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Instructional Strategies of Effective Mathematics Teachers of African American Upper Elementary Students

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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2017

Abstract

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MA, Brenau University, 2001

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Teacher Leadership

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Abstract

National assessments have revealed that African American students do not demonstrate proficiency in mathematics to the same degree as their White counterparts; however, some teachers are able to guide their African American students to mathematics success. The purpose of this qualitative case study was to determine the instructional strategies of teachers who have been successful in promoting mathematics achievement in African American students. This study was guided by a single research question that focused on the instructional strategies used by teachers whose African American upper elementary students demonstrated proficiency in mathematics on a state standardized test. Feuerstein's mediated learning experience theory formed the conceptual framework for this study. Data were collected through interviews, document analysis, and observations of 6 upper elementary teachers from 3 different schools in a single school district. Open coding was used to note emergent themes that formed the basis for the findings. This study identified 7 effective strategies for teaching mathematics to African American students: employing repetition and review, using specific teaching tools, grouping for instruction, applying assessment and reteaching, engaging student discourse, using word problems, and making real life connections. The strategies that emerged from the study displayed characteristics of the traditional and reform approaches to teaching mathematics as well as culturally relevant pedagogy. These strategies may be useful in helping teachers to increase African American students' achievement in mathematics as well as their feelings of self-efficacy. The findings of this study may improve the pedagogical practices of mathematics teachers of African American students.

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Dedication

I would like to dedicate this dissertation to my children, Zoe and Peyton. You are truly mommy's inspiration. I would also like to dedicate this dissertation to my parents (Willie and Katherine) and my siblings (Faye, Nick, Darryl and Chris). I strive to make you proud in everything I do. Most of all, I would like to dedicate this dissertation to God. I do all things through Christ who strengthens me. Thank you God for your guidance.

Acknowledgements

Thank you Dr. Patricia Anderson, Dr. Baiyun Chen and Dr. Paul Englesberg for being part of my doctoral committee. Dr. Anderson, no words will ever be able to express the sincere gratitude I have for all of the support and encouragement that you provided throughout this arduous journey. You are truly an inspiration, and it has been a privilege to work with you. Dr. Englesberg, thank you for your constructive feedback and guidance. Although it did not always make me smile to go back and make the revisions, I know that your suggestions along with Dr. Anderson's and Dr. Chen's guidance, were critical in transforming this study into a true Walden doctoral study.

Thank you Michelle and Deborah for being my sounding boards and listening to me whine and rejoice as I made it through each step in this process. To Dr. Ketchia Woods and Dr. Kerry Ann Holmes, thank you both so much for reaching back and realizing that "She ain't heavy. She's your sister." Your advice, guidance, and support will forever be appreciated.

Thank you to the teacher participants in this study. Without you, this study would not have been possible. Keep doing what you do for our children. Last, I would like to thank Walden University for granting me this opportunity to complete my degree.

Table of Contents

List of Tables

Section 1: Introduction to the Study

Student performance in mathematics has been a growing concern for educators and policy makers in the United States for decades. Results from two international assessments, the Trend in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA), indicated that U.S. student performance in mathematics has improved somewhat over the last two decades. Despite this improvement, students in the United States scored lower on these assessments than their counterparts in some European and East Asian countries and regions (Hopstock, Pelczar, & Shelley, 2010). In addition to this international achievement gap in mathematics, there exists a persistent achievement gap in mathematics performance among U.S. students of different racial groups, specifically between African American and White students (National Center for Education Statistics, 2015). During the 2015 administration of the National Assessment of Educational Progress (NAEP), fourth grade African American students had an average score in mathematics that was 24 points lower than the average score of White students in mathematics. The scale for the NAEP mathematics test scores ranges from 0-500. Based on this scale, the average mathematics score in 2015 for fourth grade White students was 248 while the average score in 2015 for fourth grade African American students was 224. Although there has been an overall decrease in this gap, African American students have lagged behind their White counterparts for over three decades. In 1990, there was a 32 point deficit between the two groups. In 2000, the deficit decreased again to a 31 point deficit, and in 2013 the deficit decreased to 26 points.

Researchers have suggested that there is a decline in student performance in mathematics when students reach the upper elementary years. This low performance seems to occur as students' attitude toward mathematics shifts toward a less positive perception (Ottmar, Decker, Cameron, Curby, & Rimm-Kaufman, 2014). This may account for the 18% of fourth grade students in the United States who failed to perform on basic level in mathematics (National Center for Education Statistics, 2011).

