the development of significant supports that may reduce and ultimately eliminate the underrepresentation of minority females in STEM majors and career fields in the United States.

Limitations

The IPA design has many advantages that outweigh its limitations for this study. However, the main limitations of this study were (a) the narrow parameters used to select participants, (b) the amount of data to be collected, (c) the impact the research may have on the participants, and (d) the researcher's biases.

In this study, I sought to recognize and understand the perceptions of 10 teachers who have experience teaching mathematics and science to African American middle school females. One of the potential weaknesses of phenomenology research is that findings cannot be generalized (Creswell, 2013; Patton, 2002; Pietkiewicz & Smith, 2014). The perceptions of the participants cannot be generalized to include all teachers in a school district or other states in the United States. In addition, IPA is a self-report of

perceptions and relies on the experience of the researcher to interpret the experiences of individuals. If researchers do not actively reflect on their interpretations during the analysis phase of the data, the results may be inaccurate or misleading (Smith & Osborn, 2008). Furthermore, Patton (2002) stated that a phenomenology study "seeks to grasp and elucidate the meanings, structure, and essences of the lived experience of a phenomenon for a person or group of people" (p. 482). Therefore, readers may subject the data to various interpretations. The review of the literature revealed that views in critical race theory, critical race feminism theory, and relational-cultural theory were the approaches needed to analyze the perceptions teachers have regarding African American middle school females as mathematics and science learners. Consequently, it was decided to adopt these theories as the conceptual framework for this study.

Interviewing was the core source of data collection for this study. It is especially important that rapport and comfort between the researcher and the participants was established and maintained throughout the study. In order to ensure that a positive impact was maintained with participants, the full disclosure of the study was communicated before, during, and after the study. In addition, confidentiality of all participants' information was maintained throughout the study. Furthermore, detailed protocols were established prior to interviews so that accurate information was conveyed.

Finally, biases of the researcher can impact the results of the study. To limit this threat, I let my research biases be made known. In addition, Patton's (2002) suggestion to maintain "a stance of neutrality" (p. 51) was used. This means that I did not go into the

study with preset assumptions or tried to manipulate the data to confirm with my personal viewpoints.

Significance of the Study

This study is significant because it will provide insight into what teachers perceive may affect the level of interest of African American females in middle school mathematics and science classes. In addition, it will elucidate how teachers with experience teaching African American middle school girls view these girls as mathematics and science learners (Carnevale et al., 2011; West-Olatunji et al., 2008; West-Olatunji et al., 2010). The purpose of this study was to explore teachers' shared, lived experiences of teaching mathematics and science to African American middle school girls. What is known about the underrepresentation of African American females in mathematics and science has been informed by previous research throughout all education levels (Farinde & Lewis, 2012; Perry et al., 2012; Riegle-Crumb & King, 2010; West-Olatunji et al., 2008; Wright, 2013). However, previous researchers have often overlooked African American middle school females, their pursuit as science and mathematics learners, and the lived experiences of teachers who teach mathematics and science to African American middle school girls. A better understanding of what may affect this population can assist instructional staff, parents, and policy-makers in developing strategies and support procedures that will contribute to African American girls' success and interest in higher-level mathematics and science courses that are needed to be successful in STEM-related fields. Moreover, this study can provide policy-makers and educators with needed information that acknowledges the benefits of

assisting African American females and their teachers at the middle school level so that they will be able to assist the society in staying competitive in the global STEM arena now and in the future. Therefore, the viewpoint and inclusion of teachers who teach African American girls in mathematics and science is a necessary step in reducing and ultimately eliminating the underrepresentation of African American girls in AP mathematics, science, and STEM classrooms.

The findings in this study can also be used by other scholars who are interested in the mathematics and science interest of other populations in the United States. While there is much literature on the necessity of mathematics and science knowledge for students to be successful in our society, there is a lack of research that explores teachers' perception of their experiences with teaching mathematics and science to African American middle school females. This study could result in positive social change by assisting the United States in developing and implementing effective processes to identify strategies and resources that are necessary to maintain student interest in mathematics and science, which will help to sustain the United States as a competitor in the global STEM arena.

Summary

There is an achievement gap that remains among African American female students and all other racial and gender groups in mathematics and science. Driven by the need to extend the current knowledge base regarding the underrepresentation of African American females in mathematics, science, and STEM, this study provided insight into the experiences of teachers who teach mathematics and science to African American

middle school girls. This study involved the collection of qualitative data through teacher interviews. In addition, how the race and gender of African American middle school girls may influence teachers' perceptions of these girls interest level in mathematics and science was also explored in an effort to narrow and ultimately end the mathematics and science gap among African American females and all other racial and gender groups.

Chapter 2 provides a synthesis of current literature and research within the past 5 years that relates to this study. An explanation of the literature search strategy is provided to allow for replication of the study's context. I conclude the chapter with a section on gaps in the research.

Chapter 2: Literature Review

Introduction

The purpose of this study was to explore teachers' shared, lived experiences of teaching mathematics and science to African American girls. In preparation for conducting this IPA study, a review of the professional and research literature was conducted. I began this literature review by searching for research studies concerning academic achievements of African American girls in mathematics and science. In addition, research studies concerning the influence of race and gender on teacher practices and teacher expectations and perceptions of African American girls in math and science were also surveyed. Several research databases and resources were used to compile an exhaustive literature review consisting of both digital and printed material from the past 5 years. Walden University's Thoreau Multiple Database tool served as the initial gateway for locating current articles and literature accessing the following databases: ERIC, Educational Resource Complete, ProQuest, PsycINFO, Academic Search Complete, SAGE, and the Dissertation and Theses Database. In addition to these databases, several academic journals were reviewed for recent studies and articles pertaining to African American females: *The Journal of Negro Education, African American Education, The Black Scholar, African American Women Scholars, Journal of Adolescent Research, Psychology of Women Quarterly, Urban Education*, and *the Journal of Education Research.* Google Scholar was also used to cross-reference articles and to find the most current literature within the last 5years pertaining to African American girls.

A strategic search for relevant literature included such key terms and phrases such as *African Americans girls, achievement gap, math and science, middle school, academic achievement, critical race theory in education, student-teacher relationships, teachers' expectations and perceptions, STEM disciplines, gender, race,* and *the representation and/or underrepresentation of African Americans girls in STEM*. All articles were limited to those that were refereed or peer reviewed and from the past 5 years in order to maintain and establish the academic rigor of the literature review. The search was designed with the research questions, critical race theory, critical race feminism, and relational-cultural theory as a framework. In addition, African American girls, mathematics and science education gaps, social, psychological, and environmental barriers, the influence of gender and race on teacher practices, teacher perceptions and expectations, and strategies that stimulate and/or hinder African American female students in mathematics and science classrooms were used as the core criteria.

Initially, a broad scan of the literature concerning African American girls yielded 1,274 results. Once the terms *academic achievement, achievement gap, math and science, STEM, representation, underrepresentation, student-teacher relationships, middle school, teacher expectations,* and *teacher perceptions* were applied to the search, only 65 results were returned, of which over two-thirds were rejected for one or more of the following reasons: data focused on areas other than education, the information in the article focused mainly on the health, fitness, and body image of African American girls, or the articles involved information on subjects other than math, science, and STEM. Moreover, a broad scan of the literature concerning influences on teacher practices

yielded 61 results. When the terms *mathematics and science* were applied to the search, only six results were returned, of which only two were used for this study. The other four studies were rejected due to the information in the articles on subjects not relevant for this study and were not within the last 5 years. Another broad scan of the literature concerning teacher practices and adding the terms *race and gender* and *students*, yielded six results. All of these were rejected due to the subject matter of the articles not being relevant to this study and/or were not within the last 5 years.

Due to the lack of studies that explored African American females' interest in math and science and influences of teacher practices, research involving critical race theory, critical race feminism, and relational-cultural theory were used to identify relevant literature.

Conceptual Framework

Critical Race Theory

When considering the low performance and underrepresentation of African American females in mathematics and science disciplines, a critical race theory perspective (Delgado & Stefancic, 2012) best encapsulates the difficulties involved. Critical race theory (CRT) began in the early 1970s by legal scholars Bell, Freeman, and Delgado, who believed that the 1960s civil rights era had begun to lose its foothold, and in most areas, seemed to be headed back to a time when African Americans had no rights (Delgado & Stefancic, 2012).

CRT is an expansion of two movements that also found ground during the civil rights movement—critical legal studies (CLS) and radical feminism. CRT borrowed

insights from CLS, feminism, and civil rights thinking. Together, they provide insight into legal indeterminacy, patriarchy, and redressing historical wrongs of marginalized groups (Delgado & Stefancic, 2012). Unlike other social theories that try to explain societal ills, CRT provides scholars and activist tools to change and transform society for the better (Delgado & Stefancic, 2012). According to Delgado and Stefancic (2012), the basic tenets of CRT are (a) "racism is ordinary" (p. 7), (b) racism serves the self-interest of elite and working class White people, who reap more benefits from it than any other ethnic groups, (c) "race and racism are products of social thought and relations" (p. 8) and has nothing to do with "personality, intelligence, or moral behavior" (p. 9), and (d) CRT provides people of color with a voice to communicate their experiences regarding race and racism that may not be cognizant to White people.

Racism is still very active in our society and in the educational system (Delgado & Stefancic, 2012; Esposito, 2011; Kumasi, 2011; Wallace & Brand, 2011). The inequities and inequalities that persist in education may stem from past racial beliefs regarding who has the right to be educated in our nation (Garrison, 2013; Kumasi, 2011; Martin, 2009). Through the use of CRT, African American females' ability, intellect, and positionality in mathematics and science are questioned, challenged, and changed (Farinde & Lewis, 2012; Pringle et al., 2012; West-Olatunji et al., 2010). For some African American females, a school may be the first step in identifying and forming future decisions regarding college majors and careers. CRT is a way of determining whether influences of educators' practices, perceptions, and beliefs affect African American girls' decisions about their futures.

A CRT lens creates a form of analysis when considering the phenomenon of the underrepresentation of African American females in mathematics and science classrooms and careers. In regards to the controversy of underrepresentation of African American females in mathematics and science, the most visible factors are race and gender (Clark, Moore, & Slate, 2012; Delgado & Stefancic, 2012; Farinde & Lewis, 2012; Pringle et al., 2012; West-Olatunji et al., 2012). In their research on gender and ethnic differences in AP courses, Clark et al. (2012) found that students of color enrollment in AP courses is not equal to the percentages of their school's population. The authors also discovered that a gender gap between minority and majority groups still exist in regards to AP course enrollment (Clark et al., 2012).

The factors of white privilege, colorblind ideology (Delgado & Stefanic, 2012; Ford, 2010), and deficit thinking (Ford, 2010) have also contributed to the phenomenon of the underrepresentation of African American females in mathematics and science. In addition, factors of race, gender, positionality, white privilege, stereotyping, colorblindness, and deficient thinking have been reflected and entertained in the educational system in ways that have lacked the essences of how racism and gender contribute to the African American female learning experiences, especially in mathematics and science.

CRT views "race and racism [as] products of social thought and relations" (Delgado & Stefancic, 2012, p. 8). A CRT lens is a way to expose the many variations of racism "in order to reveal the deeply ingrained racial hegemonic structures enmeshed in American culture" (Wallace & Brand, 2012, p. 346). CRT can provide insight into the

learning experiences of women of color and focuses on the role of race but also considers how race intersects with other components such as gender, culture, and socioeconomic status (SES) within the lives of African American females. By using storytelling and counternarratives, CRT challenges the perceptions of the dominant culture and shows marginalized people new "possibilities beyond where they live, and the shared aims of their struggle" (McKay, 2010, p. 27). In addition, teachers who share their experiences and stories through a CRT lens can assist other mathematics and science educators in changing practices that may better serve students of color and "demonstrates [their] commitment to social action" (Chapman, 2007, p. 159), which will reduce and ultimately eliminate the underrepresentation and underachievement in mathematics and science for African American middle school females.

Critical Race Feminism

Critical race feminism (CRF) builds on the premise of CRT. It focuses on the voices, experiences, roles, and multiple identifiers of women of color under the intersection of gender and race (Pratt-Clark, 2010). CRF originated from critical legal theory, feminist legal theory, and CRT. However, CRF simultaneously combines the principals of critical legal theory, feminist legal theory, and CRT in a way that focuses and examines the experiences and multiple voices of women of color by using a transdisciplinary approach, which involves the disciplines of race, gender, and social class, to address women of color social problems and injustices (Carter, 2012; Pratt-Clark, 2010). CRF is not only concerned with the theory of education but also the practice of education (Pratt-Clark, 2010).

In education, CRF has been used to challenge and question the political, social, and academic structures that have historically kept women of color at the lowest level of the educational system (Berry, 2010; Carter, 2012; Evans-Winters & Esposito, 2010; Pratt-Clarke, 2010). According to Carter (2012), the workings of racism and sexism have "diminish[ed] and ignore[ed] the experiences of Black people and women of color by perpetuating systemic structures that attempt to keep them at the bottom " (p. 11). The same sentiment is echoed in Evans-Winters and Esposito's (2010) article regarding Black girls education. Evans-Winters and Esposito further stated, "Because of racism, sexism, and class oppressions in the U.S., African American girls are in multiple jeopard[ies] of race, class, and gender exclusion in mainstream educational institutions" (p. 13). This suggests that due to the intersections of race, gender, and class, research regarding African American girls education needs to be thoroughly scrutinized, challenged, and questioned in a way that will provide positive insight into their educational experiences and not on the negative side of their experiences, as is typically done in traditional research studies (Carter, 2012; Evans-Winters & Esposito, 2010).

Not only do scholars share in their request that more analysis on the educational experiences of African American girls is needed, other researchers have suggested that teachers of African American girls need a framework that can assist them in understanding why this analysis is necessary. Berry (2010) suggested that using CRF in preparing preservice teachers for classrooms assists them with understanding and acknowledging "the multi-dimensionality" (p. 24) of African American students. In addition, CRF helps teachers to understand how storytelling, theirs, as well as their

students, influence what they teach, how it is taught, and how well it is taught in the classroom (Evan-Winters & Esposito, 2010; Mansfield, Welton, & Grogan, 2014). Viewing education from a CRF lens is a method that can offer insight into the unique lives of African American girls and their educational experiences. CRF serves as a framework to assist and improve the lives of African American girls' educational experiences while at the same time provide policy-makers, teachers, and parents with information to challenge and change educational policies that have continue to undermine, underrepresent, and underacknowledge African American girls' success in education, especially in mathematics and science.

Relational-Cultural Theory

The relationship between teachers and students is an important part in the development of children and their learning. Numerous studies have shown that there is a correlation between student-teacher relationship and academic achievement (Ayaz, Shah, & Khan, 2012; Fan, 2011; Gunderson, Ramirez, Levine, & Beilock, 2011; Rimm-Kaufman, 2014). In addition, the culture of the learning environment, instructional practices, and the curriculum can either contribute to or create barriers to the success of underrepresented minorities in STEM and AP mathematics and science courses (Hernandez, Woodcock, Schultz, Estrada, & Chance, 2013; Whittaker & Montgomery, 2011).

Relational-cultural theory (RCT) originated from the works of psychologist Baker Miller who began exploring dominant and subordinate human relationships (Jean Baker Miller Training Institute [JBMTI], 2015). In 1977, Baker along with colleagues

Jordan, Stiver, and Surrey, began meeting and discussing the damaging effects of traditional therapy on women. Through their work, the group questioned and challenged the marginalization of women, specifically women in the United States (McCauley, 2013). RCT focuses on relational development and has been used in mental health counseling, the multicultural/social justice movement, field education in social work, and group work with adolescents females (Cannon, Hammer, Reicherzer, & Gilliam, 2012; Comstock et al., 2008; Edwards, Davis, & Harris, 2013).

The core tenets of RCT are mutual empathy, mutual engagement, and mutual empowerment (Comstock et al., 2008; Edwards et al., 2013; JBMTI, 2015). Cannon at al. (2012) stated "profound disconnections lead to experiences of condemned isolation. Thus, social mistreatment creates a long-term, chronic pattern in which people progressively learn to doubt their ability" (pp. 3-4). Researchers have determined that the many social barriers African American females face in the context of their movement toward academic success in mathematics and science contributes to their underrepresentation in STEM-related majors and career fields. In the studies conducted by Whittaker and Montgomery (2011) and Hernandez et al. (2013), environmental factors that have the highest impact on minority students are the lack of faculty support and mentorship. In addition, the authors of these studies suggested that for minority students, open communications and discussions are a social and cultural necessity. For example, in their study Hernandez et al. discovered that minority students who do not understand that the scientific process involves setbacks and failures are more likely to change majors to non-STEM related fields. Whittaker and Montgomery explained that institutional barriers

such as difficulty transitioning into a different type of learning environment without support and the lack of peer-to-peer exchange also inhibit minority students' success and persistence in STEM-related majors.

RCT is useful in addressing barriers to build mutuality between teachers and students "that may have occurred because of the perpetuation of negative relational and controlling images that [teachers and students] hold about themselves and others" (Comstock et al., 2008, p. 284). A relational-cultural theory lens may provide insight into the relationship between society, educators, and African American girls that may assist in reducing the underrepresentation of African American girls in STEM and AP mathematics and science classes.

Race, Gender, and The Achievement Gap

The achievement gap in education refers to the difference in academic achievement between groups of students (Education Week, 2011). The achievement gap in education for African Americans compared to all other racial groups has been well documented (Children's Defense Fund, 2011; Garrison, 2013; Martin, 2009; Simms, 2012; Riegle-Crumb & Grodsky, 2010; Rowley & Wright, 2011; Smith-Evans, George, Graves, Kaufmann, & Frohlich, 2014; Vanneman, Hamilton, Anderson, & Rahman, 2009). Although there has been recent research to suggest that African Americans are closing the educational gap, there remains a significant gap in mathematics and science for African Americans, especially for African American females (Francis, 2012; West-Olatunji, et al., 2010; Vanneman et al., 2009). Researchers have studied and concluded several reasons why there remains an achievement gap for African Americans females in

mathematics and science compared to all other racial groups (Leaper, Farkas, & Brown 2012; Else-Quest, Mineo, & Higgins, 2013; Taylor, 2012; Whittaker & Montgomery, 2012). However, the underlying causes for this gap have been varied and challenging to identify and determine. For example, the U. S. Department of Education reported that, African American females at the postsecondary level earned 68% of associate's degrees, 66% of bachelor's degrees, 71% of master's degrees, and 65% of all doctoral degrees awarded to African American students in 2010 (U. S. Department of Education, 2012). However, African American females held only 6% of STEM jobs in 2011 (Brooks, 2011).

Contributing reasons why many African American females elected not to pursue STEM degrees and careers, may be the result of stereotypes associated with STEM disciplines or factors that have discouraged African American females from pursuing degrees in STEM. In a study conducted by Hill, Corbett, and St. Rose (2010), two stereotypes—"girls are not good as boys in math, and science work is better suited to boys and men" (p. 38), were chief among underlying reasons why there is a lack of participation by females in STEM disciplines. The same sentiment is echoed in a study conducted by the Bayer Corporation (2012) between 1995 and 2011. In this study Ph.D. scientist and science teachers, STEM company CEOs, business leaders, deans of college and universities, parents, students, and the general public were surveyed. The authors concluded that stereotyping and discouragement of females and underrepresented minorities (URMs) by STEM faculty members were the chief barriers for females pursuing undergraduate STEM degrees. The study also found that a "lack of quality

science and math education programs in poorer school districts" (p. 7) and "stereotypes that say STEM isn't for girls and minorities" (p.7), are still in existence among university staff. Not only are African American females underrepresented, stereotyped, and discourage away from STEM at the college level and workforce, they are also underrepresented, stereotyped, and discourage away from STEM at the primary and secondary school level (Corra, Carter, & Carter, 2011).