Statement of the Problem

There is a problem with student achievement in the area of mathematics at an elementary school in an urban school district located in a southeastern state in the United States. According to the 2015 results of a state-wide administered standardized assessment, approximately 80% of the third, fourth, and fifth grade students failed to meet minimum expectations in mathematics ([Redacted] Department of Education, 2015). The population of this school is 98% African American. Further supporting this problem is that approximately 85% of the third, fourth, and fifth grade students at the school have been identified as potentially experiencing difficulty in mathematics. Consequently, these students are in the response to intervention (RTI) process. The RTI process provides intensive individualized instruction to students who have been identified using a universal math screener as at risk for math failure (Lembke, Hampton, & Beyers, 2012). Additionally, professional conversations with mathematics teachers at the feeder middle schools have revealed that when the students enter the middle school mathematics classrooms, they are not prepared for the higher level of mathematics. Many of the students are experiencing academic struggles in their classes. As a result, at least one of

the feeder middle schools offers an extra mathematics class that is designed to help provide remedial instruction needed for the students to be successful in their regular sixth grade mathematics class.

National Assessment of Educational Progress (NAEP) reported that African American students across the nation are struggling in the area of mathematics (NAEP, 2013). Many of the causes of this achievement gap identified in the literature are associated with home-based variables for which there are no realistic ways to effect change; however, school based variables may yield a higher potential for positively affecting student achievement (Williams, 2011). Jackson and Wilson (2012) suggested examining the amount of exposure students have to mathematics content and the instruction students receive as factors that may provide insight into helping increase achievement in this area. In this study, I examined the instructional practices of classroom teachers who have been successful at promoting achievement in the area of mathematics with African American students.

Purpose of the Study

Over the last several decades, national and international data have shown a lack of achievement in the area of mathematics for African American students (National Center for Education Statistics, 2011). Jackson and Wilson (2012) contended that studies on African American students' achievement in mathematics fail to examine the connection that may exist between the achievement of these students and the instructional practices of their teachers. Although researchers have addressed broad principles or orientations to teaching mathematics to African American students, they have failed to adequately

identify specific instructional practices that support African American students' progress in mathematics (Jackson & Wilson, 2012). This study was therefore motivated by the lack of empirical research about instructional strategies used to teach African American students who become proficient in mathematics. The purpose of this study was to explore and record the instructional strategies of math teachers who have been successful in promoting academic achievement in African American students in the area of mathematics. Teacher success in promoting academic achievement for these students was defined as mathematics teachers who have been successful in helping their students attain a score of level two, three, or four on the state standardized assessment. These scores indicate three levels of proficiency for learners. Level 2 indicates a student who is a developing learner. Level 3 indicates a proficient learner, and Level 4 indicates a distinguished learner. Traditional and reform teaching practices as well as culturally-relevant teaching practices were used to inform this study.

Nature of the Study

I explored ways to improve academic achievement in the area of mathematics for African American students. I examined the instructional practices of six math teachers who were selected from three predominantly African American elementary schools in an urban school district in a southeastern state of the United States. A case study design that was both exploratory and comparative in nature was employed. Case studies can be instrumental in informing professional practice (Baxter & Jack, 2008). They afford the researcher an opportunity to engage in an exploration of a particular phenomenon in its natural setting utilizing more than one data source (Baxter & Jack, 2008). This allows for

multiple perspectives of the issue to be uncovered therefore prospectively yielding a broader scope of the phenomenon being explored (Baxter & Jack, 2008).

Participants in the case study were one third, two fourth, and three fifth grade teachers who taught mathematics to African American students at elementary schools in an urban school district for at least 90 minutes each day. These teachers were selected based on the recommendations of the principals at the schools. These building level administrators had the opportunity to review the assessment data of each mathematics teacher in the building and adequately recommended those teachers whose students had shown positive academic gains in this area according to the expectations of the school system as well as the state. Principals were asked to recommend Grades 3-5 teachers whose students have demonstrated high levels of growth in mathematics on the state standardized assessment. Additionally, the selected teacher participants possessed five or more years of teaching experience with their primary instruction being in mathematics. At each of the research sites, the teachers are departmentalized. Teachers are a part of a grade level team. Each grade level is comprised of four teachers. Two teachers on the grade level team teach both language arts and social studies while the other two teachers on the grade level team teach both mathematics and science. Each teacher is responsible for teaching two blocks of their designated content areas. Therefore, each participant in the study is responsible for teaching two mathematics and two science classes each day.

This study explored the teaching strategies used by these teachers in an effort to discover ways to promote academic growth for African American students in the areas of mathematics and ultimately help contribute to the quest to close the achievement gap. I

employed the use of interviews and observations with field notes to collect the data for this study.

Research Question

A single research question guided this case study: What are the instructional strategies used by teachers of African American intermediate level students who demonstrate academic proficiency in the area of mathematics? A case study approach was used to pursue this question.

Conceptual Framework

Undergirding this case study is Feuerstein's mediated learning experience theory. Although Feuerstein's ideas were not developed specifically with African American students in mind, they provide insight into the prevailing educational question: What forms of instruction help African American students learn mathematics? Answers to this question can be used to guide the instructional strategies that teachers use in their classrooms as well as investigate the importance of the role of the teacher in the learning process (Burden, 2000).

Comparisons have also been made between Vygotsky's theory and those of the Israeli psychologist and educator, Reuven Feuerstein (Seng & Tan, 2003). Like Vygotsky, Feuerstein believed that cognitive development could take place with the presence of some kind of mediation. In his theory of mediated learning experience, Feuerstein proposed that mediation occurs as a result of a special type of interaction between the learner and what he termed as a mediator (Feuerstein, 1979). That interaction is characterized by three important features: intentionality and reciprocity,

mediation of meaning, and transcendence. In a broader sense, Feuerstein's mediated learning experience theory is viewed as an interaction between a person and his/her sociocultural environment. However, the mediated learning experience (MLE) focuses on the experiences that affect the individual learner's natural tendency to learn (Kozulin, 2002). Although there are 12 criteria that characterize Feuerstein's mediated learning theory, this study is conceptually framed by the first three criteria because these criteria must be present in every learning experience (Feuerstein, 1990).

First, there must be intentionality and reciprocity. With intentionality, the mediator's role is to help the learner understand his own thinking. The criterion of intentionality is instrumental in helping the mediator transform an otherwise random situation into an intentional focus. The intentional focus is the learner and what is being learned (Presseisen & Kozulin, 1995). Reciprocity refers to the need for the learner and mediator to develop a mutual respect for one another (Feuerstein, 1979). The learner however is the primary focus of the learning experience. The mediator takes an interest in the strategies being used by the learner as well as any misconceptions by the learner. Additionally, the mediator makes an effort to intentionally interpret the stimuli and convey those interpretations to the learner. The learner is therefore receptive to as well as involved in the learning process and motivated to respond (Seng, 1997).

The second criterion from Feuerstein's mediated learning theory is mediation of meaning. In the process of mediation of meaning, the mediator clarifies and interprets the significance and purpose of what is being learned (Seng, 1997). This part of the mediated learning process results in the learner being exposed to knowledge, value, and

beliefs through the mediator (Feuerstein, 1991). Such interactions makes the learning activity or objective relevant to the learner. The learner is motivated to ask questions and formulate the basis for inquiry (Seng, 1997).

The third criterion that framed this study is transcendence. Transcendence occurs when the learner is able to make connections between newly acquired and existing knowledge (Presseisen & Kozulin, 1995). Transcendence is critical in helping learners take their acquired knowledge, values and beliefs and generalize them to existing and future issues and problems (Seng, 1997). Once learners begin to engage in transcendence, they will develop a deeper understanding of the world, a perception of the interconnectedness of things, a sense of inquiry and discovery, and a need to seek explanations (Seng, 1997).

In addition to these three interactions between learner and mediator, Feuerstein asserted that learning takes place through two distinct modes that he refers to as the direct approach to learning and the mediated approach to learning (Skuy, 1997). The direct approach involves the learner interacting with his or her environment with minimum guidance. The learner makes his or her own judgments, conjectures, and conclusions based on that interaction (Seng, 1997). The mediated approach to learning involves a human mediator that helps to guide the learner. The mediator provides meaning and insight about the learner's interaction with his or her environment (Seng, 1997). Of the two modalities, Feuerstein saw the mediated approach as the most effective. However, he asserted that both modalities must take place if a student is to reach his or her optimal

development as a learner (Skuy, 1997). In this vein, it is the mediated learning experience that readies the learner for the direct learning experience.

Definition of Terms

Achievement gap: The achievement gap in mathematics was once defined in terms of the statistical differences that exist between students in terms of race based on standardized test data. However, this gap is being reframed in the literature as a problem of inequity in opportunities to adequately learn mathematics by many students (Flores, 2007).

Culturally relevant teaching: An approach to teaching that uses pedagogy related to the home culture of the student population being taught (Ladson-Billings, 1994).

Explicit instruction: A highly structured teacher-directed instruction in which new skills are introduced in small steps based on the student's progress and understanding (Hudson & Miller, 2006).

Milestones assessment: For the purpose of this study, the Milestones is a state administered test that assesses student mastery levels of the prescribed state standards in four content areas: English language arts, mathematics, science and social studies. ([Redacted] Department of Education, 2015).