At the K to 12 levels, African American female students have narrowed the education gap. However, they trail behind Whites by more than 20 percentage points, especially in mathematics and science (National Center for Education Statistics, 2013). For females, studies show that by the time many of them reach middle school, their interest in mathematics and science has diminished considerably (American Association of University Women [AAUW], 2010; Girl Scouts Research Institute, 2012; Reigle-Crumb, Moore, & Ramos-Wada, 2010; Science Daily, 2008; West-Olatunji, Pringle, Adams, Baratelli, Goodman, & Maxis, 2008; Epstein, 2007; Zembar & Blume, 2011). A study conducted by the U. S. Department of Education in 2012 on the "differences between sex and racial/ethnic groups in education preparation and achievement" (p. v), confirmed that this is especially true for African American females.

The reasons for the achievement gap in mathematics and science for African American girls at the K to 12 levels mirrors the reasons for the achievement gap of African American females at the postsecondary level. Similar to their colleagues at the postsecondary level, faculty at the K to 12 levels play a significant role in the educational achievement of African American females, especially in mathematics and science. Like

their colleagues at the postsecondary level, faculty at the K to 12 levels have stereotyped and discouraged African American girls from pursuing AP courses in mathematics and science (Perry et al., 2012; West-Olatunji et al., 2008). In a study of school counselors, West-Olatunji et al. (2010) used the theory of positionality and found that school counselors had lower expectations for low-income African American girls as science and mathematics learners than any other racial and gender group. The perception of teachers was also found to be a contributing factor for the achievement gap in mathematics and science for African American girls when compared to all other racial groups. Pringle et al. (2012), conducted a study that explored why African American girls in grades fifth through seventh do not achieve as well in mathematics and science when compared to White girls. The authors concluded that teachers (a) held stereotypical beliefs, (b) their autonomous decision-making, and (c) the lack of understanding their roles as facilitators and advocates of girls learning mathematics and science, greatly impeded African American girls achievement and opportunities in mathematics and science classrooms. In addition, their study found that because of the low expectation teachers held for African American girls, there were no positive expectations of these girls as science and mathematics learners beyond the fifth-grade level. Not only are teacher expectations of African American girls contributing to the achievement gap in mathematics and science, Farinde and Lewis (2012) found that a students' socioeconomic status was also a factor. Using cultural mismatch theory, the authors examined teachers' perception of student behavior as it related to the teacher recommending students for advance courses. The authors concluded that poor African American females students were the least likely to

be recommended for advanced courses by their teacher, even after controlling for the students' test scores. What makes these studies significant is that the authors found that beliefs held by others with regards to race, gender, and SES, contributed considerably to the educational gap for African American girls in mathematics and science.

However, other studies have rebuked the idea of race and gender as the only contributing factors for the achievement gap for African American females in mathematics and science. Kitts (2009), explored factors such as (a) a lack of interest in science, (b) exposure to science and scientist, and (c) misconceptions regarding the amount of math needed to do science, as contributing factors for the achievement gap in mathematics and science for African American females. In addition, a study conducted by Rogers-Chapman (2014) using stratification theory examined which students have access to STEM high schools. He found that 41% of Black students and only 25.5% of White students attended exclusive STEM schools. Additionally, he found that African Americans are overrepresented in STEM schools due to the large concentration of STEM school located in large cities, which demographically speaking, is where most African Americans are located, especially in the Southern region (U. S. Census Bureau, 2011). Moreover, Rogers-Chapman stated that because of policy recommendations to attract more minorities in the STEM fields, Blacks have better access to STEM schools than other races. He also stated that even though Blacks have better access to STEM schools than other races, these schools may not be reaching them, suggesting that although STEM schools are located in areas where Black students are taught, and that Blacks have access to exclusive STEM schools, they are not benefiting from these schools.

In studies conducted by Else-Quest et al., (2013) and Reigle-Crumb et al., (2010) using Eccles expectancy theory, the authors concluded that a students' attitude about mathematics and science contributed significantly to their performance in mathematics and science. Examining how the intersection of race and gender correlated to math and science attitudes and achievement, Else-Quest, et al., (2013) found that overall, females know and understand the importance of science and math for their future and that females may be better at performing the math and science task if given the opportunity. However, because of their lack of confidence in their abilities, females miss given opportunities to pursue STEM and AP courses. Reigle-Crumb et al. (2010), study examined factors that explain the disparities in STEM choices among young adults. The researchers found that environmental and cognitive phenomena contributed to the achievement gap and underrepresentation of African American females in mathematics and science. The above studies suggested that other factors, in addition to race and gender, contributed to the achievement gap in mathematics and science for African American girls'. The next section highlights other possible barriers that may have contributed to the achievement gap and underrepresentation in mathematics and science for African American females.

Social, Psychological, and Environmental Barriers in Education for African American Females

Children in the United States have a fundamental human right to have access to and receive an appropriate education (No Child Left Behind, 2002). However, for some children, especially African American females, barriers to this right persist and occur both inside and outside school walls that negatively impact their success in education

(Bayer Corporation, 2012; Brooks, 2011; Smith-Evans et al., 2014; West-Olatunji et al., 2008; 2010). In this study, barriers refer to effects such as beliefs, emotions, events, or systems that inhibit or prevents a person from achieving an action. Over the years, researchers have studied a variety of reasons for the achievement gap in mathematics and science for African American females. They have indicated that coupled with race and gender, the manifestation of social, psychological, and environmental barriers also contributed to the achievement gap for African American females in mathematics and science education.

Social Barriers

Researchers have suggested that social barriers to mathematics and science for African American girls are caused by several things, including the girls behaviors toward math and science, their lack of exposure, internal (school) and external (home, community) demands, socioeconomic status, relationships with others, and cultural beliefs and identities. (Akom, Scott, & Shah, 2014; Buck, Cook, Quigley, Eastwood, & Lucas, 2009; Buzzetto-Moore, Ukoha, & Rustagi, 2010; Coger, Cuny, Klawe, McGann, & Purcell, 2012; Kitts, 2009; Wang, 2013;). Akom et al., (2014) asserted that the simultaneous rejection of the educational system by African Americans, and how African American are rejected by the educational system, significantly undermined and limited opportunities for African Americans to advance in STEM. African Americans who did not conform to what society deems as “normal” behaviors were most negatively impacted (Akom et al., 2014; Farinde & Lewis, 2012). When African American females display attitudes, behaviors, and dress in a style that is unfamiliar to people outside of their

"normal" it can be seen as disrespectful, disruptive, or discouraging (Campbell, 2012; Evans-Winters & Esposito, 2010; Francis, 2012). The study conducted by Whittaker and Montgomery (2012) confirms how this cultural mismatch has undermined the academic performance of African Americans. Their study examined factors that supported underrepresented minorities (URM) in STEM fields at Predominately White Institutions (PWIs), Historically Black Colleges and Universities (HBCUs), and Minority Serving Institutions (MSIs). The authors asserted that when URMs communicated their need for assistance, this was viewed as "communicating uncertainties and struggles that get [URMs] labeled in the eyes of some faculty members at majority institutions as individuals who are not adjusting or performing well or possibly may be incapable of adjusting or performing" (p. A. 47). Due to this cultural mismatch, teachers' decisions to recommend these girls for AP courses are influenced (Francis, 2012).

However, studies have shown that many African American girls display some of these actions or behaviors in the classroom in an attempt to be heard, and not to be marginalized because of their race and gender (Evan-Winters & Esposito, 2010). African American females are impacted by many of societies demands and pressures differently than females of other races, and their male counterparts. Educators, who are not familiar with the social and cultural differences of African American females, tend to view these girls as indifferent or uncertain about the importance of mathematics and science education for their future endeavors. Researchers have also shown that the socioeconomic status of these girls created barriers to their mathematics and science achievement.

Studies have indicated that low-income African American female students are the least likely candidates to be recommended for AP and honors mathematics and science courses by their educators (Francis, 2012; Pringle et al., 2012; Perry et al., 2012; West-Olatunji et al., 2010). There is a wide range of reasons for why this is true for low-income African American female students, many of which have been mention elsewhere in this study. However, a study conducted by Mutegi (2012), provides a unique argument that questioned the literature addressing the science education of African Americans. In his study, Mutegi suggested that the manner in which the literature described African American science education "mischaracterize[s] the population of African Americans" (p. 86), and impacted the issues "unique and salient to African Americans are masked" (p.86). Meaning that some of the literature that has reported on the science education of African Americans may not be reflective of the concerns unique to the needs and reasons why African American females continue to be underrepresented in mathematics and science classrooms. He stated that this might be due to past sociocultural constructions of race in Western society for African Americans, which may account for their current underrepresentation in science education. Although these social barriers provided insight into some of the many issues African American girls face in their pursuit of mathematics and science achievement, they are limited in explaining the underlying causes for the achievement gap for African American females in mathematics and science.

Psychological Barriers

In addition to social barriers, researchers have indicated that African American females also face psychological barriers in their pursuit of mathematics and science

achievement. Results of a study conducted by Spitzer and Aronson (2015) showed that although girls receive better grades, they are better writers and communicators in most academic courses, the sociocultural factors such as, anxiety, stereotyping, and traditional gender roles, undermined their interest and confidence in STEM-related subjects. Studies have indicated that students' self-concept regarding mathematics and science, played a significant role in how they perceived themselves and others as mathematics and science learners (Cvencek, Meltzoff, & Greenwald, 2011; Moakler & Kim, 2014; Reigle-Crumb et al., 2010).

Reigle-Crumb et al. (2010) concluded that there is a high correlation between gender stereotypes and levels of enjoyment in both mathematics and science during middle school. Their study found that both male and female middle school students equally displayed a high level of interest in science during middle school. However, due to stereotype threat (i.e., "a concern or anxiety that one's performance or actions can be seen through the lens of a negative stereotype [or] a concern that disrupts and undermines performance in negatively stereotyped domains" [Shapiro & Williams, 2012, p. 175]), many African American, especially African American females, are discouraged away from advanced level math and science courses "because of achievement tests and school tracking" (Farinde & Lewis, 2012, p. 423). Farinde and Lewis found that because of constant failures in achievement tests, and school tracking policies, many African American girls, especially low-income girls, tend to blame their poor performance on themselves, rather than on the systems that continued to enact these policies. The authors concluded that these policies often "weakens African American female students'

confidence in their personal abilities formulating negative perceptions of math and science, while reinforcing inaccurate stereotypes about girls strengths and weaknesses" (p. 423) in mathematics and science.

However, a study conducted by Buck et al. (2009), contradicted research that suggested that due to their confidence level, African American girls do not perform well in mathematics and science. Buck et al., study explored fourth and fifth-grade low-income African American girls attitudes regarding science, they found that many of the girls had high confidence levels and desires to learn science, yet their performance in science remained low. They attributed the low performance to teaching practices that do not value these girls' interest and experience regarding science, but only to ensure the girls had the right answers to pass a standardized test. Although these studies provided insight into the psychological barriers African American girls face regarding mathematics and science, they do not fully explain why these girls continue to be underrepresented in advanced mathematics and science courses.

Environmental Barriers

According to research, environmental factors that have had the highest impact on minority students are the lack of faculty support and mentorship. Whittaker and Montgomery (2012) and Hernandez et al. (2013), explored unrepresented students in STEM. Their studies suggested that for minority students, open communication and discussions with faculty is a social and cultural necessity. For example, in their study Hernandez et al., discovered that minority students who do not understand that "setbacks and failures are a part of the scientific process" (p. 92), were more likely to change

majors to non-STEM related fields. They suggested that it was because students rarely can think through and discuss the emotional and intellectual process of pursuing research with faculty and mentors. Whittaker and Montgomery further explained that institutional barriers such as difficulty transitioning into a different type of learning environment without support and the lack of peer-to-peer exchange also inhibited minority students' success and persistence in STEM-related majors. Both studies suggested that mentorship programs, early exposure, and opportunities to participate in research projects with faculty and Summer Bridge programs greatly assist URMs in their participation and persistence in STEM-related majors.

In addition to a lack of faculty support and mentorship, researchers have shown that the lack of role models (Moakler & Kim, 2014) and the lack of inspiration by teachers (Fouad et. al., 2010) were also barriers to female students academic achievement in mathematics and science. Results from the study conducted by Moakler and Kim using social cognitive career theory (SCCT), explored how confidence and demographic factors influenced interest in STEM disciplines. The authors found that females interest and confidence grew substantially when "interacting with female role models and mentors in STEM career fields" (Moakler & Kim, 2014, p. 139). Another study conducted by Stout, Dasgupta, Hunsinger, and McManus (2011), is consisted of the study conducted by Moakler and Kim. In their study, the authors conducted a dual study using a stereotype inoculation model that involved exposing women "to same-sex STEM experts" (p. 257) to identify whether women exposed to same-sex peers or male experts affected their performance in STEM. In part one of the study, the authors tested whether female or

male peers affected females' performance and effort on math test. In part two of the study, the authors examined whether female or male peers influenced females' performance and effort in engineering. Both studies concluded that women who had contact with same-sex role models benefited more so than contact with male peers. These studies have shown that same-sex role models enhanced a females overall performance and persistence in STEM majors.

However, for African American females, the benefit of same-sex role models is limited because African American females are consistently underrepresented in teaching overall. A study conducted by Bireda and Chait (2011), reported that although the public school enrollment is made up of 40.7% minority students, minority teachers represent only 14.6% of the teaching workforce. The authors also stated that in over 40% of public schools "there is not a single teacher of color" (Bireda & Chait, 2011, p. 1). For African American, the lack of role models negatively impacts their self-esteem and persistence in science classrooms (Towns, 2010). These environmental barriers shed light on barriers that have undermined African American females underachievement in mathematics and science. Still, they do not fully explain the underlying causes for the persistent underrepresentation of African American females in mathematics and science classes.

The Influence of Race and Gender on Teacher Practices

Research has shown a correlation between student-teacher relationship and academic achievement (Ayaz, Shah, & Khan, 2012; Fan, 2011; Gunderson, Ramirez, Levine, & Beilock, 2011; Rimm-Kaufman, 2014). However, literature regarding how race and gender impact this relationship is scant. The results of the limited research

studies that have explored this phenomenon suggested that the race and gender of students does influence teacher practices (Cho, 2012; Dee, 2006; 2007; Egalite, Kisida, & Winters, 2015; Price, 2010; Robinson-Cimpian et al., 2014; Scantlebury, 2009; Winters, Haight, Swaim, & Pickering, 2013). These studies have also implied that a teachers' conscious or unconscious gender and racial biases of students in their classroom can either challenge or contribute to students' academic performance. One of the first studies to explore how the gender of students impacts teacher practices was conducted by Dee (2006). In this study, Dee used data from the National Education Longitudinal Survey of 25,000 eighth-graders. He concluded that both men and women teachers offered more praise and acknowledgment to boys in the classroom than they did for girls. In addition, his study found that a teacher's gender shaped students engagement in the classroom. What Dee meant was that students who are taught by a teacher who shared the same gender will "behave more appropriately and perform at a higher level" (p. 70), than they would with a teacher of a different gender. The same sentiment is echoed in the study conducted by Winters et al., (2013). In this study, the authors concluded that students' academic improvements may be due to students having a "high-quality role models or because [their teachers] are more inclined to think positively about the student's potential" (p. 74), theoretically, because they share the same gender. For females, especially African American females, this could assist in improving their academic achievement in mathematics and science since researchers have shown that mentorship and role models improved academic performance (Moakler and Kim, 2014; Whittaker and Montgomery, 2012).

The issue of race has also shown to influence how teachers impact students' academic performance. Egalite et al., (2015) explored how the race of teachers affected student achievement. In their study, the authors analyzed student test results and the impact of own-race/ethnicity matching of students and teachers in grades three through ten. Controlling for teacher quality, the authors found positive results in reading, and significant math achievement for students who are taught by teachers who share the same race, especially for black and white students. The same results were found in a longitudinal study conducted by Ouazad (2014). In this study, the author collected data from Early Childhood Longitudinal Study, Kindergarten Class 1998-1999, on students in grades kindergarten through fifth-grade. The dataset included teacher assessments and student test scores in both mathematics and English. Ouazad's study concluded that teachers gave better assessment grades to students who share their same race and that this same-race effect appeared as soon as in kindergarten. These studies have shown how students' academic achievement is influenced by a teacher's race and gender. However, other studies have shown how students' race and gender can also affect teacher practices.

Pittman (2010) conducted a study that explored women faculty of color experiences in the classroom at the postsecondary level. Using intersectional oppression theory, the author concluded that women faculty of color reported challenges of their authority, teaching competency, and scholarly expertise exclusively from their white male students. According to Pittman, this type of disregard and disrespect can negatively affect teachers' effectiveness and the overall learning environment, and has "shown to have harmful effects on the retention,

achievement, and well-being of women students and students of color" (p. 193). The race and gender of students and teachers play a significant role in academic achievement. However, the limited amount of research conducted in this area, show how race and gender impact African American females at the middle school level remains elusive.

Teachers Perceptions and Expectations of African American Female Students

Researchers have suggested that the perceptions and expectations that teachers hold toward their students' impact their learning and achievement outcomes (Austin, 2010; Borum & Walker, 2012; Campbell, 2012; Evans-Winters & Esposito, 2010; Farinde & Lewis, 2012; Francis, 2012; Hartney & Flavin, 2014; Pringle et al., 2012; Tosolt, 2010). Research in the area of teacher perceptions and expectations, as it relates to African American females, vary in conclusions (View & Frederick, 2011; Pringle, Lyons, & Booker, 2010). Some suggested that cultural differences between student and teacher significantly impacted how teacher expectations and perceptions affected student achievement (Bakari, 2003; Boutte & Johnson, 2013; Henfield & Washington, 2012; Pringle et al., 2010; Rowley & Wright, 2011). Other studies have suggested that the attitude, not the intelligence of the female student, influenced teachers' expectation and perceptions (Bianco, Harris, Garrison-Wade, & Leech, 2011).

Costner, Daniels, and Clark (2010) conducted a study of college faculty using a modified version of the Teaching African American Students Survey (TAASS). Their study found that although faculty, regardless of race and gender, were willing to teach African American students, they were not willing to use pedagogical practices that would

be beneficial to the students. The authors suggested that these findings were due to faculty believing that an African American curriculum would not be as beneficial to African American students' futures more so than the traditional Eurocentric curriculum. Meaning, that although faculty felt that African American culture is valuable knowledge, it does not assist the future college and career readiness of these students, which can be interpreted as African American students who do not assimilate into the White culture have little chance of achieving success in American schools and society (Martin, 2009).

Campbell (2012) suggested that African American girls were the least likely to be recommended for AP courses because teacher expectations and perceptions of these girls were misinterpreted by the girls behaviors, demographics, and the subjective beliefs teachers held about these students. For example, in her study, Campbell found that teachers held lower expectations and perceptions of African American girls who persistently asked questions to ensure their understanding of the content. Teachers misinterpreted this as the girls "[do] not understand the material and [are] not yet ready to progress to more challenging courses" (p. 399). Similar results were concluded in a study conducted by Pringle et al. (2012). In their study, the authors found that teachers held beliefs regarding who is interested in mathematics and science, and their misinterpretation of African American girls' behaviors, hindered these girls achievement in mathematics and science. Despite research confirming that teacher perceptions and expectations of African American female students impacted these students' achievements in mathematics and science, studies have suggested that the strategies used by teachers in mathematics and science classrooms, also influence students academic performance.