Reform mathematics teaching: A teaching technique based on the constructivist theory, which requires the learner to construct meaning by interacting with his or her environment. This form of instruction is based on the recommendations of the National Council of Teachers of Mathematics (NCTM, 2014).

Traditional mathematics instruction: A teaching approach that is extensively teacher-centered in nature and places an emphasis on the acquisition of procedural knowledge (McKinney, Chappell, Berry, & Hickman, 2009).

Assumptions

The following assumptions are made regarding this study. I assumed that the participants would be open, honest and candid in their responses to any questions asked during the course of this study. Although each teacher utilized his or her own instructional strategies, it was assumed that all teachers used the Common Core Standards Curriculum as prescribed by the state. I assumed that the positive academic progress made by the students was the result of the effective instructional strategies that each teacher utilizes in his or her classrooms. Another assumption of the study was that each teacher was able to articulate in detail the specific strategies that contribute to the academic success of students.

Limitations of the Study

The methodology chosen for this study may pose several limitations. First, the sample size was limited to six teachers (two third, two fourth, and two fifth grade teachers) at three different elementary schools in the same cluster area in the same public school district in a state in the southeastern United States. The participants were selected using purposeful sampling. Therefore only participants with specific experience relative to the problem were asked to participate. The number of participants was limited to six in an effort to gain an in depth understanding of the phenomenon being studied. Further, the six teachers represented those teachers who have been successful in serving the

students identified in the problem of the study. It is my hope that the findings from this study can be generalized to other schools in the same cluster area of the same district who are also experiencing this problem. Further, a smaller sample size helped reduce the chances of failing to discover a perception that I will seek to find or know in the study (DePaulo, 2000). All of the participants were teachers at predominantly African American schools, and all of the teacher participants were African American which may present another limitation of this study relative to its ability to be generalized to other populations. This study was limited by time constraints. Given the timeframe of the academic school year, a longer time period to observe teacher instructional practices and the resulting student progress may provide stronger reliability and validity to support this study. During the member checking process, participants were given the opportunity to review the transcripts of their interviews to verify accuracy and completeness; however, preliminary interpretations of this data including emerging themes and patterns were not shared with the participants thus creating a limitation in this study.

Scope and Delimitations

This study included only teachers considered effective teachers of mathematics. For the purpose of this study, an *effective teacher* is defined as one who has consistently demonstrated the ability to facilitate academic achievement as evidenced through test scores for African American students in the area of mathematics. This study included six regular education teachers only. These teachers were selected from three school sites in a single school district. These teachers taught in schools where the student population is

predominantly African American. Therefore, the results of this study may not be generalized to larger populations given its small sample size.

Significance of the Study

The mathematics education research community has been instrumental in identifying instructional practices that have been shown to be effective in improving student achievement in mathematics (NCTM, 2013). However, there are few studies that intentionally focus on identifying instructional practices that support the development of conceptual understanding of mathematics specifically for African American students (Jackson & Wilson, 2012). The significance of this study is that it can potentially contribute to the field of mathematics education by identifying such instructional practices that will ultimately lead to improvements in learning opportunities for African American students in the area of mathematics. According to Jackson and Wilson (2012), it is important that the mathematics education community work to find ways to instructionally support African American students' meaningful participation in mathematics. More importantly, the findings from this study are expected to lead to more research in the area of effective strategies for African American students in mathematics. Further, this study is significant because it may potentially contribute to finding effective ways to improve the mathematics achievement of African American students in one local urban school district.

Implications for Social Change

The purpose of this study was to explore the instructional strategies of teachers who have been successful at promoting student growth and achievement for African

American students in the area of mathematics. Research in the areas of mathematics and African American students has implications for social change. Studying the problem of African American students' lack of achievement in the area of mathematics at three urban elementary schools could lead to positive social change by reducing the current retention and the dropout rates of African American students in the cluster area in which the three schools are apart. This, in turn, could lead to more students achieving high academic standards, graduating from high school, and potentially attending vocational schools, and institutions of higher education. Additionally, students may become equipped with the skills necessary to successfully thrive in a technologically advanced society.

Summary

In Section 1, an overview of the proposed study was presented. I addressed the concern that educators at the national and local level have about the lack of achievement of African American students in mathematics (NAEP, 2013). In order to help these students make growth in this area, it is imperative that teachers use instructional strategies that support student achievement (Ottmar, Rimm-Kaufman, Berry, & Larsen, 2013). The purpose of this study was to explore the instructional strategies of teachers who have been successful in promoting the achievement of African American students in mathematics. This study focused on the instructional strategies utilized by six math teachers from third, fourth, and fifth grades. These teachers were selected from three elementary schools in an urban school district. A qualitative research design was developed to address one research question. This study will add to a limited body of knowledge on instructional strategies that enhanced the learning of a specific population

of students.

In Section 2, a review of the literature is presented to establish a background for understanding how mathematics is currently taught in the United States. This examination of mathematics instruction pertains to teaching mathematics in general and teaching mathematics to African American students. Topics discussed in the literature review include the traditional method of teaching mathematics, the reform method, a balanced approach to teaching mathematics and culturally relevant pedagogy. A description of the research design and methodology that was used in this study is presented in Section 3. Participant selection criteria, data collection instruments, measures to be taken for ethical protection of the participants, and the overall context of the study are explained. Data collection methods and analysis are also discussed. The results of the study are presented in Section 4, and in Section 5, the results, recommendations for future research, and implications for positive social change are discussed.

Section 2: Literature Review

One significant problem of African American students in schools across this country is the achievement gap in mathematics (Williams, 2011). On national achievement assessments in mathematics, African American students continue to lag behind White students showing no significant improvement in closing the gap (NAEP, 2013). The achievement gap in mathematics has been attributed to several underlying factors including class size (Chingos, 2012), lack of parental involvement, low income, and instructional approaches and strategies (Burchinal et al., 2011). Literature contributing to an understanding of mathematics instruction informs this review.

The intent of this literature review is to provide an overview of the current instructional methods for teaching mathematics, in the context of Feurerstein's (1979) three key features. First, focus is placed on an exploration of the achievement gap in mathematics. Next recommendations for teaching mathematics will be discussed. An overview of the elements of the varying instructional methods for teaching mathematics is provided. This overview is followed by a discussion of the benefits and limitations of each instructional method for teaching mathematics.

Search of the Literature

The review of the literature began with a search of: Educational Resource Information Center (ERIC), EBSCOhost, ProQuest Central, Education Research Complete, Education from SAGE, Google Scholar, and Teacher Reference Center, Thoreau, and Taylor and Francis Online. The following keywords were used: *strategies for teaching African American students mathematics.* This search term did not yield

sufficient information for the review of literature. Additional searches for relevant information was facilitated through the use of terms such as *African American students and mathematics* and *Black students and mathematics.* I limited the results to research that was published since 2010. In addition, I generally limited the results to peer-reviewed research.

Additional searches for relevant information regarding instructional approaches to teaching mathematics were facilitated through the use of terms such as *reform mathematics, reform approaches to teaching mathematics, constructivist approach to teaching mathematics, NCTM recommendations for teaching mathematics, traditional approach to teaching mathematics, explicit approach, balanced approach to teaching mathematics and teaching mathematics in urban schools.* Several relevant publications were retrieved. The search for relevant materials continued using the terms *culturally relevant teaching and mathematics,* which resulted in several additional publications.

The Achievement Gap in Mathematics

The achievement gap in mathematics which exists between White and African American students has been well documented on several measures of academic achievement (Williams, 2011). Both international and national assessment results have revealed that there is a problem with the way that African American students are learning mathematics (NAEP, 2013; OCED, 2012). Theories relating to possible causes have been developed and discussed in the literature. According to Rearden (2013), the achievement gap may be a result of a developmental process that begins before students even reach the school level and is acted on or exacerbated by their subsequent school

experiences. This developmental gap has been attributed to the socioeconomic status of the student because it is the socioeconomic status of a child's family that impacts the child's ability to have access to resources needed to enhance a child's development and educational experience (Reardon, 2013).

Several studies have been conducted that investigated possible causes of the achievement gap. Konstantopoulos and Li (2012) investigated the relationship between class size and the achievement distribution. In their study, they found that once a student has a made gains in a small class setting, the additional benefits of being in a reduced class setting over multiple years are not statistically significant. Basch (2011) explored the effects of eating a nutritional breakfast on academic achievement. The researcher revealed that skipping breakfast is more prevalent among school-aged urban minority youth than any other socioeconomic group of students. Additionally, the lack of this daily nutritional sustenance can adversely impact a student's academic achievement (Rothstein, 2004; Thernstrom & Thernstrom, 2003).

School-based factors that may contribute to the achievement gap in mathematics have also been explored in the literature. Two of the most extensively researched school-based factors have been teacher quality (Williams, 2011) and teacher effectiveness (Stronge, Ward, & Grant, 2011). According to Williams (2011), the findings on teacher quality as a possible cause of the achievement gap have been inconclusive. Teacher quality may be difficult to assess because research has yet to reach a clear consensus on what teacher quality is or how to quantify it (Stronge et al., 2011). Additionally, it has been equally problematic to define teacher effectiveness because effectiveness is a term

that is ambiguous in nature. According to Stronge et al. (2011) defining what effective means relative to teaching can be complicated given the various perspectives of teaching.