Teaching Strategies That Stimulate and Hinder African American Female Students in Mathematics and Science

Numerous programs have been put into place over the years to increase the achievement and participation of African American females in STEM. However, African American females remain underrepresented in STEM classrooms, majors, and career fields (Kitts, 2009; Shapiro & Williams, 2012; Smith-Evans et al., 2014). Research conducted by the Bayer Corporation (2012) and Smith-Evans et al., (2014) identified two root causes of for the low numbers of African American females in STEM classes and career fields: (a) The lack of STEM courses offered in schools that are disproportionately attended by minorities, and (b) stereotypes regarding race and gender that discourage African American females away from STEM classes and career fields. Other studies have shown that strategies and pedagogical practices used to teach African American girls in mathematics and science have either stimulated or hindered their performance (Archer-Banks & Behar-Horenstein, 2012).

In a longitudinal study examining students in seventh grade through 12th-grade perceptions of math classroom characteristics, and their influence on course enrollment and career interest, Wang (2012) concluded that teachers who created a supportive classroom environments, increased student motivation and interest in mathematics. Wegner, Strehlke, and Weber (2014) found similar results for students in science classes. Their study investigated the differences between girls and boys identified as gifted learners, and their experiences during science lessons. The authors concluded that teachers acting as facilitators and who were trained in gender-related issues, reduced girls

frustration, boredom, and insecurities when performing science experiments, even when the girls experiments did not turn out as planned. These studies have shown that pedagogical practices that are supportive and gender-free stimulate the performance of African American females in mathematics and science classrooms. In spite of this, there is also research that has indicated that educators, who have the responsibility in the knowledge construction of African American middle school girls, are not adequately addressing their academic needs (Pringle, et al., 2012; West-Olatunji, et al., 2010).

Farinde and Lewis (2012) conducted a study that explored factors that contributed to the lack of participation in higher-level math and science courses by African American females in K to 12 and higher education. The authors determined that a lack of rigorous math programs, few highly qualified teachers, lack of exposure to images that look like themselves as scientists and mathematicians, and standardized testing were chief among the factors that hindered African American girls lack of participation in higher-level math and science courses. Farinde and Lewis study complements the findings of a study conducted by Ford (2010), who suggested that a lack of teacher referral, differential performance on achievement test, outdated policies and procedures, and a lack of knowledge by African American and Hispanic students and their caregivers about gifted programs were the contributing factors of why minority students, especially African American and Hispanics are underrepresented in gifted education programs. Ford (2010) added these factors to three larger problems within the education system—deficit thinking, colorblind ideology, and white privilege, which acted as barriers that negatively affected these students, their communities, and the nation as a whole.

Deficit thinking in education suggests that African Americans and other minority students are inferior to Whites students, which may cause educators to lower expectations and/or commit to negative stereotypes (Ford, 2010; Guerra & Nelson, 2010). Colorblind ideology in education suggests that everyone is to be treated the same regardless of race or color (Ford, 2010; Neville, Awad, Brooks, Flores & Bluemel, 2013). However, this thought process often situates African Americans and other minorities in awkward and often unfair positions because it does not recognize their uniqueness or the importance of their contributions to society. White privilege in education suggests that White Americans values and traditions are the norms or the standards (Ford, 2010). Again, this implies that African Americans and other minority values and traditions are insignificant and unimportant. White traditions, beliefs, and values are often viewed as the norm in the American educational system while African Americans and other minorities cultural beliefs and traditions are often seen as abnormal or are not part of the social structure from which this country was built. When educators intentionally or unintentionally display deficit thinking, colorblind ideology, and white privilege, they are adding to the failure of African Americans and other minority students' educational success.

A phenomenology case study conducted by West (2013), who explored the experiences of African American high school students, also suggested that for African American girls, a standardized test cannot be the source to bridge the gap in academic achievement between minorities and majority groups. Hunter and Bartee, as cited by West (2013), stated: "Closing the performance gap between the racial minorities and the racial majority in schools require more systemic and institutional approaches that cannot

be achieved through standardized test" (p. 2). West concluded that the relationship between students and teachers was a key factor in closing the achievement gap for African American students. He suggested that well-qualified teachers who believe in their students and have high expectations for their academic performance is central to closing the achievement gap between minorities and the majority. Close interpersonal and caring relationships between teachers and students are necessary elements to assist in reducing the underrepresentation of African American females in STEM-related majors and careers fields, and AP mathematics and science classrooms.

Summary of Literature Review

For many females, middle school is where decisions about future endeavors begin to take form. Researchers have shown that possessing high levels of science and mathematics knowledge are essential components necessary to be successful in our society. In addition, studies in this literature review support the fact that teachers, their pedagogical practices, and their relationships with students play a significant role in the knowledge construction of students, and are key factors to reduce the underrepresentation of females in STEM and AP mathematics and science classrooms. However, for African American females, due to the intersections of race, gender, and SES, many barriers limit their decisions regarding their future endeavors. Based on the information provided in this literature review, there is a lack of attention, especially in mathematics and science, given specifically to the teachers of African American middle-school girls. The underlying causes of why a large majority of our middle school African American girls currently are not doing well in mathematics and science remains elusive. The review of

the literature in this study has shown that, “African American girls are in multiple jeopardies of race, class, and gender exclusion in mainstream educational institutions” (Evans-Winters & Esposito, 2010, p. 13), especially in mathematics and science classrooms. The lived experiences and voices of purposely selected teachers who have experience with teaching African American middle school girls is needed to shed insight on this phenomenon.

These ideas are further explored using the methodology in Section Three. In addition, Section Three explains my role as the researcher, how the participants for the study were chosen, and describes in detail procedures that I used for data collection, data analysis, and validity.

Chapter 3**:** Research Method

In this IPA study, I explored the lived experiences of teachers who teach mathematics and science to African American middle-school girls. According to Smith and Osborn (2008), the aim of IPA is to explore, in detail, "how participants are making sense of their personal and social world" (p. 53).

The purpose of this study was to explore teachers' shared, lived experiences of teaching mathematics and science to African American girls. Analyzing teachers who have experience teaching mathematics and science to African American middle school girls can offer valuable insight to assist other educators and policy makers in developing significant support and improve conditions that may be helpful in changing the underrepresentation and underachievement of African American females in mathematics and science in the United States.

A large body of research exists regarding the educational gap in mathematics and science for African Americans; however, little is known about the educational gap that befalls for African American females at the middle-school level. In addition, there is scant knowledge about the lived experiences of the teachers who teach mathematics and science to African American middle school females.

In order to meet the needs of middle school African American girls in mathematics and science classrooms, it is necessary to explore the lived experiences of teachers who teach mathematics and science to them. The knowledge gained through this study will enable educators, parents, and policy-makers at all levels to develop strategies, policies, and practices and identify key factors that will facilitate the educational

experiences for African American girls and promote educational equity regardless of their race, gender, and SES.

Research Design and Rational

The research questions that guided this study were developed based on my experience as an elementary and middle-school mathematics and science teacher and on the available literature that disclosed issues that teachers of African American middle-school girls in mathematics and science need to be better understood to improve the educational outcomes of African American middle-school girls.

1. How do teachers describe their lived experiences of teaching African American middles school females?
2. How are teachers' lived experiences with African American middle school girls who have lost interest in mathematics and science different from those students who have not lost interest?
3. How do teachers with experience teaching African American middle school girls perceive themselves impacting these girls interest in mathematics and science?
4. How do teachers perceive their teaching and learning experiences as contributing to African American middle school girls' interest in mathematics and science?

A phenomenology approach was chosen for this study because the perceptions and experiences of the participants are central to understanding their experiences as teachers of African American middle-school girls in mathematics and science classrooms. The

focus of this approach was to answer the question, “What are the meanings, structures, and essences of the lived experiences of this phenomenon for this person or group of people?” (Patton, 2002, p. 104). In addition, the focus of this approach was the lived experiences of the participants as they interpret the phenomenon within a bounded study. Furthermore, my role as the researcher used my knowledge and experience as an elementary and middle school mathematics and science teacher to help frame the participants’ perceptions of the factors that assist in promoting the successful acquisition of knowledge in this population for other educators and policy-makers.

An IPA was selected for this study rather than traditional phenomenology. Traditional phenomenology allows participants in a study to talk and describe how he or she experiences a phenomenon, whereas an IPA allows the participants to interpret how he or she makes sense of their experiences (Pietkiewicz & Smith, 2014; Smith & Osborn, 2008). Although a traditional phenomenology and IPA are related, the strength of the IPA approach is how the individuals interpret and views the phenomenon and make sense of their experiences (Pietkiewicz & Smith, 2014).

In phenomenology, the emphasis is placed on the participants’ experience and less on the researcher (Creswell, 2013). Therefore, researchers are seeking to uncover the underlying meaning of the experiences of the participants. Evidence from phenomenological research is derived from first-person accounts of their lived experiences. Moreover, phenomenology is a process that allows participants to express their “unique set of experiences which are treated as truth and which determine that individual’s behavior” (Eichelberger, as cited in Patton, 2002, p. 106). From the different

descriptions, the researcher is tasked with interpreting the meaning of the phenomenon from the participants' point of view (Creswell, 2013; Smith & Osborn, 2008). According to Patton (2002), "interpretation is essential to an understanding of experience" (p. 106); therefore, the method researchers use to obtain the essences of the participant's experiences is essential.

The ethnographic, case study, narrative, and grounded theory designs could highlight various portions of this study; however, they would not be appropriate for this study. The ethnographic design will be suited if the researcher's aim is to examine the culture of an intact group, rather than describe the shared, lived experiences of the participants involved in the study. In addition, the ethnographic design requires the researcher to immerse themselves over an extended amount of time into the daily lives of the group being studied. The case study would be appropriate if the researcher is seeking to compare cases with set boundaries. This design also requires the researcher to spend an extended amount of time in the daily lives of the participants. A narrative design is also not appropriate because it is best suited to tell the chronological story of a very small pool of participants. Finally, a grounded theory design seeks to develop a theory of the process rather than using the support of available theory (Creswell, 2013). Therefore, the interpretative phenomenological analysis approach was selected for this research study.

Role of the Researcher

In order to capture and describe the true essences of the participants involved in this study, my role as the researcher was to interview and ask questions about teachers' lived experiences teaching mathematics and science to middle school African American

girls. After my committee had approved my proposal, the process began with contacting the community research partner that served the district in which the teachers are employed. After obtaining a Letter of Cooperation to conduct the study from my community research partner (Appendix A), I then received permission from the Institutional Review Board (IRB; # 10-28-15-0176581) at Walden University, prior to approaching participants. After receiving approval from IRB, I contacted the school principals who were approved by the community research partner via certified mail. After receiving approval to conduct my study from the principals, I then contacted potential participants via email. I discussed the full scope of the study with participants who agreed to participate in the study and acquired their informed consent (Appendix C). Once participants signed the consent form, interviews were scheduled. Collected data was in the form of interviews and narratives from the perspectives and experiences of the each participant. Rapport with the participants was established prior to conducting each interview to build trust with the participants and to assist them in becoming comfortable with talking about themselves and to alleviate any apprehension (Pietkiewicz & Smith, 2014; Smith & Osborn, 2008). I provided participants with the interview questions (Appendix D) before their meeting to give them time to reflect on their experiences (Patton, 2002).

Methodology

This section includes the rationale for the selection of the participants for the study, the instrumentation that was used, procedures for the recruitment of the

participants, data collection procedures, data analysis and interpretation plan, and ethical procedures.

Participation Selection Logic

The purpose of this study was to explore teachers' shared, lived experiences of teaching mathematics and science to African American middle-school girls. A public school district in the southeastern part of the United States was chosen for this study. The demographic makeup of the school district had a majority of African American students enrolled. The rational for choosing a school district with a majority of African American students was to seek information that attributes to African American girls' interest in mathematics and science. In addition, the ultimate goal of this study was to reduce the underrepresentation of African American females in AP mathematics and science courses. To achieve this goal, the perspectives of teachers regarding the interest level in mathematics and science of African American middle school females were necessary. Therefore, a school district with a majority of African American students was chosen for this study. Furthermore, to answer the research questions, participants selected for this study consisted of the following:

1. Teachers who had 3 or more years of teaching experience, teaching middle school African American females, non-African American females, African American males, and non-African American males who are taking AP mathematics and/or science honors courses.

2. Teachers who had 3 or more years of teaching experience, teaching high-school African American females, who are and/or were in AP mathematics and honors science courses in middle school.

3. Teachers who had 3 or more years of teaching experience, teaching high-school African American females, non-African American females, African American males, and non-African American males, who were in AP mathematics and/or honors science courses in middle school.

4. Teachers who had 3 or more years of teaching experience, teaching high-school African American females, non-African American females, African American males, and non-African African American males who remained in AP mathematics and/or honors science courses in middle school.

I sought rich, in-depth information from a diverse group of participants. In order to obtain the depth and quality of information that adds to the body of knowledge regarding African American girls' interest in mathematics and science, teachers who have the knowledge base and experience is essential for closing the gap in the literature that is currently lacking about this phenomenon. For this reason, teachers who had 3 or more years of experience teaching mathematics and science were chosen for this research. Their valuable knowledge and insight regarding African American middle school girls' interest in mathematics and science can be an asset in increasing the knowledge of novice educators and policy makers understanding about this phenomenon.

The sampling size choice made in a qualitative study is dependent upon the purpose, information sought, usefulness, credibility of information, and amount of time

and resources that can be contributed to the study (Patton, 2002). A purposeful sampling approach was used for the selection of the participants for this study. First, criterion sampling was used to ensure that participants met the predetermined criterion (i.e., years of experience and experience teaching African American middle school females). Next, maximum variation sampling was used to purposefully select participants who met the required criteria so that shared themes and patterns could be identified (Patton, 2002).

For my study, 10 teachers who have a shared, common perspective regarding teaching mathematics and/or science to middle school African American girls were selected for this study. According to Patton (2002), researchers using a large sample size are seeking breadth rather than depth to "[explore] a phenomenon and trying to document the diversity or understand variation" (p. 244). On the other hand, researchers who use a small sample size are seeking in-depth, information-rich experiences from a "more open range" (p. 244) of participants. Therefore, my sample size was small enough to acquire the in-depth information I was seeking, yet large enough to accommodate different perspectives regarding the phenomenon under study.

Instrumentation and Data Collection Procedures

To answer the research questions in this study, recorded interviews were the primary source of data collection. Interviewing is one of the most highly respected methods used for obtaining data in qualitative research (Creswell, 2013; Patton, 2002). Patton (2002) stated that the interview is a way of discovering what cannot be observed directly. The face-to-face interview gave me direct access to participants. It also allowed me to obtain information using the five senses (i.e., hearing, sight, smell, touch, taste),

especially body language and non-verbal cues (Janesick, 2011). A semistructured, flexible interview protocol was used in this study. (Smith & Osborn, 2008). In addition, follow-up questions were asked that related to each participant's answers when necessary. The semistructured interview process allowed me to maintain the structure of the conversation, while at the same time, to develop a richer picture of the phenomenon under study because the information gathered was in the voice of the participants. Furthermore, the interview allowed me to enter into the perspectives of others.

Open-ended questions allow the participants to determine the answer. I conducted one in-depth interview with all participants, lasting approximately one hour. Additionally, a more structured follow-up interview face-to-face or through email with each participant was also conducted, lasting at least 30 minutes. This interview was shorter to help participants frame their responses from the initial interview (see Appendix D for a list of possible interview questions and probes). Finally, participants engaged in member checking to review the transcripts of their interview for accuracy, which took up to 30 minutes.

Data Analysis and Interpretation Plan

The purpose of the data analysis conducted in phenomenological research was to describe what participants understand and how they experience a phenomenon (Creswell, 2013; Lichtman, 2010). The process of developing and describing an understanding of the lived experience of mathematics and science teachers of African American middle school females was accomplished through an analysis of data. This interpretative

phenomenology study used QDA Miner CAQDAS program, audio recorder, field notes, and my journal.

A well-defined data management system helps to alleviate unnecessary work and time. I kept a journal during the entire research process as a way to reflect on ideas and practices (Janesick, 2011). In addition, to assist with data management and storage, I maintained data accounting logs of all interviews and contact summary forms of all participants in the study (Appendices F and G; Miles et al., 2014).

The group of potential participants for this study was 10 teachers. If less than five participants were recruited, the study would have been expanded to include other teachers in other subjects who have experience teaching African American middle school girls. However, this was not necessary. The beginning of each interview with participants began with a reminder of the purpose of the study, their right to withdraw from the study at anytime, their confidentiality, and their right not to answer any questions they are not comfortable with answering. Also, the participants were reminded that the interview would be recorded. I made every effort to respect the participants' wishes and to ensure they are comfortable with the process to gain a deeper understanding of their experiences by intently listening to them and giving them the freedom to elaborate on points that were important to them. Interviews were conducted at a location and time that were convenient for each participant. All face-to-face interviews were recorded using a handheld digital device. At the conclusion of each interview, participants were thanked for their time and reminded that the transcribed interview would be sent to them electronically for verification and a follow-up interview would then be scheduled.

Immediately following all interviews, I typed the field notes and the recorded interviews. After I read and transcribed all interviews, I sent them to each participant for verification to ensure the accuracy of their responses. Once all transcriptions had been verified, and initial coding was completed, they were uploaded into QDA Miner software program. QDA Miner software program was chosen for this study because of its ability to maintain and organize the data generated through the data collection process. In addition, QDA Miner allowed me to produce visual graphics of the data to assist in developing a list of statements about how the participants experience teaching mathematics and science to African American middle school females. Descriptive coding, InVivo coding, and value coding were used to initially frame and classify information. Pattern coding was then used to narrow the data into smaller numbers of categories and themes to "develop interpretations of what the data is revealing" (Miles et al., 2014, p. 86). The IPA process of reading, re-reading, initial noting, developing themes, connecting across themes, and moving to the next case is an iterative process, and was an ongoing process throughout the analysis of the data (Smith, 2008). Once saturation of the data collection was reached, a holistic view of themes was done to look for patterns amongst the data. I used selected excerpts from the data to support the phenomenological themes of the study. Pseudonyms for each participant's identity were used to ensure their confidentiality. To ensure that my biases remain intact, I would have discussed any inconsistent information with the participant to ensure and enhance the confirmability of the study. However, no inconsistencies with the information occurred.

Issues of Trustworthiness

In this section I explain how I ensured trustworthiness and credibility of the study. Each subsection specifically addresses elements that are appropriate for qualitative research. The section concludes with ethical procedures for this study.

Credibility

All participants' interviews were fully explored to capture the full description of their lived experiences and to increase internal validity (Miles et al., 2014). To add to the validity of the study and to assist with interpretation of the data, I invited participants to validate and clarify their responses through member checking. Member checking of the data enhanced the credibility of the study and allowed participants to be actively involved in this part of the research process. Furthermore, reliability was improved by audiotaping each interview and by checking transcripts against the audiotape to ensure accurate transcription. Triangulation occurred with the multiple perspectives of each participant through the use of two separate interviews. Using various ways of collecting data (i.e., face-to-face interviews, written field notes, electronically, researcher reflective journal), participants had multiple ways of sharing their thoughts, feelings, and experiences.

Transferability

The analysis of the experiences collected in this study produced multiple themes regarding teachers' perspectives of African American middle school females' interest in mathematics and science. A primary aim of the design was to build upon what is learned about the phenomenon. The hallmark of an IPA study is that it focuses on the unique and in-depth perspectives of individuals under study (Pietkiewicz & Smith, 2014). Therefore,

a thick description of the participants' experiences is necessary to achieve external validity (Lincoln & Guba 1985). To improve the transferability of this study into future works, an in-depth, thick description of the participants' perspective is essential. If for example, discrepant cases arise, the data would have been explained within the context of the participant's responses and in relation to other participants within the study. A thick, in-depth description of the experiences of the participants is provided in Chapter 5 of this study.

Dependability

To ensure the dependability of this study, member checking and verbatim transcriptions of all recorded interviews were conducted. Throughout the course of this study, detailed records of how and when the data is collected were maintained to allow for transparency and duplication of the study. In addition, to ensure the integrity of the data, QDA Miner software program was used to secure, store, manage, and code the data.