Many of the causes of the achievement gap identified in the literature are associated with home-based variables upon which there are no viable or realistic ways to effect change (Williams, 2011). However, school based variables may yield a higher potential for change relative to student achievement. Factors such as teacher quality and teacher effectiveness may be useful in addressing the achievement gap in mathematics (Williams, 2011). Scholars and educators have shifted their focus to examine how mathematics is taught in the classroom because researchers have indicated that effective teaching strategies are critical determinants of student learning (National Comprehensive Center for Teacher Quality, 2011).

Recently mathematics education researchers have begun to view the mathematics achievement gap of African American students through two distinct lenses: a lens of achievement and a lens of opportunities to learn (Milner, 2012). When viewing these students through a lens of achievement, the educational focus is influenced by a need to fix what is wrong with the learner. However, by looking at the development of African America students in terms of opportunities to learn, the focus shifts from the student as the problem to the instructional system as the cause for concern (Martin, 2009b). With the focus on instruction, emphasis can be placed on the way that students and teachers interact and the way that this interaction influences the students' academic learning as well as the construction of their mathematics identities (Jackson & Wilson, 2012).

Despite the lens through which the achievement gap is viewed, a focus on instructional practices as a means of closing this gap appears to be a consistent theme in the literature.

Mathematics Instruction for African American Students

Despite numerous reforms in education and the recommendations for teaching math made by the NCTM (2000), African American students continue to experience low levels of academic success in mathematics (Berry, Ellis, & Hughes, 2014). Some researchers believe that this is due primarily to teaching strategies that were developed to meet the needs of the dominant society and not the specific needs of African American learners (Berry et al., 2014). A closer examination of how African American students learn math revealed that these students are often given less access to advanced level mathematics content. They often learn math through methods that are not consistent with the recommendations of the NCTM (Berry et al., 2014). The use of rote memorization, drill and practice still tends to be the primary means of instructing African American students in mathematics (Berry et al., 2014). Instructional practices tend to ignore relational, cultural and racial aspects of the learning experience (Battey, 2013). In fact, researchers such as Martin (2009a) and Jackson and Wilson (2012) acknowledged that there is still much the mathematics education community does not know about how to effectively support African American learners in mathematics and have called for an in-depth examination of the instructional practices relative to these students.

Jackson and Wilson (2012) interviewed teachers, coaches and principals at different schools among four large urban school districts. In the interviews, the educators indicated that there was a problem with the way that African American students were

learning mathematics. Despite their intentions to meet the needs of these students, the educators felt inadequately supported in their efforts. They reported an overall lack of professional development in this area and a lack of school level support to help them address the problem. In response to their findings, researchers Jackson and Wilson (2012) conducted a comprehensive review of the literature that resulted in recommendations for identifying specific pedagogical and instructional practices that may yield positive results in increasing mathematics achievement for African American students.

One recommendation was to reframe what is thought of as *teacher quality*. In the traditional sense, teacher quality is often defined in terms of quantifiable measures such as certifications, course work, degrees earned or scores on teacher certification assessments. However, Martin (2007) suggested expanding the traditionally accepted definition of teacher quality to include teachers' perspectives and beliefs about their students' abilities to learn mathematics. These are teachers who are likely to effectively provide students with the opportunities to learn mathematics that is necessary for student growth (Jackson & Wilson, 2012). In addition, the authors suggested taking a closer look at the instructional practices in the mathematics classrooms. Their recommendations for instruction were aligned with the recommendations for teaching mathematics as specified by the NTCM. However, they expressed that these forms of instructional practices should take the experiences of the African American learner into consideration and be empirically shown to facilitate the participation of these students in meaningful mathematics practices.

Varelas, Martin, and Kane (2012) opined that mathematics and science learning should be viewed as a process that incorporates both content learning and identity construction. African American students were the primary focus of this framework because this population of students is frequently ranked on the lower end of the achievement spectrum in these two content areas. Varelas et al. contended that there are three specific identity developments necessary for African American students to be successful learners of mathematics and science: disciplinary, racial, and academic. The interaction of these identity construction processes with each other and content learning has the potential to support African American learners in both mathematics and science by allowing these learners to make meaning of their learning.