Confirmability

Biases of the researcher can affect the results of the study. To limit this threat, I let my research biases be known. In addition, I used Patton's (2002) suggestion to maintain "a stance of neutrality" (p. 51). Meaning, I did not go into the study with preset assumptions or try to manipulate the data to confirm with personal viewpoints. To accomplish this, I used bracketing—"taking a fresh perspective toward the phenomenon under examination" (Creswell, 2013, p. 80), as much as possible during the analysis and interpretation process. In addition, to further assure confirmability, I maintained a reflexive personal journal (Lincoln & Guba, 1985) throughout the interviewing process.

Ethical Procedures

The protection, integrity, and confidentiality of all participants are the primary concerns of this research study. To ensure the ethical protection of the participants, I obtained approval through the Walden University's IRB, making sure that I followed their procedures as outlined in their application process. Next, I made sure that full disclosure of the intent and purpose of this research was made evident to the district personnel who were involved in this study. Once approval from the IRB and the district personnel was acquired, an invitation to participate, explanation of the purpose of the study, and the informed consent form were first distributed to participating school principals, and then all participating teachers who met the criteria. Those who met the criteria and returned the informed consent form were scheduled for interviews. Participants that were chosen to participate in the study were assigned a pseudonym to protect their confidentiality and identity. Participants were also asked to participate in member checking to verify their interview transcriptions to ensure that I had captured their words accurately. After my initial interpretation of their data, participants were asked to confirm that I had interpreted their meaning correctly. Before, during, and after the interview process, I reiterated to the participants that they have the option to refuse to participate or terminate their involvement at any time during this research study.

Summary

This chapter provided details of the methodology chosen for this qualitative study. The design of this research was organized in a manner consistent with an IPA approach in order to allow other researchers to build upon this work. The provisions and criteria for

the selection and treatment of participants are also included. In addition, the IPA design was explained, which included information regarding my role as the researcher, instrumentation and data collection, data analysis and interpretation plan, and issues of trustworthiness. Furthermore, as the reflection and interpretation of the participants are at the center of this analysis, a plan for including their thoughts, ideas, and feedback at the core of this study assisted in promoting a broader understanding of their experiences teaching mathematics and science to African American middle school girls. Also, the participants perceptions revealed what they deemed are the interest level in mathematics and science for African American middle school girls. Chapter 4 of this study contains an analysis of each participant's reflections of and the finding from the study.

Chapter 4: Results

Introduction

The purpose of this phenomenological study was to explore the perceptions of teachers' shared, lived experiences of teaching mathematics and science to African American middle school girls. The following section provides a detailed explanation of the processes used to gather, record, and analyze the data for this study. Additionally, it includes a presentation of the findings that addresses the following four research questions that guided this study:

1. How do teachers describe their lived experiences of teaching African American middle school girls?
2. How are teachers' lived experiences with African American middle school girls who have lost interest in mathematics and science different from those students who have not lost interest?
3. How do teachers with experience teaching African American middle school girls perceive themselves impacting these girls interest in mathematics and science?
4. How do teachers perceive their teaching and learning experiences as contributing to African American middle school girls' interest in mathematics and science?

Setting

The setting for this research study was a school district located in the southeastern region of the United States. This particular school district is one of the nation's 25th

largest school districts in the United States. It is responsible educating over 128,000 students, of which over 61% are African American students. Educational programs in this school district include Prekindergarten through 12th grade, Advanced Placement, Talented and Gifted, International Baccalaureate, Dual Enrollment, Academy of Aerospace Engineering and Aviation Technology, Law, Education, and Public Service, Global Studies, Charter Schools, Head Start Program, Creative, Visual, and Performance Arts, and Junior Reserve Officer's Training programs, just to name a few. The school district also employees over 18,500 employees in various positions, of which over 8,000 are classroom teachers (National Center for Education Statistics, 2015).

To begin my study, I contacted the director of research and evaluation at the participating school district via certified mail. I included a copy of my research proposal, a letter introducing myself and my study, the Letter of Cooperation (Appendix A), the Interest/Criterion Questionnaire (Appendix B), the Letter of Consent for Teachers (Appendix C), and the Interview Questions and Probes (Appendix D). After approximately 2 weeks, the director of research and evaluation administrative assistant contacted me via email, asking me to provide a list of schools in the district that I wanted to participate in my study. I immediately sent a list of three high schools and five middle schools that I wanted to include in my study. I received authorization from the school district director of research and evaluation authorizing me to conduct my study 2 weeks later, along with a copy of the Principal Permission to Conduct Research Study Form (Appendix E) for all requested schools. The Principal Permission to Conduct Research Study form had to be sent to each of the requested school principals for further

authorization to contact potential participating teachers from their schools. Once authorization was received from the school district, this information was faxed immediately to Walden IRB. I received authorization to conduct my study from Walden IRB approximately five days later (#10-28-15-0176581). However, data collection could not be collected from teachers until each school principal gave their permission for me to contact their teachers.

I contacted each school principal via certified mail. Included was a letter introducing myself and my study, a copy of the Principal Permission to Conduct Research Study Form (Appendix E), and a copy of the Letter of Inform Consent (Appendix C). Two of the eight school principals returned the Principal Permission to Conduct Research Study Form with their approval. The approval forms were immediately faxed to IRB. I then contacted the other six principals a second time via email, which resulted in one other principal's approval, which was also faxed to IRB. Once I received approval from IRB, I sent the Interest/Criterion Questionnaire Form via Google mail to mathematics and science teachers at the approved schools. Five teachers completed the form, of which one did not wish to participate in the study. I then contacted the director of research and evaluation requesting to add four other schools to my study. Approval was granted, and I contacted the new school following the same procedures as mentioned earlier to obtain IRB approval. The result was two new schools and eight teachers responding to the Interest/Criterion Questionnaire, of which five teachers did not wish to participate. I again contacted the school district requesting two new schools. The result was one new school and three new participants. Copies of the signed Principal

Permission to Conduct Research Study Forms were returned to the department of research and evaluation via certified mail as requested by the director of research and evaluation.

The 10 teachers who completed the Interest/Criterion Questionnaire were contacted by the method they chose as requested on the form. Interviews were scheduled with all 10 teachers at prearranged times and locations that were convenient and comfortable for them. Three of the interviews had to be rescheduled due to unexpected circumstances on the part of the participant. However, no other apparent personal problems affected or influenced the outcome of the study. Interviews began on December 8, 2015 and were completed on January 22, 2016 (see Data Accounting Log: Appendix F).

Demographics

Table 1 displays the information about each participant interviewed for the study. Participants' official names were not included; rather, I created pseudonyms for all participants to keep their identities confidential, protected, and secured. The table indicates the following for each participant: alias names, current grade level teaching, gender, current subject(s) teaching, years of experience, and years of experience teaching mathematics and/or science. The teachers were from different grade levels, representing high school and middle school grades.

Table 1

Participant's Characteristics and Information

Alias names	Current grade level teaching	Gender	Subject currently teaching math (M) science (S)	Years of teaching experience	Years teaching math (M) and/or science (S)
Michael	9th & 10th	Male	S (Honors)	20	13 S
Sara	6th	Female	M & S	22	18 M & 3 S
Stephen	8th	Male	M (Honors)	23	12 M
Terry	7th	Female	M	11	7 M
Dianne	7th	Female	S (Honors)	14	7 M & 3 S
Joanne	6th	Female	M & S (Talented and Gifted)	19	12 M & 3 S
Nikka	6th & 8th	Female	M (Talented and Gifted)	17	8 M
Daniel	6th	Male	M & S	10	5 M & 3 S
Anthony	6th	Male	M (Honors) & S	13	13 M & 3 S
Georgia	6th	Female	M (Talented and Gifted and Honors)	11	9 M

Data Collection

Data were collected by conducting 10 interview sessions with mathematics and science teachers regarding their perception of African American middle school girls' interest in mathematics and science. All participants had 3 or more years of experience teaching mathematics and/or science to African American middle school girls. The Interest/Criterion Questionnaire Goggle Form, via the Internet, was the initial contact made with potential teachers. The following questions were asked to verify their ability to participant in this study: grade level, subject taught, years as a mathematics and/or science teacher, and years of experience teaching mathematics and/or science to African American middle school girls. Once potential participants completed the Google Form indicating that they were interested in participating in my study, I contacted them by the contact information that they indicated on the form. Participants were then sent the Informed Consent Form (Appendix C). Once the Informed Consent Form was signed, an interview location and time were scheduled with each participant. I sent each participant a copy of the interview questions (Appendix D), via email, prior to their scheduled meeting in an effort to give them time to reflect on their experiences.

Interviews

Written Informed Consent forms were received from all participants to record their interview sessions, which were recorded using an Olympus digital voice recorder, model number WS-802. Spare batteries were available during each interview session; however, they were not necessary. Each interview session lasted between 28 and 60 minutes. In the interview sessions, the same open-ended questions (see Appendix D)

were asked from all participants so that they would share their thoughts about their experiences teaching mathematics and/or science to African American middle school students. In four of the 10 interviews, I used probing questions, which encouraged participants to share their experiences. My interest was to capture the thoughts of mathematics and/or science teachers' experiences teaching mathematics and/or science to African American middle school girls. A few of the participants were not very expressive during the interview session; therefore, shorter interviews were conducted than the original time. However, all participants answered all of the interview questions.

At each interview session, participants were greeted at his or her prearranged location and time. I introduced myself, confirmed their identity, and thanked them for their participation. I reviewed the interview protocol and the purpose of the study with each participant. I also explained to each participant that his or her participation was voluntary and confidential. In addition, I reiterated their right to withdraw from the study at any time and that they did not have to answer questions they did not want to answer. I also reminded each participant that I would be using a digital voice recorder to record everything he or she said and asked if he or she was comfortable with having the interview recorded. Each participant stated that recording the interview was not a problem. I then activated the digital voice recorder and the interview began.

The interviews proceeded following the interview protocol. Probing questions were added to four of the 10 interview sessions to ensure that the participants' lived experiences were fully explored. Field notes were also recorded throughout the each

interview session to record my personal thoughts and to assist me in remaining impartial during the interview but still being able to reflect on those ideas following the interview.

After each interview, I replayed a portion of the interview to check the quality of sound and clearness of the voices to ensure that accurate and precise transcription of each interview would occur. I thanked participants for their participation and reminded them that I would be sending the transcription of the interview to them via email within 1 week. Participants were instructed to note any issues they had with the transcript and to make any changes they deemed necessary.

To assist with record keeping of all interview sessions, a data accounting log (Appendix F) and a contact summary form (see Appendix G for an example of a contact summary form) was used. The data accounting log assisted me with the progress and progression of all interview sessions. The contact summary form was used as part of my field notes to document salient information during the interview and to assist me with the reflection of each interview session.

All audiotaped interviews, contact forms, and field notes were transcribed into a word processing document. I elected to act as the only transcriptionist to (a) maintain the confidentiality of the participants and (b) to immerse myself fully in the data that were collected from each participant. Each transcribed interview was emailed to each participant for review and instruction to return if there were changes. There were no changes made to any of the interviews. After initial coding of the transcribed interview, they were uploaded along with my field notes to QDA Minor software program. Once the interviews were uploaded to QDA Miner software program, analysis of the data began.

Issue of Trustworthiness

The explanations below are the areas that increased the trustworthiness and accuracy of the study. These four areas assisted me with the balance and objectiveness of all interview sessions, effective handling of the data once they were collected from each participant, and accurate reporting of the original stories shared by the participants.

Credibility

To ensure the credibility of this study, I made sure that the data collected provided evidence of the participants' lived experiences by checking the transcripts against the audiotapes and inviting participants to validate and clarify their responses through member checking. The use of the phenomenological research method allowed me to accurately capture the essence of each participant perception related to their experiences of teaching mathematics and science to African American middle school females. According to Miles et al. (2014), phenomenological research is used to capture the full description of the participants' lived experiences and to increase internal validity. I was able to build relationships with participants because of the engagement through the text and emails with the participants. The validity of this study was enhanced by simultaneously implementing and following the procedures while checking to make sure the procedures worked and made adjustments as necessary.

Transferability

The analysis of the experiences collected and the reported findings in this study produced multiple themes regarding teachers' perspectives of African American middle school girls' interest in mathematics and science are not transferable to other studies. The

information in this study is unique to the population in this study. However, the findings in this study might be used to provide instructional staff, policy-makers, and parents with information to better understand the interest of other populations in mathematics and science. Moreover, the findings in this study can be used by other scholars who are interested in the mathematics and science interest of other populations in the United States and abroad.

Dependability

The processes, strategies, and methodologies used to gather information from participants are detailed in this study. The goal and purpose of this information are to ensure transparency and duplication of the study by future researchers. For dependability and reliability, I repeatedly compared the transcriptions with the audiotapes to ensure the information contained in both was the same and free of errors.

Confirmability

I ensured that the findings in this study were the results of the participants sharing their lived experiences of teaching mathematics and science to African American middle school girls by asking probing questions and rephrasing questions during the interview. In addition, after the interviews had been transcribed, participants were asked to validate and clarify their responses through member checking. Biases of the research can affect the results of this study. To limit this threat, I made sure during the interview sessions that my personal bias, opinions, and preset assumptions were reduced or eliminated to ensure that the findings were from the perspectives of the participants and not of the

researcher. In addition, I used bracketing as much as possible during the interpretation process.

Data Analysis and Results

All interview data were transferred from the digital recorder and contact summary forms to a word document and transcribed to hard copies, which were labeled and filed in individual folders and stored in a safe location, accessible only by the researcher.

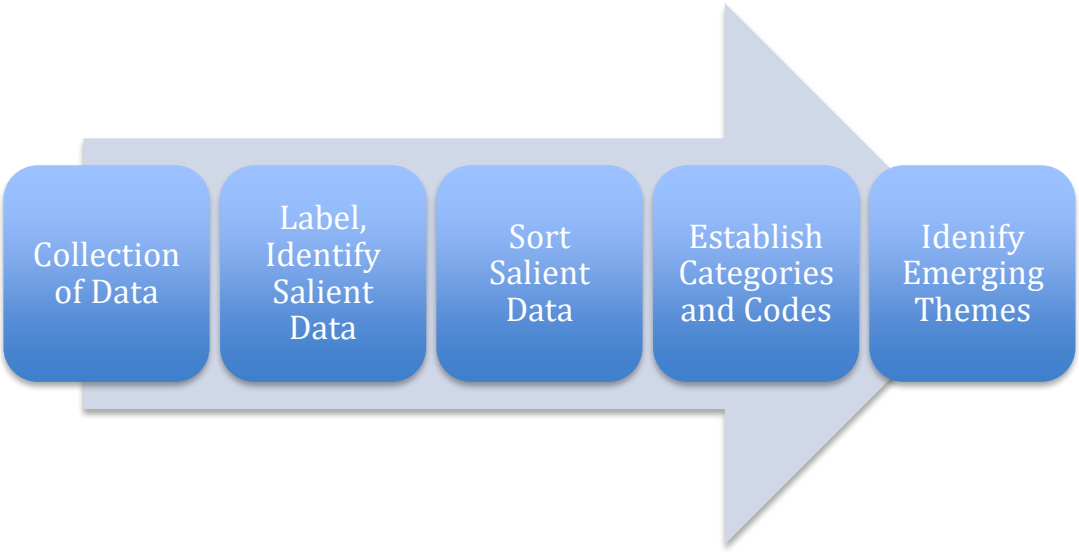

Figure 1. Data management process.

Figure 1 above indicates the process used to collect, sort, and coding of data into salient information. The same process was used for every participants interview session, to ensure accuracy and consistency. This process assisted in the identification of themes and commonalities among participants' thoughts and experiences. In addition, this strategy assisted me in keeping my focus on the main points expressed by the participants.

Methods for Coding Data

Coding of the data was a very significant and critical part of dissecting the participants' interview sessions into meaningful and useful information. Each transcribed interview session was read several times to amass similar experiences, themes, and ideas. The majority of the participants were forthcoming with information expressing their experiences of teaching mathematics and science to African American middle school girls. My responsibility was to extract and compile the information for readers in a manner that would provide an in-depth view of the participants' experiences. The coding method was completed using first and second cycle coding. First cycle coding helps the researcher to initially summarize data into categories, while second cycle coding uses information from first cycle coding to summarize the data into smaller more useful patterns and themes (Miles et al., 2014). Below are the cycles and coding methods used to extract and dissect the data collected from each interview session.

First cycle coding.

1. Descriptive coding**:** Each transcribed interview was read several times. In my second and third readings, portions of each interview were highlighted and grouped into topics that were written in the margins. This method allowed me to develop initial categories and to identify commonalities among participants' responses. With descriptive coding, I used different colored highlighters and colored pencils to help distinguish the different categories.

2. In Vivo coding**:** After initial categories had been generated, I reread the transcribed interviews a fourth time. Using words and short phrases from the participants' own words, initial codes were generated and attached to the descriptive categories. This method allowed me to identify further commonalities and patterns in the data. With In Vivo coding, I again used different colored highlighters and pencils to distinguish the different codes.
3. Value coding**:** Once In Vivo coding was completed, I uploaded all 10 interviews to my computer using QDA Miner software program. All initial categories and codes were then given a value, an attitude, or a belief code. A value code was given when participants provided information about themselves, other people, things, or ideas. An attitude code was given when participants provided information about how they felt or thought about themselves, other people, things, or ideas. Finally, a belief code was given when participants provided information about experiences, opinions, or perceptions. This method assisted in preparing the data for Second Cycle coding.

Second cycle coding.

Pattern coding: To assist with reducing the number of categories and codes, I used the research questions to help me to keep the focus on what is important, and to holistically view and look for patterns amongst the data. Pattern coding allowed me to identify emergent themes

> amongst the data. Several common patterns were identified. The patterns were then grouped into themes to be analyzed. For each theme, the codes that were used in value coding were also narrowed and attached to the themes to assist with identifying similar experiences among all participants.

During the interview sessions, participants were asked several questions to explore their perceptions of African American middle school girls' interest in mathematics and science. Their responses were categorized into five major themes as shown in Table 2. The five major themes are; lived experiences, interest vs. lack of interest, impacts, contributions, and specific strategies for African American girls.

A description of each major theme and their associated concepts will be described in this section using verbatim passages from individual participant interview sessions to support the specific themes related to the four research questions. Namely, major themes and their associated concepts and sub-concepts are discussed to increase readers' knowledge regarding teachers' perceptions of African American middle school girls interest in math and science.

Table 2

Major Themes and Associated Concepts From the 10 Interview Sessions

Research question	Major themes	Associated concepts and sub concepts
How do teachers describe their lived experiences teaching African American middle school girls?	Lived experiences	1. Classroom experiences a. Routines b. Technology c. Discussions d. Homework e. Activities f. Modeling 2. Best math/science student experiences 3. Student support systems experiences a. Parents b. Teachers
How are teachers' lived experiences with African American middle school girls who have lost interest in math/science different from those who have not lost interest?	Interest versus lack of interest	1. Student characteristics a. Interested students b. Lost interested students c. Positive characteristics d. Negative characteristics e. Personalities f. Behaviors 2. Regaining student interest a. Economic b. Exposure c. Mentors d. Role models e. Parental involvement f. Assistance given (teacher) g. School involvement 3. Challenges a. Personal b. Civic/societal c. Lack of support d. Lack of resources 4. Factors a. Circumstances b. Influences

(*table continues*)

Research question	Major themes	Associated concepts and sub concepts
How do teachers with experience teaching African American middle school girls perceive themselves as impacting these girls interest in math and science?	Impacts	1. Relationships a. Positive b. Negative c. Neutral 2. Keeping student interest a. Projects/Experiments b. Tie to real life c. Media d. Strategies e. Conversation 3. Teaching in this school district a. From/live in area b. Give back c. Personal reason
How do teachers perceive their teaching and learning experiences as contributing to African American middle school girls' interest in math and science?	Contributions	1. Personal school experiences a. Positive experience b. Negative experience 2. Why students need to learn the subject a. Monetary b. Social c. Intellectual 3. Personal influences linked to practice a. Yes b. No
	Strategies for African American girls	1. Specific 2. Alternative 3. None

Research Question 1

How do teachers describe their lived experiences of teaching African American middle school girls?