NCTM Recommendations for Teaching Mathematics

The NCTM (2000) established a set of teaching standards to provide teachers with a more effective way for teaching mathematics. These standards emphasize a focus on conceptual understanding and student centered teaching strategies (NCTM, 2008). This framework for teaching mathematics was established to provide students with opportunities to build mathematical knowledge through problem solving and the application of problem solving strategies. In addition, students are given the opportunity to develop, communicate, and justify their own answers to non-routine, complex mathematics problems with proper representational devices and meaningful connections to real life context (NCTM, 2008). NCTM and educational researchers in the mathematics field have included eight additional strategies for teaching mathematics that are considered essential for effectively teaching mathematics to all students. These

conceptual methods for teaching mathematics are considered effective because they promote retention of learning and a deeper understanding of mathematics instead of emphasizing rote memorization, drills and repetition (Richland, Stigler, & Holyoak, 2012).

However, these recommendations made by NCTM are considered conceptually controversial by supporters of the traditional instructional approach to teaching mathematics (Grady, Watkins, & Montalvo, 2012). Supporters of this instructional approach contend that mathematics instruction should involve the teaching of basic mathematics knowledge and skills that lay a solid foundation for students. This results in students' abilities to use reasoning and solve complex problems in mathematics (Grady et al., 2012). Ladson-Billings (1994) offered a social cultural framework for teaching African American students known as culturally relevant teaching. This framework emphasizes using pedagogical practices that address students' racial and ethnic backgrounds in an effort to improve student learning. Aspects of this teaching framework have been extended to the teaching of mathematics (Ladson-Billings, 1997).

Educators and researchers tend to agree that instructional practices of teachers are a significant predictor of student learning (Blazar, 2015). However, the educational research community has failed to agree on what those teaching strategies should look like (Slavin, Lake, & Groff, 2009). The question of how teachers should teach mathematics has presented a conundrum for all stake holders in the mathematics education community (Boaler, 2015a).Those engaged in what Schoenfeld (2004) has described as *math wars* view mathematics teaching through two divergent lenses: traditional instruction and

reform instruction. This next section of the literature review will examine different instructional approaches for teaching mathematics.

The Traditional Approach to Teaching Mathematics

Despite the recommendations of the NCTM (2000), the traditional approach to teaching mathematics has remained a consistent approach to teaching mathematics in many classrooms in the United States (Van de Wallle, Karp, Bay-Williams, 2012). This approach to teaching mathematics is characterized by what many educators refer to as drill and kill. It requires students to memorize facts, follow the standard algorithms, execute procedures, and plug in formulas to do math (Van de Walle et al., 2012). In the traditional teaching method the primary focus is placed on helping students to acquire what is thought of as basic mathematics knowledge and skills (Grady et al., 2012). Its primary objective is to provide students with the foundational skills necessary to successfully master the more advanced skills (Grady et al., 2012). Because the traditional method of teaching mathematics is predicated on the notion that mathematics is an established set of procedures and skills, the roles of both student and teacher are clearly delineated (Doabler et al., 2013). The teacher's primary role in this context is to present isolated content or objectives through the use of direct or unilateral instruction that occurs repeatedly until student mastery results (Grady et al., 2012). The students' role is to memorize the content and recall it when prompted, giving little thought to the actual mathematical process (Boaler, 2015b).

This method of teaching mathematics is grounded in the theoretical work of Edward L. Thorndike (Ellis & Berry, 2005). The stimulus-response bond theory

asserted that learning is facilitated by strengthening the relationship between a stimulus and a desired response. The goal of Thorndike was to contribute to the education of the masses of students by making public schools more effective and efficient in general; however, his work ultimately had a specific effect on teaching and learning of mathematics (Ellis & Berry, 2005). Thorndike's findings influenced a significant portion of the educational community to embrace a style of teaching characterized by carefully sequenced and explicitly taught lessons that are repeatedly taught until mastery is achieved (Ellis & Berry, 2005).

Explicit Instruction

Explicit instruction is a form of the traditional method of teaching mathematics (Heasty, McLaughlin, & Williams, 2012). It is also referred to as direct or teacher-centered instruction. At its core, this type of instruction is defined as a highly structured and organized teaching approach that effectively facilitates the mastery of foundational skills (Doabler et al., 2013). This approach to teaching is highly characterized by teacher modeling, scaffolding, guided practice, independent practice and corrective feedback (Munter, Stein, & Smith, 2015). Due to its familiarity and its benefit of learning facts, explicit instruction is commonly used in mathematics textbooks and classrooms (Boaler, 2015a). Although it can be employed with all students, it has been found to be particularly effective with students who have difficulty with math or are at risk for having math difficulty (Doabler & Fien, 2013).