There was one major theme, and three associated concepts that emerged from the interview sessions as shown in Table 3, that provided answers to the research question stated above. The major theme was: lived experiences. The research question sought to build an understanding of the essence of the participants lived experiences teaching African American middle school girls through an exploration of their experiences in the classroom, their perceptions of the best math and/or science student experiences, and their student support system experiences.

Theme 1: Lived Experiences

Classroom Experiences

The first associated concept regarding lived experiences that participants shared were their classroom experiences. Participants shared details about their classroom routines, the use of technology in the classroom, discussions with students, homework, activities conducted in the classroom, and modeling

Nine participants mentioned routines that they conducted most days with their students. Michael shared, “We may be doing different activities, for example, today we were talking about waves. And another student is doing some math.” Stephen shared, “Each day is different, but every Monday is similar, regularity with variation. Sometimes messy, explorative, process-focused, content-focused, noisy, but under control.” Other

participants mentioned similar methods of how they start their classroom experiences most days.

> A typical day would involve some type of warm-up, a review of the previous lesson, and then linked to what [we] will be learning for the day" (Terry). "A typical day in the classroom, of course, we start with homework, reviewing homework. We do our warm up"(Dianne).

Joanne stated,

> In my class, we begin with a warm-up. We review the warm-up and clear up any misconceptions there may be about the warm-up. At times, this will turn into a great discussion as I like to allow students to clear up the misconceptions of other students and then we do homework review.

When asked about a typical day in his classroom, Anthony shared a different experience then all other participants:

> I come to school prepared with all the knowledge and materials that I planned to share, teach with my students. Many times, I'm struggling in terms of classroom management. I have a lot of things to teach but most of the time students take my classes for granted.

During the interview sessions, the use of technology in their classrooms was another major concept that was frequently shared by participants. Michael shared why technology is an important part of his classroom experiences with students:

> I try to give them the skills that I think they'll need beyond school, so a lot of it has to do with computer skills, they know how to use a phone, but not for videos.

> So learning how to use a computer is one of the biggest fields now and I guess I do my best to focus on technology because I know it will be useful.

Dianne explained that the use of technology was an important part of her classroom routine due in part because the students enjoy it and due to the lack of resources:

> I'm trying to get with the technology because this is where the kids are at, and incorporating virtual labs; we've been doing a lot of virtual labs this year. For instance, today we are going to do an activity in Google classroom where they are on BBC Science, and there's an interactive video that takes them through metals and non-metals. Because like I said, the availability of copper and aluminum and all the different stuff we need to give them hands on experiences is difficult. So, I like to; I'm trying to incorporate the technology because it seems like the kids, when we can't get hands-on, the kids enjoy that.

Daniel shared how technology is a part of his daily routine: "I reteach or remediate the concept or extend it a bit further; I break the students into a three group rotation system which contains a teacher group, independent group, and a technology station." Terry had a different outlook than the other participants regarding technology in her classroom. She stated, " In my opinion, technology is the downfall for a lot of students. I think technology was designed to help but in the end, students are using them as crutches, entertainment."

Discussion in the classroom was another frequent concept that participants shared about their classroom experiences. Michael shared that discussion with students led to students asking questions:

> We also talk about science fair projects, not only just the scientific method, but all the different concepts that we talk about, that I talk about on a regular basis. So I like to do different things, and I prefer to actually explain things to student, because that's when they start asking questions.

Joanne shared that discussions with her students help to clarify things and gets students engaged:

> At times, this will turn into a great discussion, as I like to allow students to clear up the misconceptions of other students. We move into the lesson beginning with a question about the lesson just to get students engaged in a conversation about what they already know about the skill or concept being taught.

Nikka stated that she used discussion in "different ways of approaching problems."

Finally, activities, homework, and modeling were the other concepts that participants shared about their classroom experiences. Three of the participants mentioned reviewing homework as part of their daily routine (Dianne, Joanne, and Sara). In regards to activities as part of their classroom experiences most of the participants used the term "hands-on activities" and "small group activities" (Michael, Stephen, Terry, and Georgia). Modeling was also a concept that participants referred to as part of their classroom experiences. Michael shared, "I find that girls tend to pick up things faster. If

they don't already know it, once I show it to them, they'll run with it. He goes on to state why he uses modeling in his classroom: "Students need someone who will actually walk them through step by step, at least initially to build their confidence." Nikka stated that she used modeling as a way to "demonstrate how to solve and discussing different ways of approaching problems. Teaching and modeling how to be methodical."

Best Math/Science Student Experiences

Below are participants' responses to their best math and/or science student experiences. According to Stephen and Joanne, the best math and/or science students are students who had positive experiences in their earlier grades that assisted them with middle school mathematics and/or science. Stephen said,

> Students who've had strong teachers in 6th and 7th grade consecutively is the usual predictor of success. Most of my students have had positive experiences in math in elementary school. Some do have an innate knack, but all can do well.

Joanne's statement was similar. She stated, "The best math and/or science students are those who have a good foundation in math and science and possess good reasoning skills."

Some participants alluded to the fact that students who have a general like for the subject and understand the importance of education are the best math and/or science students. Dianne shared,

> In my experience, the best science students that I have enjoyed the most are students that ask a lot of questions. You know, they like to ask, they carry a conversation about what we're talking about in class. They show some interest in

> it. Can add to the discussion that we have in class. You know, even if they are just using background knowledge, you know.

Nikka said, “The ones who understand the importance of an education even at an early age.” Georgia had a similar comment; she said, “The students in any subject are those who believe they can, keep trying when they hit a bump, ask for help when needed, and don’t give up until they experience success.”

Other participants suggested that race, gender, and/or religion were the keys to the best math and/or science students. Michael stated,

> The few Asian students I’ve had have typically been the best science students. They’re typically the best ones in math and science. After that, I would have to say African American females to be the best science students. So when they do well, they do very well. And then comes, we don’t have too many Caucasian students here, and the ones we do have here, they don’t, they kinda fit in with everyone else. They don’t stand out. They don’t want to seem to stand out at all. So then you have the African American male students who tend to do well. I think they deal with stigma also, for not wanting to out-shine or be noticed by out-shining others.

Anthony said, “Boys.” Daniel commented that parents and religion played a significant part in students who he considered were the best math students:

> I see students who have a strong religious background and whose parents limit their TV and Internet and Cell usage and monitor their grades and skills seemed to be the most effective in creating a student who excels in the classroom. It helps to

build their moral compass and fear of letting someone or an entity down as well as provides an environment that is narrowly focused on academics as being the catalyst to succeed in life.

Student Support System Experiences

Another concept that some participants found to be important to their lived experiences were their student support system experiences. Parents and their students' former teachers were the two supports that participants mentioned the most. Five of the participants shared how parent and teacher support or the lack thereof, contributed to their lived experiences of teaching African American middle school girls. Michael shared how students who have parental support assisted them in school. "The direction seems to come from their parents. Because they will actually talk about what their parents want them to do. They want them to go to college; they want them to do post graduate work" (Michael). Georgia had a similar response to parental support. She stated, "When parents see their children experience success with math, parents begin to feel more positively about math also." However, she goes on to state how a negative reaction from parents toward math can affect students. "I also find that most parents have such a negative reaction to math, and their feelings are often passed along to their children" (Georgia). Stephen and Joanne both mentioned that a lack of parental support could affect students in the classroom. Stephen stated, "Lack of support, academically, emotionally, motivationally, from home leads to doing too much with social relationships with peers. Like gangs, promiscuity, poor peer influences."

Support from their students' former teachers was another concept that participants shared as part of their lived experiences in regards to their classroom experiences.

> Not having strong and decent teachers lead to an accumulation of fundamental flaws in their computation skill as well as time spent in poorly managed classes, creates room for them to develop negative identities and self-perceptions in school (Stephen).

Joanne's response appeared to be a self-reflection on what she desired for her students. She stated, "As an educator, I wish there was more time to really cater to individual students and their interest and needs." Most of the participants openly shared their thoughts and lived experiences teaching African American middle school girls math and science.

Table 3

Summary of Participants' Responses Regarding Theme 1: Lived Experiences

Alias names	Classroom experiences						Best math/student experiences	Student support system experiences	
	Routines	Technology	Discussions	Homework	Activities	Modeling		Parents	Teachers
Michael	x	x	x		x	x	x	x	
Sara	x		x	x	x		x		
Stephen	x				x		x	x	x
Terry	x	x			x				
Dianne	x	x		x			x		
Joanne	x		x	x			x	x	x
Nikka	x		x			x	x		
Daniel	x	x					x	x	
Anthony	x						x		
Georgia	x				x		x	x	

Research Question 2

How are teachers' lived experiences with African American middle school girls who have lost interest in math/science different from those who have not lost interest?

For research question two there was one major theme and four associated concepts that emerged from participants interview sessions as shown in Tables 4 and 5. The research question sought to identify teachers' perceptions of the interest level of African American middle school girls in mathematics and science through an exploration of student characteristics, teachers' perceptions of what would regain student interest, challenges, and factors that teachers perceived affect student interest in math and/or science.

Theme 2: Interest Versus Lack of Interest

Student Characteristics

All 10 participants communicated both positive and negative characteristics concerning their perspectives of students' interest and lack of interest in mathematics and science. Positive characteristics that participants shared were, interested students are quiet (Michael and Georgia). Michael also commented on the social aspect of the girls' characteristics. He stated, "They don't appear to be very sociable; to themselves, not necessarily having; they don't appear to have a lot of friends." Others commented on the mindset of the girls. Daniel said, "Hard working, focused and can block out distractions, fear of failure, good problem-solving skills, curious; ask questions, good support system, good numeracy skills." And Dianne said, "They're inquisitive, they have a lot of questions. They might want to explore things a little more you know. They bring things

back to you from home that they may have done at home." Anthony also contributed by saying, "They are focused. They have goals in life, and want to take math-related courses in college and want to pursue [a] math-related career." Similar views were also shared by Nikka, when she said, "They are antisocial, serious-minded, ardent readers, mature, they come from a math or science background."

When participants commented on students who have lost interest in math and/or science, all 10 participants shared negative characteristics that they perceived causes this trend. Sara shared, " One who is not interested, put forth no effort to comprehend anything dealing with math or science. She simply goes through the motion of completing as little of the work as possible." Dianne and Michael mentioned how students who have lost interest in science did not have an interest in the subject. Dianne stated,

> They're nonchalant. They seemed to be bored with the topic. Frustrated, then they go into the whole thing about this is stupid. That's what I see with my girls. That you can just tell that this is not their topic.

Michael shared a similar view.

> Unfortunately, most of the girls don't seem that interested in science. Those are the ones who seemed to be more concerned about their appearance. The focus is, as they're going through puberty, and they're becoming interested in themselves and how they fit into their communities. How they look. How they interact.

Participants also mentioned that being distracted was a cause for students to lose interest in math and/or science. Anthony stated, “They’re easily distracted or easy to persuade.” And Georgia shared that, “Talkative, easily distracted, impatient. They quickly give up.”

Most of the 10 participants commented on other positive characteristics that students have that keeps their interest in math and/or science. Michael, Anthony, and Daniel said that a positive attribute is a student who is focused. Three of the participants spoke about characteristics that students use in class to show interest in the subject. Dianne shared,

> They’re confident you know, especially in math. You can see the confidence in them. They’re good at it. They can go beyond what we are talking about in class. They might want to explore things a little more you know. They bring things back to you from home that they may have done at home.

Joanne thoughts were similar to Dianne’s when she talked about students who have an interest in the subject:

> They like to have deeper discussions about our lesson, and they seem to like school in general. They possess good reasoning skills. These students are not afraid of challenges or the unknown. They have that inner drive, motivation and a genuine interest in math and science.

Other positive characteristics that participants attributed to students who have an interest in math were, “They seem to be more directed” (Michael). “They have good problem-solving skills” (Daniel). “She excels in her work in math and science grades” (Sara).

Four of the participants commented on negative characteristics that they perceived were characteristics of students who have lost interest in math and/or science. Terry shared, “they look for distractions.” Nikka had a similar view when she said, “Those who have become social and caught up with peer pressure.” Other negative characteristics the participants shared were, “Unmotivated and not responsible” (Daniel). “Impatient” (Georgia).

Another source that participants shared regarding student interest versus a loss of interest in math and science were student personalities and behaviors. Most of the comments shared by participants were along the same line as student characteristics mentioned above; quiet, sociable, focused, and high achiever, with the exception of Stephen, who said, “ These girls are usually not obsessively promiscuous; looking for affirmation from males.”

Student behaviors were another source that participants contributed to students’ interest or lack thereof, in mathematics and science. Most of the comments shared by participants, expressed how social behaviors interfered with student interest in math and science. Michael shared,

> They want to talk about what their girlfriends are doing. What the guys are doing. For some of them, it’s how to stay out of trouble because they’re getting into trouble with their friends and if those relationships are tenuous at best.

Nikka also shared that social interest was a behavior that interferes with student interest when she said, “Those involved with too much social media.” Daniel, on the other hand,

stated, “They blame others for their lack of learning. [They] don’t set high enough goals or goals at all.”

Participants also shared some positive behaviors that students possess that keep them interested in math and science. “Hardworking” (Daniel). “Diligent, cooperative, excellent work habits, on-task” (Georgia). “They do not surround themselves with girls who do not have similar characteristics as them” (Stephen).

Regaining Student Interest

Participants gave various recommendations on the subject of what would assist African American middle school girls to regain interest in math and science. Six different concepts were developed from their recommendations. The first was economic. Only two of the 10 participants made reference to how economic assistance would help to regain African American girls interest. Terry shared, ”More funding for math and science clubs specifically geared to girls.” Joanne recommended that “Perhaps if students and parents were provided with STEM programs that offered financial assistance.”

The second recommendation participants made reference to was exposure. Participants alluded to the fact that if the girls had more exposure to math and science, they would regain their interest. Anthony recommended, “Show to them that they can be successful in the field of math and science. Encourage them and provide activities and/or programs on their interest, but they would have to be interesting for them.” Dianne suggested that exposing the girls to more women in the field could regain the girls’ interest. Nikka recommended that exposure could assist the girls to regain their interest

and support them in the future when she said, “We must expose them to those things, which show them how these contents improve their job prospects.”

Role models were the third concept that participants suggested would help the girls’ to regain their interest in math and science. Dianne and Michael were the only two participants that endorsed role models as a way to regain the girls’ interest in science. Dianne even shared how having a role model helped her:

> Honestly, I think for African American girls there has to be a role model. The more role modes we have, you know, women, Black women, scientist, then there is going to be more interest there. Like, we don’t all have to strive to be Beyonce and, you know, we have more going for us, you know. Yeah, I think that’s a big thing. I know for me, I like science, but those role models, there was a nurse, you know. So, I even though about going into nursing, you know, but I think that if there is more out there you know, as far as African American girls seen as doctors, more engineers. Just more women in that science field being around them and exposed to them. I think we will see more African American girls in the field of science. Cause you see it with, you know, your Asian girls, your Indian girls, you know, they pursue those careers, because I think that they are kind of pushed to that area, and they see, they are exposed to it. So I think that’s a big part of it.

Michael comments were similar to Dianne’s:

> I, I think that they would need to see some other women that are in science, in scientific fields and actually talk to them. Like a mentoring program would probably be better than a field trip because if you just see someone and you hear

> them give a spill that's not necessarily gonna make a connection. So, if someone were to actually come in and say, hey, you know I'm a science teacher, this is what I; this is the aspect of science I liked when I was young. This is what I did to become what I'm doing, or you know, I'm a doctor, I'm a chemist; this is what I did to actually achieve those goals. And start talking to the girls to make it believable to be quite honest.

The fourth suggestion was parental involvement. Only two of the 10 participants made scant reference to how parental involvement could assist the girls in regaining interest in math and science. Joanne said, "Depending on how involved parents are, they may not even realize the interest their child has in science. So as educators we may need to inform them. Daniel stated, "A better support system, family based or school based."

Assistance given by the teachers was the largest recommendation participants contributed. One of the participants made reference to her personal needs when she was in school, which she uses to assist the girls in regaining their interest in math.

> I think I am a visual learner so I try to explain and give explicit notes to my students and try to use various strategies so that all students can learn. I try to take my time and explain the math the way I needed it explained to me when I was a child (Terry).

Other participants shared how they helped support the girls to regain their interest in math in science. Michael commented that getting the girls interest in science is his mission; especially if the girls tell him, they do not like science.

> When students tell me that they don't like science, I almost make it my mission to show them the fun side of science. And doing the labs and working with them, sometimes you have to really set down next to some of them, because they want to do it, but they're not sure what to do. So they need someone who will actually walk them through step by step, at least initially to build their confidence.

Daniel and Georgia's comments shared the same optimism as Michael. Daniel stated, " I try to make it fun and engaging by including competitions and games that help the students learn in a non-traditional way." And Georgia said, "I want to bring my creativity in lesson planning to the subject with the hopes of helping my students enjoy math like me."

Finally, some of the participants shared that having the school more involved with the girls' would assist them in regaining their interest in math and science. Stephen shared that more involved teachers would make a difference in assisting the girls' to regain their interest. He stated, "Inter-disciplinary assignments. Or finding ways to get their favorite teacher involved in their mathematics. Elementary teachers teach several subjects, why can't middle school teachers?" Joanne perspective was similar to Stephen. She said, "As educators, we may have to make personal contact with parents to encourage them to make sure their child becomes a part of some of these outside programs." Nikka stated, "We need a way of revamping how we teach our content. I think we must plan a more deliberate approach. Sara suggested that students would regain their interest if they could improve their grades. She said, "Give them a booster course to show [them] how to improve their grades in math and science."

Challenges

When asked about what challenges African American middle school girls learning math and science, all 10 participants reported that many African American middle school girls face challenges both inside and outside of school that affect their learning and interest level in math and science. Some of the challenges participants referenced were of a personal nature. For instance, Anthony shared that some of the girls' parents and friends personally challenges their learning math. "Parents and peer pressure. Many parents are setting high expectation for their children. Girls usually don't want to disappoint parents. That's the reason why they are forcing themselves to study and become successful in math and science." Georgia communicated that the girls' confidence level toward math affected their interest. She said. "Lack of confidence makes them cease to persist. Once they experience failure, they accept it and believe that they just can't do math." Other personal challenges that participants mention were; " They have low expectations. They have difficulty balancing the discipline of math with the emerging social identity of adolescence" (Stephen). "Lack of desire for education" (Terry). "They lack the ability to preserve in academic situations" (Daniel).

Participants also mentioned how some civic and societal challenges affect the girls' interest level in math and science. For science, Michael referenced math, social media, and stereotyping as the civic and societal challenges to African American girls' learning:

> I think math is a big part of it. And I'm not gonna say necessarily interest, but there is a stigma for a lot of our students probably. Especially for the girls, that if

> you are into your books then, I guess you're not into anything else. Because I think that the girls that I have seen who are interested; actually really into their studies or very interested in science, the relationships they have in terms of the number of relationships, doesn't seem to be very high. And I think that's a big deal to the students. With Facebook, and Instagram and all these things, they start counting all the people that they associate with, and that means something to them. And I think that that's still the stigma. That somehow you are closing yourself off to fun and these other relationships however trivial and fly-by-the-night they are.

Joanne, who also teaches math, commented about challenges the girls face was different from Michaels. She said,

> As an educator, I wish there was more time to really cater to individual students and their interests and needs. With the way education is headed, nothing seems to matter but test scores, and this takes away from what our real focus needs to be, which is teaching the whole child, which includes supporting their individual interest.

Terry and Sara both said, "being distracted by boys and wanting to fit in" were the social challenges African American middle school girls' faced when learning math and science.

The lack of support and the lack of resources were the other challenges participants mentioned regarding African American middle school girls learning math and science. Not having support outside of school, especially from the girls' parents was an issue for most of the participants. These were not only challenges for the girls but also

for the some of the participants. Michael stated how parents' not discussing what students learn in school with them was a real problem. He said,

> I don't think science is really being discussed outside of school. They appreciate the technology that comes from science; everyone has a new phone. When I start telling them about some of the minerals in those phones, what countries they come from, you know, they kind of look at me like, hey, and I know a lot of them never heard that before. No one talks about things like that. I, sometimes, I joke about that to them. I say y'all don't talk about these concepts around the dinner table? And of course they look at me, I'm joking, but they look at me crazy like, why would I talk about that at dinner? But that's the problem. We should, you should be talking about what you're learning. Your parents should kind of be bouncing questions off you, but that doesn't happen. And I think it's even worse for the young ladies cause that's not the focus.

Joanne's sentiment was similar to Michael's about how the lack of support from parents challenges African American girls learning math and science. She also added how the teachers do not have time to address student interest was a challenge for the girls. She stated, "Not having a real support system, meaning parents not even aware of their child's interest and teachers not having the time to support students' individual interest and needs."

Some participants expressed how teachers and their practices were a challenge for African American girls to learn math and science. Stephen said, "Staffing issues of effective math teachers at the secondary level. I'm generalizing, but tech, math, and

science people aren't warm. Warm teachers aren't disciplined, and this impacts adolescent girls inordinately. Joanne expressed, "I think they [girls] could lose interest due to a lack of parent and teacher support." And Nikka shared that, "Teachers who are not motivated to plan hands-on activities, impacts girls interest."

Only three of the 10 participants expressed how the lack of resources was a challenge for their teaching practices. Dianne shared that the lack of materials at the middle school level was a challenge for her teaching practices. She said,

> I don't know if this has anything to do with it, I think, something that has bothered me teaching science is the lack and availability of hands-on materials in middle school. When I was with the elementary, you know in elementary, you know, they had the kits, and everything was there. We had a lot more hands-on experiences. That's why I'm trying to get with the technology, incorporating virtual labs.

Factors

Participants were asked their opinions about what factors have contributed to African American middle school girls who lack interest in mathematics and science. Participants shared some influences and circumstances that they perceived contributed to the girls' lack of interest. However, a large majority of the responses overlapped with other concepts, with the exception of the responses below. Joanne stated that " something life changing may have happened in the home," was a circumstance that may have contributed to girls' lost of interest in math. Daniel shared, "They're focused is on what's

cool in society rather than understanding that a good education is the most vital thing right now." And Sara said,

> The subject is not relating to them on a girls level. I mean showing them how math is not for boys, but seeing how products can enhance girls learning math and applying it to improve those things that interest them; like fashion, personal products, and jobs in all areas. Also, one must change that old myth about boys being better in math and science.

Anthony stated, "Girls usually tend to give up because of the difficulties and will divert their attention to the unrelated math concepts."

Based on the responses from the participants' interview sessions, their perceptions about African American girls who have an interest versus those who have a lack interest in mathematics and science includes the girls' characteristics, challenges, and factors they face both inside and outside of school. Participants also gave suggestions that could help regain the girls' interest in mathematics and science.

Table 4

Summary of Participants' Responses Regarding Theme 2: Interest Versus Lack of Interest (Student Characteristics, Regaining Student Interest)

Alias names	Student characteristics			Regaining student interest					
	Interested/ Lost Interested Students	Positive/ Negative Characteristics	Personalities/Behaviors	Economic	Exposure	Mentors/Role Models	Parental Involvement	Assistance Given (Teachers)	School Involvement
Michael	x/x	x/	x/x			x/x		x	
Sara	x/x	x/	/x						x
Stephen	x/x	x/x	x/x	x	x			x	x
Terry	x/x	x/x	x/x	x				x	
Dianne	x/x	x/	/x		x	/x		x	
Joanne	x/x	x/	x/x	x	x		x		x
Nikka	x/x	x/x	/x		x				x
Daniel	x/x	x/x	x/x				x	x	x
Anthony	x/x	x/	x/x		x				
Georgia	x/x	/x	x/x					x	x

Table 5

Summary of Participants' Responses Regarding Theme 2: Interest Versus Lack of Interest (Challenges, Factors)

Alias names	Challenges				Factors	
	Personal	Civic/Societal	Lack of support	Lack of resources	Circumstances	Influences
Michael	x	x	x			x
Sara		x			x	x
Stephen	x	x	x			x
Terry	x	x			x	
Dianne		x		x	x	x
Joanne		x	x	x	x	
Nikka		x	x	x	x	
Daniel	x		x		x	x
Anthony	x	x				x
Georgia	x	x			x	

Research Question 3

How do teachers with experience teaching African American middle school girls perceive themselves as impacting these girls interest in math and science?

There was one major theme and three associated concepts that emerged from the interview sessions as shown in Table 6 that provided answers to research question three. Research question three requested the participants to provide responses to help readers' build and understanding of their perceptions of how they impact African American middle school girls' interest in math and science. Participants' responses centered on their relationships with the girls, how they keep the girls interested in math and science, and their reasons for teaching in their present school district.

Theme 3: Impacts

Relationships

All 10 participants communicated responses about their relationships with the girls. Most of the participants' comments regarding their relationships with the girls were positive or neutral. There were no negative responses regarding relationships with the participants and their students. When asked about their relationship with students, two of the participants responded that they had a neutral relationship with the girls. Anthony stated, "I maintain a line between teacher and students when it comes to relationships. I'm respecting them as my students and doing what I think will be beneficial to them." He elected not to comment further when asked to elaborate. And Sara comment was also similar to Anthony's. She said "A friendly relationship with respect on both sides." She

too elected not to comment further. All other participants' comments were of a positive nature. Dianne shared, hesitantly, at first, the relationship she has with her students:

> Describe my relationship, Oh Gosh. I really don't know how to answer that question. This is my second year with the majority of these students. So I, I think I have a fondness for them. I know many of them and what to expect and how they; I know how they operate. I think that this year I've had a pretty good relationship with most of my kids because we know each other. I think that it takes a while for kids to know my personality, you know, I have my own way of joking with them. I've had a pretty good experience with the kids.

Joanne's expressed that the relationship she has with her kids was not as positive as in the past. Still, she reported that she is still trying to build a good relationship with her students this year:

> I am usually very connected to my students and have a really good relationship with them. However, this year I feel some kind of disconnect with my students and I have not been able to figure out why. But I'm still working on it. I have not had such a feeling of disconnect in the past. But I still try to make my students feel comfortable asking questions in class and sharing their thoughts, which I do think they are doing.

Stephen comment was very unique. He stated, "My relationship with the girls is warm but respectful. Passionate but slightly emotionally detached. Professional caring. Like Daddy Love." When asked to explain what he meant by "Daddy Love" he said, "Oh,

well I have four daughters, I am very protective, but firm and fair with them. So that's what I mean by Daddy Love".

Keeping Student Interest

Below are the responses from all 10 participants on how they keep the girls interested in mathematics and science. Over half of the participants communicated the strategies they use to keep the girls interested in mathematics and science. Involving students in their learning was the strategy communicated the most by participants. Terry said, " I also let them be the teacher and let them record themselves teaching a lesson and sharing it with their classmates." Dianne stated, " I allow them to make their own Kahoot's, and we play their games." And Anthony shared, "One key way to keep students interested in math and science is to involve them in their learning." Joanne stated, "In math, I try to allow the students to lead the discussions and lessons as much as possible."

Seven of the 10 participants said they used projects and experiments to keep the girls interest. Another way participants asserted how they keep girls interested in math and science was through conversations with the girls and tying the subject to real life scenarios. Terry shared, "I try to tie my lesson into real-life situations that they are interested in, such as football and basketball." I asked her was their other real-life situations she used with the girls, she said she could not think of any at the moment. Joanne stated, "I try to relate as much as I can to real-world situations to give the lesson more purpose for my students."

Media as a source of keeping the girls interests was also narrowly reported in conjunction with other ways by three of the 10 participants. Dianne used virtual labs. Daniel used media with his math instruction. And Nikka said she used "a variety of sources of media, like text, discussion, and journaling."

Teaching in This School District

One of the interview questions asked the participants, what made you want to teach in this school district? There were various reasons the participant reported for teaching in this particular school district. Six of the participants said that they live in the area. For instance, Michael stated,

> I'm from [County School District]. I graduated from [school] and I also want to say, since I still live here I wanted to be close to home. I have actually taught in [school district close to current school district]. And that was prior to my first son being born, and that, I guess I saw that being kind of far away and, you know, just in case you needed to come home for whatever reason, I just wanted to be close to home. So that is one of the reasons why I chose to stay here in [County School District].

Other participants gave personal reasons. Nikka shared, "My own kids is what directed me. Learning that my oldest child had a disability motivated me to obtain a job closer to home." Sara said, "I wanted to give back to the district in which I live in and help educate my district family." And Stephen said,

> I grew up here. I went to elementary, middle, and high school in [County School District]. I started in social studies at the high school level. I saw too many kids

> dropping out of school because of Algebra. So I decided to switch to middle school to address a more pressing issue. Algebra. Algebra, in my opinion is the new Jim Crow. It's also the gatekeeper to STEM jobs of the future and SAT proficiency in the short term.

I asked Stephen what he meant by Algebra being the new Jim Crow. He just smiled. Daniel's reason was similar to Sara's. He said,

> I have always been strong in math, and it came easy to me. While in college, I started coaching little league football and fell in love with the interaction with the students. I decided that I would like to work with kids as a career and went into teaching. I was raised in this district and wanted to give back to this county.

Participants' responses to how they impact African American middle school girls highlighted their relationships with the girls, how they keep the girls interested in mathematics and science, and why they chose to teach in this school district.

Table 6

Summary of Participant' Responses Regarding Theme 3: Impacts

Alias names	Relationships			Keeping student interest				Teaching in this school district		
	Positive	Neutral	Negative	Project and/or Experiments	Tie to Real Life/Conversation	Strategies	Media	From/Live in area	Give Back	Personal Reason
Michael	x			x	/x			x		x
Sara		x			x/x	x			x	
Stephen	x			x	/x	x		x	x	
Terry	x				x/	x		x		
Dianne	x			x	x/	x	x			x
Joanne	x			x	/x			x		
Nikka	x			x			x			x
Daniel	x			x			x	x	x	
Anthony		x			x/	x				x
Georgia	x			x		x		x		

Research Question 4

How do teachers perceive their teaching and learning experiences as contributing to African American middle school girls' interest in mathematics and science?

There were two major themes and four associated concepts that emerged from the interview session with participants as shown in Table 7, which answered research question four. This question sought to identify how teachers perceived their personal learning experiences with mathematics and science contributes to African American middle school girls' learning mathematics and science, and how their personal influences with the subject influences their teaching practices. In addition, this question identified teachers' thoughts on why students need to learn mathematics and science.

Theme 4: Contributions

Personal School Experiences

All 10 participants shared their personal experiences with mathematics and/or science when they were in middle school, high school, and college. For the most part, all of the participants' experiences were positive.

Michael shared his love for science, which resulted in a positive personal experience throughout his formal education:

> I have always had a love for science. I think it was always one of my favorite subjects in school. For middle school, is probably where I had the best experience, and that's where I started doing the science fair projects. High school, I continued to be very good because I was; I liked all the classes that I had, all the teachers I thought were pretty good. We always did labs, and that was good. Now college, it

> became harder. Organic chemistry. I liked the class, but it was so much information to learn. So, I didn't do as well in college as I did in high school and middle school. But I still enjoyed it. Even though it was, it was difficult; chemistry was difficult, organic chemistry. It was still very enjoyable, still, trying to get that information, I, I just didn't know how to figure it out. It took me a while to figure out how to actually get that information, how to plan my time, because it was so much more. I never had to study that hard, like when I was in middle school and high school.

Dianne, like Michael, also remembers her experience with science in school. However, unlike Michael, her positive experiences included elementary, high school, and college:

> Middle school, Imma give you; I'm giving you all honest answers. I don't remember much of science in middle school. I do remember some, and actually, it was a lot of background building. Kinda like what we are doing in here. Building up vocabulary is what I remember the most. Cause I think because I had to study so much to understand the vocabulary. I remember elementary a little more. And I know you said middle school, but I enjoyed; I enjoyed reading about life science in particular and when we got to maybe watch a video, cause back then, you know, we didn't have a lot of technology, but it was big time when we got to watch a video about what we were studying in class. So high school, I remember chemistry because that's when we really got to go into a science lab, a real lab. We got to wear the equipment and learn. You really got to apply those lab safety rules because everything was there as far as the Bunsen burner, and always having

> to use our safety goggles, and then having to do those dag gone formulas. That was chemistry I remember. Biology, I remember, everyone remembers dissecting the frog. Frog dissection. But that, I just know that was the subject I enjoyed going to the most. College, I enjoyed my science class. Chemistry was tough for me. I took; I took several chemistry courses. I had to take biochemistry. That was; I really had to work, that chemistry. Which was, where I usually didn't have to work in science. When I took microbiology, I loved that class.

Joanne shared her personal experiences and struggles with math, and how she received support. In addition, her science experience was similar to Michael and Dianne:

> In middle and high school, I remember being able to do the computation in math. But as I got older, I remember not being able to apply the computation to work problems and real world situations, which is where I struggled. In college, I remember having a professor [who] for the first time showed me how to apply what I was learning to real-world situations, and I remember feeling like I understood word problems for the first time. As for science, in middle and high school, I remember doing lots of hands-on experiments, which I really enjoyed because I had teachers that were really into science. I don't recall a lot of bookwork.

Georgia expressed her love for math. She also shared an experience with her Algebra teacher that was not favorable:

> Once I fell in love with math, I was hooked. The only area of math that causes me to cringe is Algebra, and quite frankly, I had an Algebra teacher who talked to the

> board and geared all conversations to those who already understood exactly what she was teaching. The rest of us were lost.

Daniel and Sara had similar responses regarding their personal experiences with math. Daniel stated, “I have always excelled and scored in the top 10%, 20% of all standardized tests, summative exams, and formative exams. It [math] has always come easy to me, and I have never scored less than a B in any math area.” And Sara said,” I loved math. And throughout my years in education, math was very easy and enjoyable for me.”

Why Students Need to Learn the Subject

Below are the responses from all 10 participants regarding why it is important for middle school African American girls to learn mathematics and science. Seven of the 10 participants shared the social importance of learning mathematics and science; two shared monetary importance, and six participants mentioned the intellectual importance of learning mathematics and science.

Anthony shared his thought on the real-world applications for why the girls need to learn mathematics and science:

> There are so many real-world applications of concepts, and students need to understand that we cannot live without these subjects. Nowadays, our nation is dependent on science and technology. Our future depends on mathematical applications and for us to live in this kind of world. Students need to learn math and science.

Daniel supported this concept as he shared his thought about the importance of learning mathematics. He shared, “It’s a foundational skill necessary to interact with the daily

surroundings and their are countless numbers of jobs that involve math and science that students can obtain once their love of the subject matter is learned."

Terry expressed similar thoughts as Daniel concerning the importance of learning math:

> I think it is important for students to learn math because math is a subject that they use daily and don't know that's what they are doing. Children need math for the little things like, knowing what time to get up in the morning; to know how much life they have if they are playing a video game. They don't know what a big impact math has on their everyday lives.

Nikka commented on the intellectual reasons why the girls need to learn math. She said, "They must be able to determine if things make sense in order to handle personal finances, calculate, and get a job. Gloria shared, "Math is the gateway to critical thinking." Joanne comment was similar to Gloria's, she shared, "It allows students to develop great problem solving strategies."

Dianne also contributed her thoughts about science by stating,

> It's important for kids to understand, you know, how the science behind what they do. So even if they are into culinary, you know, arts or something, they should understand that there is a chemistry of science in pretty much everything that they do.

Personal Influences Linked to Practices

These are the responses from all 10 participants on how their personal experiences as a mathematics and science students influences their teaching practices. Nine of the 10

participants reported that their experience as a mathematics and/or science student did influence how they teach the subject.

Joanne shared how her personal experience in school influences how she teaches math to her students:

> Yes. As I began teaching math and learning the different strategies, I remember thinking about the reasons my teachers always made me show my work, and I make my students do the same. When teaching, I make sure to break problems down as far as possible, and I don't make assumptions about what students know or do not know. I also allow students to show their way of solving problems in addition to sharing it with their peers. When I was in school, I don't recall students teaching students. I also try my best, which is still difficult at times, to make students feel comfortable as possible to ask questions when they don't understand. I let students know, no one knows it all so I explain to them how they can help each other understand. For example, if a student has a question, I allow other students to attempt to answer or assist that student. I can remember not feeling comfortable asking questions aloud in class as a middle school student.

Daniel expressed how his experience as a math student shaped his practices as a math teacher:

> Yes. I think my experiences have shaped my practices. My experiences with math have been pleasant and engaging, so I try to make sure my stance and delivery of math concepts are from a positive background. In addition, I try to

> make it fun and engaging by including competitions and games that help the students learn in a non-traditional way.

For Gloria, her experience as a math student helped to shape her commitment to making sure her students to know the responsibility of taking charge of their learning:

> Absolutely! My algebra teacher helped me to understand the importance of being student led in my instruction. In other words, if my students do not understand what I taught on Monday, we stayed there until they got it. Students can only build on success. Failure breeds disinterest, lack of confidence, and math phobia.

Sara was the only participant who had a uniquely different response regarding her personal experience influencing to her teaching practice. She shared, "No it has not. I have learned through the years to change my methods depending on the system I am in and the type of students I encounter." When asked to elaborate on what she meant, she said,

> Every year I consider myself a first-year teacher because of the different students I encounter. Of course, I have an arsenal of experience to use to tackle these students and their behaviors and their intellectual levels. But I can honestly say, that my personal experience does not influence my teaching practices.

Participants expressed the contributions they perceived assist African American middle school girls learning mathematics and science. As participants reflected on their personal experiences as a mathematics and/or science student, they shared how their experiences influence their current teaching practices. In addition, they expressed their reasons why it is important for the girls to learn mathematics and science.

Table 7

Summary of Participants' Responses Regarding Theme 4: Contributions

Alias names	Personal school experiences		Why students need to learn the subject			Personal influences linked to practice	
	Positive Experience	Negative Experience	Monetary	Social	Intellectual	Yes	No
Michael	x	x			x	x	
Sara	x	x	x	x			x
Stephen	x	x	x		x	x	
Terry	x	x		x		x	
Dianne	x	x		x	x	x	
Joanne	x	x		x	x	x	
Nikka	x			x	x	x	
Daniel	x			x		x	
Anthony	x	x		x		x	
Georgia	x	x			x	x	

Theme 5: Strategies for African American Girls

Participants shared the strategies they used to assist African American middle school girls learning mathematics and science as shown in Table 8. Half of the participants reported that they have specific strategies to assist the girls. Dianne explained how allowing the girls to socialize with each other, assists them learning science:

> I can say that, as far as girls, the biggest strategy I may use is just the social, you know, giving them something to work on socially. If it is like a lab, you know, to try to pair girls up that I know work well together. And they usually sort through things well together. I've found that some teachers may try to separate students that they may feel like their friends; they're chatty. But with, with girls, and certain girls, I try to see if they can work it out sitting next to the people they get along with because they work better together. They seem to motivate each other to do the work.

Gloria had a similar strategy; she said, "I like pairing the girls with each other. Another strategy I have used is having math clubs just for girls. This helps to empower the girls by having them lead the small group activities." Stephen shared, "I've become a big fan of projects and small group cooperative learning. Also, creating a positive, safe, exploratory environment for the girls is also key." Sara expressed how she taught an all-girls math class as a strategy to help keep the girls interested in math. "I once taught an all girls class in math, and it proved to be very successful. They were all interested in the subject. They also helped each other to develop their math skills."

The other half of the participants shared that they did not have a specific or alternative strategies for African American girls to learn mathematics and science. Michael expressed how the strategies he uses were for all students. He said, “I haven’t come up with any strategies particularly for female students. The strategies have been for all students.” Terry had a similar response, she shared, “I have not developed anything as of yet, other than open class discussions for all students.”

Table 8

Summary of Participants’ Responses Regarding Theme 5: Strategies for African American Girls

Alias names	Strategies for African American girls		
	Specific	Alternative	None
Michael			x
Sara	x		
Stephen	x		
Terry			x
Dianne	x		
Joanne			x
Nikka			x
Daniel	x		
Anthony			x
Georgia	x		x

Discrepant Cases/Nonconforming Data

Almost all data collected were placed in categories identified in Table 2. I allowed participants to voice themselves freely throughout the interview sessions. However, some participants were redirected by using probing questions, especially when their responses were not relevant or went in a direction that did not provide answers to the research questions. I used the method of reduction coding to reject gratuitous information not relevant to the study. Participant's responses were carefully screened to make sure that only relevant information was included in the discussion that had significant meaning to the body of literature. There was one participant who mentioned personal information about family and another participant who used the term Afro-American once to describe African American.

Evidence of Data Quality

This qualitative IPA study explored teachers' perceptions of African American middle school girls' interest in mathematics and science. The information presented was gathered from 10 interview sessions with teachers with three or more years experience teaching African American middle school girls. I asked thought-provoking, open-ended questions that encouraged participants to describe and share their lived experiences teaching African American middle school girls. After each interview session, I listened to the audiotapes to ensure clarity in sound and dialog, and to verify that participants' responses were accurately captured. The presentation of data and the finding are all based on the perceptions of the participants. I did my best to ensure that my personal biases

were eliminated during the interview session, by not going into the interview sessions with preset assumptions and using member checking after each interview session.

During the final stage of the data analysis for this study, I constantly reviewed the transcribed interviews to identify key terms, commonalities, differences, and similarities in participants' responses. I acted as the only transcriptionist to immerse myself fully in the data and to develop a better understanding of how teachers' perceived of the interest level of African American middle school girls in math and science. To ensure the quality of the findings, I allowed the participants to review their transcribed interviews, as well as my analysis of the data. None of the participants made any changes to my findings. Also, to ensure validity, I made sure that all information was collected using the same procedures and kept safe and stored in a location, accessible only by me.

Summary

In Chapter 4 I reported the results of 10 interview sessions with teachers who have 3 or more years experience, regarding their perceptions of African American middle school girls' interest in mathematics and science. Through first and second level coding, I was able to identify five major themes: lived experiences, interest vs. lack of interest, impacts, contributions, and specific strategies for African American girls. The major themes provided relevant and meaningful answers to the research questions for this study. In addition, the discussion in this chapter described how data were gathered, recorded, coded, grouped, and analyzed. The 10 interview sessions were between 28 and 60 minutes. Also, issues of how trustworthiness was maintained were described during the

study. In Chapter 5, I interpret the findings, recommend actions for further research, describe implications for social change, and shared my reflections regarding this study.

Chapter 5: Discussion, Conclusion, and Recommendations

African American females are underrepresented in STEM related degrees and career fields (Brooks, 2011; Carnevale et al., 2011). In addition, a large majority of African American middle school females are not doing well in mathematics and science, two subjects that are essential to be successful in our society (Brooks, 2011; Farinde & Lewis, 2013; National Math and Science Initiative, 2013). Recent data have shown that African American middle school girls have the lowest achievement scores in both mathematics and science than all other races and gender (NCES, 2104).

The purpose of this phenomenological study was to explore teachers' shared, lived experiences teaching mathematics and science to African American middle school girls. An extensive review of the literature uncovered a lack of studies regarding African American middle school girls' interest in mathematics and science and the perceptions of teachers who are charged with their education. Therefore, I was able to identify this gap, which allowed me the opportunity to capture the thoughts, perceptions, and experiences of 10 teachers who have 3 or more years of experience teaching mathematics and/or science to African American middle school girls. The four research questions below that guided this study were framed by employing Delgado and Stefancic's (2012) CRT, Pratt-Clark's (2010) CRF, and Baker-Miller's (1976) RCT. The findings in this study suggested teachers' perceptions were a contributing factor of unmasking the level of interest for African American middle school girls in mathematics and science. The research questions that were the motivations for conducting this study are as follows:

1. How do teachers describe their lived experiences of teaching African American middle school girls?
2. How are teachers' lived experiences with African American middle school girls who have lost interest in mathematics and science different from those who have not lost interest?
3. How do teachers with experience teaching African American middle school girls perceive themselves impacting these girls' interest in mathematics and science?
4. How do teachers perceive their teaching and learning experiences as contributing to African American middle school girls' interest in mathematics and science?

Five major themes emerged from conducting 10 interview sessions with teachers who have 3 or more years of experience teaching mathematics and/or science to middle school African American girls: lived experiences, interest vs. lost interest, impacts, contributions, and specific strategies for African American girls. Verbatim passages from the participants' responses were used to develop the information and findings presented in this chapter.

Interpretation of Findings

The findings in this study grew out of the increasing importance for policy-makers, parents, and other scholars to understand teachers' perceptions of African American middle school girls' interest in mathematics and science. In addition, this study is aligned with the key tenets of Delgado and Stefancic's (2012) CRT, Pratt-Clark's (2010) CRF, and Baker-Miller's (1976) RCT. First, CRT emphasized that race and racism are a natural phenomenon within our society and has nothing to do with

"personality, intelligence, or moral behavior" (Delgado & Stefancic, 2012, p. 9). Next, CRF emphasizes that due to racism and sexism, the experiences of women of color have been ignored by the structure of our society (Carter, 2012). Finally, relational-cultural theory focuses on relational development, in this case, between teachers and students (JBMTI, 2015).

The linking of these three theories supported the findings in this study. They suggested that teachers' perceptions of African American middle school girls' interest in mathematics and science are impacted by teachers; lived experiences, their perceptions of the interest level of African American girls in mathematics and science, and how teachers themselves impact and contribute to the learning of African American middle school girls in mathematics and science played a significant role in how they perceive these girls as mathematics and science learners. Through individual recorded interviews, the experiences and perceptions of teachers were analyzed regarding African American middle school girls' interest in mathematics and science.

The information gathered from the theories outlined in Chapter 2 provided evidence to support answers to the research questions for this study.

How do teachers describe their lived experiences of teaching African American middle school females?

Theme 1: Lived experiences. All 10 participants shared various lived experiences they have with African American middle school females through their interactions with the girls in their classrooms, through experiences with students whom they perceived were the best math and/or science students, and through student support

systems. In the classroom, participants mentioned several methods to describe how they teach African American middle school girls. The most common teaching method was establishing a daily routine. In addition, the use of various educational tools such as technology, discussion, homework, modeling, and activities were also mentioned as part of their lived experiences with the girls. According to Wang (2012) and Wegner et al., (2014), there is a direct correlation between teachers who create a supportive classroom environment and students' increased motivation and interest in mathematics and science. Nine out of the 10 participants demonstrated the supportive classroom environment that African American girls need in order to maintain an interest in mathematics and science.

The perceptions held by teachers can play a significant role on their beliefs about their students. When describing their perceptions and lived experiences of the best mathematics and/or science students, most of the participants' responses were positive and were not aligned with previous studies that suggested that the race and gender of students influences teachers' perceptions. However, two of the participants, both male, provided responses that previous studies concluded negative contributors of why there is an achievement gap between African American girls and all other races and gender. Michael referred to race and Anthony referred to gender. Cho (2012), Robinson-Cimpian et al. (2014) and Winters et al. (2013) implied that teachers' conscious or unconscious gender and racial biases of students in their classrooms can either challenge or contribute to students' academic performance. Whether Michael and Anthony's responses were conscious or unconscious, they play a significant role in how they perceive according to previous research.

During the interview, all 10 participants indicated that support or the lack thereof from parents and teachers were a crucial part of their lived experiences regarding African American girls' interest in mathematics and science. Most of the participants' responses were centered on the support from parents, which is different from most of the research conducted for this study. Parental support is scarcely mentioned as part of the support system students need to be successful in mathematics and science in previous studies. According to studies such as Whittaker and Montgomery (2011) and Hernandez et al. (2013), faculty support and mentorship are the social necessity for minority students' success in the classroom.

Baker-Miller's RCT was used to explore the lived experiences of teachers regarding their perceptions of African American middle school girls' interest in mathematics and science due to its usefulness in building mutuality between teachers and students. As teachers reflected on their lived experiences with African American middle school girls, some racial, cultural, and social identities were unmasked to show their significance in the interest level of African American middle school girls' interest in mathematics and science.

How are teacher's lived experiences with African American middle school girls who have lost interest in math/science different from those who have not lost interest?

Theme 2: Interest versus lack of interest. There were several thoughts participants shared during the interview sessions about the difference amongst African American middle school girls who have an interest in mathematics and/ or science and those who have a lack of interest. Participants, for the most part, agreed on the positive

and negative characteristics and behaviors that differed amongst the girls regarding their interest in mathematics and science.

Participants were asked what would regain/reignite the girls' interest; there were stark differences, some of which were supported by previous research. Five of the participants suggested that exposure to people in the field, especially women, would be a solution to regain/reignite. Farinde and Lewis (2012) supported participants' suggestions when they indicated that a lack of exposure to images that look like themselves was a factor that contributed to the lack of participation of African American girls in higher-level math and science courses. In other words, African American girls need to be exposed to other African American women in the field to increase their interest in higher-level mathematics and science courses. Another factor that most of the participants agreed on was the involvement of their school. For example, some of the participants recommended, interdisciplinary assignments, teachers teaching more than one subject at the middle school level, revamping the curriculum to show a more deliberate approach, and time to cater to the individual needs of the students, just to name a few.

Research in this study supported mentors and role models as important persons who would assist African American girls to have an interest in mathematics and science (Moakler & Kim, 2014, Towns, 2010). Only two out of the 10 participants agreed with this sentiment. Leading the recommendation of what would assist the girls to regain/reignite their interest in mathematics and science, most of the participants shared what they are currently doing to assist the girls to regain/reignite their interest in mathematics and science. The participants' current practices support previous research

regarding African American girls in mathematics and science. According to Wegner et al. (2014), the pedagogical practices that are supportive and gender-free stimulate the performance of African American females in mathematics and science.

Participants also discussed the challenges and factors that hinder African American middle school girls' interest in mathematics and science. All but two of the 10 participants mainly referenced civic and societal challenges that impede the girls' interest. Among them were stereotyping, being distracted by others, especially boys, lack of resources, and lack of support outside of school walls. Most of the factors that were shared by the participants overlapped with the challenges, with the exception of two of the participants. Joanne shared a life-changing event at home and Sara commented that the subject does not relate to the girls on their level. Here, CRT, CRF, and RCT provide answers to this research question.

First CRT encapsulates the difficulties involved when discussing interest and lack of interest for African American girls. Teacher's practices, perceptions, and beliefs can affect the decisions these girls make regarding their future. Their reflections on their current practices assist them in changing their practices or the practices of others that may better serve students of color, which validates and strengthens their commitment to the underrepresentation and underachievement of African American middle school girls in mathematics and science.

Next, due to the multiple oppressions that African American girls face both inside and outside of school walls, CRF challenges and questions of teachers' academic structures have historically kept women of color at the bottom of the educational system

(Pratt-Clarke, 2010). When teachers reflect on the practices that either propel or undermine students' interest, CRF helps teachers to understand how their voices and their stories influence others on what, how, and how well mathematics and science are taught in the classroom.

Finally, RCT also supported the concepts participants shared regarding interest and loss of interest in mathematics and science. According to Hernandez et al. (2013) and Whitaker and Montgomery (2011), the learning environment, teacher instructional practices, and the curriculum can either contribute to or undermine the success of underrepresented minorities in advanced mathematics and science courses. In other words, the relationship between students and teachers must be understood by each to establish a learning environment that is beneficial to the learning needs of students, especially African American middle school girls.

How do teachers with experience teaching African American middle school girls perceive themselves as impacting these girls interest in math and science?

Theme 3: Impacts. All 10 participants shared how they impact African American girls in math and science through their relationships with the girls and what they do to keep the girls interested in math and science. In addition, participants shared their personal reasons for teaching in their current school district.

Ayaz et al. (2012), Fan (2011), and Gunderson et al. (2011) posited that there is a correlation between the student-teacher relationship and academic achievement. This means that the relationship established between students and teachers plays a significant role in how well a student performs academically. All 10 participants reported that they

had a positive or neutral relationship with their students. Their relationships with their students are demonstrated by the methods they use to keep the girls interested in math and science. Researchers have suggested that the race and gender of a student influences teacher practices and that for girls, their interest in math and science grows when females teach them (Moakler & Kim, 2014). In addition, a study conducted by Lavy and Sand (2015) suggested that teachers favor boys more so than girls. The actions discussed with the participants in this study regarding their teaching practices with African American girls do not support these research studies. For these participants, neither the gender of the girls nor the race of the girls in regards to their relationships with the girls or their teaching practices was a factor. This may be because the majority of the participants either lives in or is originally from the school district where they are currently teaching. According to the authors of RCT, when there is a shared connection between individuals, mutual empathy is acknowledged even if there are "confluences of similarities and differences between their respective life experiences" (Comstock et al., 2008, p. 282). In other words, because the participants and their students share a common existence, they have a mutual connection that bridges a relational awareness that assists them in developing a positive relationship, which has resulted in a positive impact on students' academic abilities.

How do teachers perceive their teaching and learning experiences as contributing to African American middle school girls'?

Theme 4: Contributions. Participants passionately shared their personal experiences as students in middle school, high school, and college, and how those

experiences are linked to their current teaching practices. All 10 participants responded positively to their formal school experiences, which are linked to the responses they gave when asked why it is important for African American middle school girls to learn mathematics and science.

Researchers have indicated that a student's self-concept regarding mathematics and science plays a significant role in how they perceive themselves and others as mathematics and science learners (Cveneck et al., 2011; Moaker & Kim, 2014; Reigle-Crumb et al., 2010). In other words, if the participants perceive their past experiences in mathematics and science positively or negatively, it is reflected on how they view their students as math and science learners. In this study, it is apparent that the 10 participants' personal experiences are linked to how they present information to their students and their thought processes of the importance of learning math and science. For example, Daniel expressed that his positive experience in school shapes his teaching practices. He said, "Yes. I think my [school] experiences have shaped my practices. My experiences with math have been pleasant and engaging, so I try to make sure my stance and delivery of math concepts are from a positive background." His comment is linked to the response he gave for why it is important for African American girls to learn math. He said, "It's a foundational skill, necessary to interact with the daily surroundings and there are countless numbers of jobs that involve math and science that students can obtain once their love of the subject matter is learned." Based on this example and similar responses from participants gathered in this study, it was apparent that the participants'

commitment and enthusiasm for their subject matter contribute greatly and influence how they present information to their students, supports previous research.

Theme 5: Strategies for African American girls. Another theme that emerged from participants regarding this research question was participants' strategies for African American middle school girls in mathematics and science. Research conducted for this study indicated that African American girls needs are different from other races and genders, which suggested that they require specific and unique strategies when learning mathematics and science. Five of the 10 participants in this study communicated that they have specific strategies for African American middle school girls. One participant stated that his strategies were for all students. The other four participants conveyed that they did not have strategies for African American girls. Information obtained from the data, and literature review affirmed that teachers' instructional practices are directly linked to African American middle school girls learning mathematics and science. Pringle et al. (2012) posited that when teachers do not understand their roles as facilitators and advocates of girls learning mathematics and science, it impeded the girls' achievement and opportunities in mathematics and science classrooms. For the teachers who do not have a specific strategies to assist African American girls learning math and science, indicates that these students are missing many opportunities that in turn may lead to their diminished educational attainment in mathematics and science.

Summary

As was touched on in the textural and structural synthesis above, Delgado and Stefancic (2012) Critical Race Theory (CRT), Pratt-Clarke (2010) Critical Race

Feminism (CRF), and Baker-Miller (1977) Relational-Cultural Theory (RCT) were a significant part of the findings in this study. First CRT suggested that race could impede the performance of African American females due to past racial beliefs in education and the fact that racism still exists in our society (Delgado & Stefancic, 2012). However, race was not a factor for perceptions of the participants in this study. Therefore, the interest or lack thereof in mathematics and science for African American middle school girls is not supported by CRT in this study. This may be due to the majority of the participants being of African descent. However, this was not the case for CRF.

CRF suggested that due to the multiple identifiers for women of color they are in jeopardy of being excluded from the opportunities of mainstream education (Evan-Winters & Esposito, 2010). The responses from some of the participants in this study, both male and female, consciously or unconsciously, held stereotypically and deficit thinking beliefs that African American females, due to their race and gender, are being oppressed, which supports previous research regarding CRF and education. When teachers display or hold, intentionally or unintentionally, deficit thinking and stereotypical beliefs about African American females, they are adding to the failure of these girls educational success. Hence, the interest or lack thereof, in mathematics and science for African American middle school females.

Finally, RCT posited that a positive relationship between teachers and students is an important part in the development of children and their learning. The findings of this study confirm previous research that there is a connection between student-teacher relationship and academic success (Ayaz et al. 2012; Fan, 2011; Guderson et al. 2011;

Rimm-Kaufman, 2014). The 10 participants in this study acknowledged that a positive relationship with students supported their commitment and showed their understanding of the learning needs of African American middle school females in mathematics and science. Thus, research in this study that suggested that teachers lack this commitment and understanding is not supported.

Congruent with the ideas and thoughts of CRT, CRF, And RCT, the findings in this study revealed factors that both do exists and do not exists within teachers' perceptions of African American girls' interest in mathematics and science.

Limitations of the Study

The course of conducting this research study, some limitations experienced by the researcher:

1. The findings of this study are unique to the population of this study.
2. Some participants were not expressive with sharing their experiences pertaining to teaching African American middle school girls.
3. No White teachers participated in this study.

Recommendations for Action

The recommendations for action can be useful to policymakers, parents, teachers, and scholars who have an interest in the educational needs of African American middle school girls. In this section, recommendations for action as they pertain to African American middle school girls' interest in mathematics and science will be discussed. All personal who are held accountable for the education of African American girls, need to understand fully how and why African American girls are still underrepresented and

underperforming in mathematic and science classrooms across this nation, specifically at the middle school level.

First, policymakers can assist in this endeavor by collaborating with parent, teachers, business and community leaders before they craft policies and procedures to ensure the educational readiness of students. Their thoughts, ideas, and knowledge, are a crucial part of the how instructional practices in the classroom can be shaped to cater to the needs of African American middle school girls so that these girls are also successful in mathematics and science. In addition, this collaboration could bring an understanding that past educational practices that are still considered the norm, are no longer adequate or appropriate for education our diverse student body. Next, professional development sessions for staff and parent-teacher conferences should be considered to raise the awareness regarding the inequities and unequal educational, instructional, and socioeconomic practices that have impeded the educational developments of African American female students. As such, this could counter the lack of knowledge that is absent regarding the educational and developmental needs of African American females. Also, it is recommended that teachers work together to share best practices that have been developed specifically for African American middle school girls. Finally, because of the constant diversity of our instructional leadership, specifically our teachers, pre-service training for new teachers, and yearly training for seasoned teachers in multicultural instruction needs to be implemented. This would keep the awareness of how changing cultural differences, changing socioeconomic differences, and changing instructional differences that are specific to our children's needs are vital to their educational efforts.

Recommendations for Further Research

Below is a list of recommendation for conducting further studies of teachers' perceptions of African American middle school girls' interest in mathematics and science. Future research can be expanded in the following areas:

1. This study was concentrated on one southeastern school district and may not be generalized to other school districts. It may be significant to look at different geographical areas for future research to glean a greater understanding regarding African American middle school girls' interest in mathematics and science.
2. A study of the perspective of teachers in school districts where African American girls are the minority may provide another view of how these girls are perceived as mathematics and science learners.
3. A study to explore the perceptions of African American middle school girls to investigate how they see themselves as mathematics and science learners. This type of study could assist them in examining their attitudes and perspectives toward mathematics and science.
4. A phenomenological study to explore K to fifth grade mathematics and science instruction. Examining the mathematics and science instruction at the elementary level may assist in how instruction at this level could better prepare students for higher levels of mathematics and science instruction.

This study can be used as the basis for further research for the above recommended research studies. As a result, these recommendations will add to the body of literature,

which can assist in providing a better understanding of teachers' perspectives of African American middle school girls' in mathematics and science classrooms.

Implications for Social Change

The implication for positive social change is contingent on the collaborative effort of all those involved in educating our children. Research has shown that African American females are underrepresented in STEM-related degrees and career fields (Brooks, 2011; Carenevale et al., 2011). In order to assist the United States in maintaining its competitive edge in STEM, all students must graduate possessing high levels of mathematics and science knowledge. The results of this study can be used to assist in reducing and ultimately eliminating the underrepresentation and underachievement of African American females in mathematics and science.

Policymakers, teachers, parents, and other scholars can use the results of this study to guide further the mathematics and science instruction and practices that are necessary to meet the needs of African American girls in middle school classrooms. The implication for positive social change from the data is that the race, gender, and socioeconomic status of all students must be considered when developing instructional policies and procedures. In addition, teachers' perspectives need to be included to assist in understanding the educational needs of students, especially African American females, when developing educational policy. Furthermore, the participants in this study discussed how their relationships with their students fosters their support in assisting African American girls' to gain a love for and see the importance of mathematics and science in their future endeavors.

Finally, although this study focused on teachers of African American middle school females, there are also positive social change implications for all students. The theories of CRT, CRF, and RCT implicate that all students benefit from a multicultural learning environment that promotes mutuality across the learning environment.

Researcher's Reflection

I started my formal teaching career as a kindergarten teacher. The makeup of my first class was 90% Hispanic of which 80% of them spoke limited English. However, I was determined to give them 100% of my abilities to ensure that they received the best education I could muster. The result of that experience was, in six months nearly of them could count to 100 and beginning to read their sight words without assistance. As I grew in my practice, and also the grades that I taught, my determination to make sure that every student that crossed my path would receive 100% of my abilities, ensuring they received what they needed to move forward in their academic careers, has never waivered. Very often I am asked will I leave the classroom once I receive my Ph.D. My response is honest, I do not know. I love being a teacher. I love standing in front of a room full of students and watching them absorb the knowledge I relay to them. Even more exciting to me is to have former students and their parents come back to me and share how I was an instrumental part of their academic achievements.

The opportunity to conduct this study began when I started my doctoral degree. I had been teaching math and science in fourth and fifth grades and was moved to teach sixth grade math and science at the middle school level. I had been reading articles that were counter to what I saw in my classroom and I wanted to know if other teachers were

seeing the same things that I saw, or were seeing what the literature was documenting regarding African American middle school girls' in mathematics and science. As I increased my knowledge, I realized that a phenomenology study regarding teachers' perspectives was the most appropriate design to satisfy my curiosity.

As a researcher, middle school mathematics and science teacher, and an employee of a school system, I brought insight from multiple sides of the issue. As much as I could, I set aside my personal biases to bring forth the perspectives of the 10 teachers' who participated in this study. I did this by maintaining a personal journal and using Creswell (2013) bracketing method during analysis and interpretation of the data. I was fully aware of my personal biases throughout this study, but I maintained control of its influences, knowing that they could not be completely eliminated.

Throughout my studies, I learned different strategies that cover the qualitative researcher to conduct a study ethically and productively. The interview protocol, coding, transcribing, and analysis methods I learned inspired me to enhance my practices as a mathematics and science teacher and appreciate the perspectives of other teachers regarding the interest level of African American middle school females in mathematics and science. The responses from the 10 participants in this study, increased my awareness of teachers who teach mathematics and science to our middle and high school students, and how they perceive African American middle school girls as mathematics and science learners.

The qualitative research process afforded me the opportunity and pleasure to interact with the interviewees and hear their experiences regarding the interest level of

African American middle school females in mathematics and science. It was rewarding to hear their perspectives, personal accounts, and recommendations regarding this phenomenon. It takes commitment and dedication to teach children of all ages. The participants in this study helped to satisfy my curiosities and allowed me to critically evaluate the institutions of education.

Conclusion

African American female face many challenges that continue to impede their academic success in STEM related degrees and careers. Their challenges are seen throughout their formal schooling. Although the mistakes and challenges of the past cannot be corrected, we as a society can move forward to ensure that we learn from those mistakes and move forward to ensure they are not repeated. My hope, based on the results of this study, is that teachers of all levels know and understand the benefits of ensuring that African American girls' interest in mathematics and science play an essential part in the STEM economy. Reducing or ultimately eliminating the achievement gaps between African American girls and their peers, demonstrates that our educational system is an effective force that emphasizes our collaborative efforts in ensuring that all students have the right to be educated, regardless of race, gender, and socioeconomic status.

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Appendix A: Letter of Cooperation From School District

To: Director, Department of Research & Evaluation
(School District Address)

Date:

Name of School District:

Your district is being invited to take part in a research study of African American middle school girls' interest in mathematics and science. This study will engage middle school and high school teachers with three or more years teaching mathematics and/or science to African American girls. Participants will include 10 to 15 teachers. Your district was chosen based on demographics identified through the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

A researcher named Bonnie M. Arnold, who is a doctoral student at Walden University, is conducting this study. Please note that this study is not in correlation with any professional capacity in which you may know Mrs. Bonnie M. Arnold.

Background Information:

The purpose of this study is to explore teachers' shared, lived experiences of teaching mathematics and science to African American girls. This study will strive to answer the primary research question: What teaching and learning experiences do teachers suggest contribute to African American middle school girls' interest in mathematics and science?

Methodology/Procedures:

Examining how teachers perceive the academic performance of African American middle school females in math and science requires careful interpretation of the experience (Smith & Osborn, 2008). The method chosen for this study will be a interpretative phenomenological analysis (IPA). The hallmark of interpretative phenomenological interpretative analysis (IPA) is exploring how individuals make sense of their experience (Pietkiewicz & Smith, 2014; Smith & Osborn, 2008), and "how they experience what they experience" (Patton, 202, p. 107). This approach allows the researcher to explore and gain a better understanding of how people, in the course of their everyday lives, experience the phenomenon under study. The focus of IPA is to gain an understanding of what an experience is like from the participants' point of view (Smith & Osborn, 2008). The assumption of this framework is that there is an essence to be shared in an experience (Patton, 2002). IPA is the practical application within a research framework and the process for developing an understanding of personal life experiences.

Data will be collected in the form of recorded interviews and field notes with math and science teachers who have experience teaching African American middle school females. A minimum of two semi-structured interview will be conducted with each participant. Recorded interviews will be transcribed verbatim and converted into text files. After each interview is read and transcribed, they will be electronically sent to each participant for verification. Once all transcriptions have been verified they will be uploaded into QDA Miner Computer Assisted Qualitative Data Analysis Software (CAQDAS) program. QDA Miner software will be used to code and store the interviews and field notes of each participant.

If you agree to allow your district to participate in this study:

- Teachers will be asked to complete an online survey, which will take between 10 and 15 minutes to complete at a time designated and agreed upon, by the teachers, the district, and the researcher. This survey is to ensure teachers meet the experience qualifications.
- Teachers will participate in two face-to-face interviews. The initial interview will last at least one hour. The second follow-up interview will last between 30 and 40 minutes.
- Teachers will engage in member checking if necessary to review the transcripts of their interview for accuracy, which will take up to 30 minutes.

Significance:

This study is significant because it may provide insight into what teachers perceive may affect the level of interest of African American females in middle school mathematics and science classes. In addition, it will address and give voice to an untapped population in the United States that has been overwhelmingly underrepresented in the educational system and science and mathematics—the African American middle school female—particularly their position as mathematics and science learners (Carnevale et al., 2011; West-Olatunji et al., 2008; West-Olatunji et al., 2010). What is known about the underrepresentation of African American females in mathematics and science has been informed by previous research throughout all education levels (Perry et al., 2012; Farinde & Lewis, 2012; Riegle-Crumb & King, 2010; West-Olatunji et al., 2008; Wright, 2013). However, previous literature have often overlooked African American middle school females, their pursuit as science and mathematics learners, and the lived experiences of teachers who teach mathematics and science to African American girls.

Benefits to (School District)

A better understanding of what may affect this population can assist instructional staff, parents, and policy-makers in developing strategies and support procedures that will contribute to African American girls' success and interest in higher-level mathematics and science courses that are needed to be successful in STEM-related fields. Moreover, this study can also provide policy-makers and educators with needed information that

acknowledges the benefits of assisting African American females at this level of their education so that they will be able to assist our society in staying competitive in the global STEM arena now and in the future. Therefore, the viewpoint and inclusion of teachers who have experience teaching African American middle school girls in mathematics and science is a necessary step in reducing, and ultimately eliminating the underrepresentation of African American girls in AP mathematics, science, and STEM classrooms.

The findings in this study can also be used by other scholars who are interested in the mathematics and science interest of other populations in the United States. While there is much literature on the necessity of mathematics and science knowledge for students to be successful in our society, there is a lack of research that explores teachers' perception of their experiences with teaching mathematics and science to African American middle school females. This study could result in positive social change by assisting the **(school district)** and the United States in developing and implementing effective processes to identify strategies and resources that are necessary to maintain student interest in mathematics and science, which will help to sustain the United States as a competitor in the global STEM arena.

Voluntary Nature of the Study:

District participation in this study is voluntary. This means that your decision of whether or not you want to be in this study will be respected. If you give permission for teachers in your district to join the study, and they later decide not to be in the study, no one will treat them differently. If teachers in your district decide to join the study now, they can still change their mind during the study. If they feel stressed during the study, they may stop at any time. Teachers can skip any question they are not comfortable with answering.

Risks and Benefits of Being in the Study:

There are minimal identified risks through participant in this study. All survey and interview responses will be kept confidential, and the results of the study will not indicate individual teachers, the district, or schools. In the event that district confidentiality is breached, you will be notified immediately by the researcher in writing and by phone. There is no risk associated with the inadvertent breach of confidentiality in relation to employability, reputation, or financial standing.

Compensation:

There is no compensation provided for participation in this study.

Confidentiality:

All district and participant information will be kept confidential. The research will not use your district information for any purposes outside of this research project. Also, the researcher will not include your district or participant's names or anything else that could identify your district or the participants in any reports in the study.

Contact and Questions:

You may ask any question you have now or if you have questions later. You may contact the researcher via phone at XXX or e-mail at XXX@waldenu.edu. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 612-312-1210. Walden University's approval number for this study is 10-28-15-0176581 and it expires on October 27, 2016.

The researcher will give you a copy of this form to keep.

Statement of Support:

I have read the above information and the attached proposal and I feel I understand the study well enough to make a decision about my district's involvement. By signing below, I am agreeing to the terms described above.

School Districts Name	
Printed Name of Authorizing Personnel	
Date of Consent	
Authorizing Personnel Written or Electronic * Signature	
Researcher's Written or Electronic* Signature	

The Uniform Electronic Transaction Act regulates electronic signatures. Legally, an "electronic signature" can be the person's typed name, their email address, or any other identifying marker. An electronic signature is just as valid as a written signature as long as both parties have agreed to conduct the transaction electronically.

Appendix B: Interest/Criterion Questionnaire

Interest/Criterion Questionnaire to Participate in a Research Study

Calling on all Math and Science teachers, please respond to this short questionnaire to determine your interest in taking part in a research study regarding teachers' perceptions of teaching mathematics and science to African American middle school girls created by Bonnie Best, a Ph.D. candidate from Walden University. If you are selected to participate in this study, more information will be provided soon. Thank you for your time.

* Required

How many years have you been a math and/or science teacher? *

- ☐ 1-3 years
- ☐ 4-6 years
- ☐ 7-10 years
- ☐ 10+ years

Do you have experience teaching African American middles school females? *

- ☐ yes
- ☐ no

How many years of experience do you have teaching African American middle school females? *

- ☐ 1-2 years
- ☐ 3-4 years
- ☐ 5-6 years
- ☐ 6+ years

Are you willing to participate in a research study that requires two face-to-face recorded interviews lasting approximately 1 hour for the initial interview and approximately 30 minutes for the second interview? *

- ☐ yes
- ☐ no

If you answered yes to the previous question, please provide contact information: name, email address, phone number, and the best time to contact you.

Appendix C: Letter of Consent for Teachers

Dear Participant

You are being invited to take part in a research study of African American middle school girls' interest in mathematics and science. This study will engage middle school and high school teachers with three or more years teaching mathematics and/or science to African American girls. Your district was chosen based on demographics identified through the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part. A researcher named Bonnie M. Best, who is a doctoral student at Walden University, is conducting this study. Please note that this study is not in correlation with any professional capacity in which you may know Mrs. Bonnie M. Best.

Background Information:

The purpose of this study is to explore teachers' shared, lived experiences of teaching mathematics and/or science to African American girls. This study will strive to answer the primary research question: *What teaching and learning experiences do teachers suggest contribute to African American middle school girls' interest in mathematics and science?*

Procedures:

If you agree to participate in this study:

- Teachers will be asked to complete an online questionnaire, which will take between 5 and 10 minutes to complete at a time designated and agreed upon, by the teachers, the district, and the researcher. This questionnaire is to ensure teachers meet the experience qualifications.
- Teachers will participate in two face-to-face interviews. The initial interview will last at least one hour. The second follow-up interview will last between 30 and 40 minutes and can be completed through email.
- Teachers will engage in member checking if necessary to review the transcripts of their interview for accuracy, which will take up to 30 minutes.

Voluntary Nature of the Study:

Your participation in this study is voluntary. This means that your decision of whether or not you want to be in this study will be respected. No one at your local school district will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind during the study. If you feel stressed during the study, you may stop at any time. You can skip any question you are not comfortable with answering.

Risks and Benefits of Being in the Study:

There are minimal identified risks through participant in this study. All questionnaire and interview responses will be kept confidential, and the results of the study will not indicate individual teachers, the district, or schools. In the event that your confidentiality is breached, you will be notified immediately by the researcher in writing and by phone.

There is no risk associated with the inadvertent breach of confidentiality in relation to employability, reputation, or financial standing.

Compensation:

There is no compensation provided for participation in this study.

Confidentiality:

Any information you provide will be kept confidential. The research will not use your information for any purposes outside of this research project. Also, the researcher will not include your name or anything else that could identify you in any reports in the study.

Contact and Questions:

You may ask any question you have now or if you have questions later. You may contact the researcher via phone at XXX or e-mail at XXX@waldenu.edu. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 612-312-1210. Walden University's approval number for this study is 10-28-15-017581 and it expires on October 27, 2016.

The researcher will give you a copy of this form to keep.

Statement of Consent:

I have read the above information and the attached proposal and I feel I understand the study well enough to make a decision about my involvement. By signing below, I am agreeing to the terms described above.

Printed Name of Participant	
Date of Consent	
Participants Written or Electronic * Signature	
Researcher's Written or Electronic* Signature	

The Uniform Electronic Transaction Act regulates electronic signatures. Legally, an "electronic signature" can be the person's typed name, their email address, or any other identifying marker. An electronic signature is just as valid as a written signature as long as both parties have agreed to conduct the transaction electronically.

Appendix D: Interview Questions and Probes

Please state your name, grade level, and subject taught.

Please state how many years you have been a math/science teacher.

Please state how long you have been teaching in this school district.

Interview Questions:

1. How did you decide to become a math/science teacher?

2. What made you decide to teach in this school district?

3. Why do you think it is important for students to learn math/science?

4. What was your experience as a math/science student in middle, high school, and college?

5. Do you think your experiences as a math/science student influences your teaching practices? If so, please explain.

6. Tell me about a typical day in your classroom?

7. Describe your relationship with your students.

8. What are some of the things you do to keep students interested in math/science?

9. In your experience, what are the characteristics of African American middle school girls who have an interest in math/science?

    a. What are the characteristics of African American middle school girls who have lost interest in math/science?

10. In your opinion what factors have contributed to African American middle school girls to loose interest in mathematics/science?

11. What do you think would assist African American middle school girls who have lost interest in math/science to regain/reignite their interest?

12. What do you think challenges African American middle school girls learning math/science?

13. Have you at any stage of your teaching career developed any specific strategies to help the girls face any such challenges? If so, what are they and how successful were those strategies?

14. In your experience, who are the best math/science students?

15. Is there anything you would like to add?

Appendix E: Principal Permission to Conduct Research Study Form

DEPARTMENT OF TESTING, RESEARCH AND EVALUATION

DIVISION OF TEACHING AND LEARNING

Do not write in this box — DRE use only

October 7, 2015 June 30, 2016 DRE-RA-1516033

Authorization Date Authorization Expiration Date DRE Application Number

Mrs. Bonnie M. Arnold-Best has received conditional authorization from the Department of Research and Evaluation to conduct the following research study:

"Teachers Perceptions of African American Middle School Girls' Interest in Mathematics and Science"

in ********** The researcher would like to conduct the study in:

****

School

Implementation of this study is contingent upon the researcher securing the permission of the principal in the above-listed school in which the study will be conducted.

****

D E Staff Signature

_____Approved _____Disapproved

Remarks:

Appendix F: Data Accounting Log

	Michael (9th & 10th grade science teacher)	**Sara** (6th grade math and science teacher)	**Stephen** (8th grade math teacher)	**Terry** (7th grade math teacher)	**Dianne** (7th grade science teacher)	**Joanne** (6th grade math and science teacher)	**Nikka** (6th & 8th grade math teacher)	**Daniel** (6th grade math and science teacher)	**Anthony** (6th grade math and science teacher)	**Georgia** (6th grade math teacher)
Informed Consent Signed	12/7/15	1/8/16	12/9/15	12/14/15	1/11/16	1/12/16	1/12/16	1/12/16	1/8/16	1/14/16
Interview 1	12/8/15	1/10/16 1/16/16	12/12/15	12/17/15	1/13/16	1/14/16 1/21/16	1/14/16	1/15/16	1/10/16	1/17/16 1/22/16
Transcribed	12/13/15	1/22/16	12/18/15	12/22/15	1/18/16	1/29/16	1/17/16	1/23/16	1/14/16	1/30/16
Interview 2 (Verification)	12/13/15	1/23/16	12/18/15	12/12/16	1/18/16	1/29/16	1/17/16	1/23/16	1/14/16	1/30/16

Appendix G: Contact Summary Form

Name_____ Interview Date_____

Type of Contact: _____Interview Site_____

Face-to-face_____ Today's Date_____

Email: _____ Completed by_____

1. What was the most salient information or theme that struck you during the interview with this contact?

2. Was all information sought acquired during the interview? What information was not received from this contact?

3. Was there anything else that was salient or interesting about this contact?

4. What new target questions, if any, do you have for this contact during the next interview?