Research on mathematics programs or curriculums that employ explicit instruction has yielded positive results (Doabler et al., 2013). Agondi and Harris (2010)

investigated the using 110 schools that were specifically selected across the school district based on their categorization as urban schools. To test the effectiveness of the math curricula that employed explicit instruction, the researchers tested the first and second grade participants in the fall and in the spring establishing a pre and post- test design. Teacher surveys and classroom observations were conducted at least once during the study. The results of the study were that students randomly assigned to the curriculums that utilized teacher-directed instruction showed more academic gains in mathematics than did the students who were randomly assigned to the research groups that utilized the more student-centered mathematics curriculum.

Additional studies have been conducted in an effort to explore the effectiveness of explicit instruction. Morgan, Farkas, and Maczuga (2014) investigated which mathematical instructional approaches best helped students in first grade who were experiencing math difficulties as well as those first grade students who were not experiencing difficulty with mathematics. These methods included: student-centered instruction, teacher-directed instruction, the use of manipulatives and calculators and music and movement. The first grade students were assigned to five groups: three groups in which students had been classified as having mathematical difficulties and two groups in which students had been classified as not having mathematical difficulties. An initial regression analysis showed favorable results for students who received instruction using manipulatives/calculators and music movement. However, further analysis revealed that teacher-directed instruction was most effective with students who demonstrated mathematical difficulties. A second example is a study conducted by Heasty et al. (2012)

to examine the effectiveness of the direct instruction approach to teaching mathematics to a single third grade student with learning disabilities. The participant was pulled out of her regular classroom to receive the explicit instruction in mathematics for an average of 300 minutes per week. The result of the study was that direct instruction was effective in increasing the number of items that the student answered correctly on a daily assignment. These two studies illustrate the effectiveness of the traditional approach.

Elements of the Traditional Approach

The traditional approach to teaching mathematics provides a specific framework for delivering what is believed to be effective and systematic instruction (Doabler & Fien, 2013). This form of instruction is characterized by explicit instruction (Doabler et al., 2013). The traditional approach to teaching mathematics is often characterized by a specific set of instructional elements and behaviors. (Archer & Hughes, 2011). Distinct elements of explicit instruction were found in the literature.

With explicit instruction, the teacher determines what will be taught. Teachers tend to focus instruction on critical content. They teach skills, strategies, vocabulary terms and rules that generally match the students' instructional need. These skills are taught in a logical sequence that often involve addressing easier skills before more advanced skills. Teachers in a traditional classroom break down complex concepts into smaller segments to account for possible cognitive overloading, processing demands and students' ability to retain the information. Therefore, lessons are organized and focused to make optimal use of instructional time (Munter et al., 2015).

Other elements of explicit instruction emphasize how the content will be taught. The instructional process begins with the teacher stating the lesson objectives and the importance of the learning goals. Teachers review prior skills before beginning the lesson and ensure that students have the prerequisite skills to understand the skills being addressed in the lesson. Teachers use step by step demonstration generally in the form of a think aloud (Doabler et al., 2012). The teacher uses clear and concise language and provide a reasonable range of examples and non-examples. In an effort to promote student success and self-efficacy, teachers provide guided and supported practice before students engage in independent practice (Heasty et al., 2012).

Additionally, teachers pose level appropriate questions and require frequent student discourse. They listen intently to student responses in an effort to assess mastery, identify misconceptions, and clarify misconceptions. Teachers provide immediate feedback that is both affirmative and corrective. They give students multiple opportunities for mastery by providing cumulative practice that includes previously learned skills as well as newly learned skills. These elements are often combined into what is known as the traditional instructional model which includes: review, present/model, guided practice, independent practice, feedback and assessment (Heasty et al., 2012).

Benefits of the Traditional Approach

According to some proponents of the traditional approach to teaching mathematics, there are several advantages to using this approach (Doabler et al., 2012). A major benefit of the traditional approach to teaching mathematics is that it may be an

effective way to increase student achievement (Clarke et al., 2011). It is generally employed with students who have difficulty with mathematics or deemed to be at risk for having difficulty with mathematics (Doabler & Fien, 2013). The No Child Left Behind Legislation (2001) required school districts to analyze student test data and identify intervention strategies for those students who were not meeting minimal state standards on the state administered standardized tests in the areas of reading and mathematics. Taylor and Bilbrey (2012) noted that these intervention strategies often included elements of the traditional approach to teaching mathematics such as the use of rote memorization and teacher directed instruction. Further, the traditional approach ensures appropriate pacing of instruction, teacher modeling of new concepts, multiple opportunities for student mastery and immediate academic feedback (Doabler et al., 2012). Additionally, this kind of instruction helps students develop the computational framework that is necessary to segue students into the conceptual framework of mathematics needed to develop a deeper understanding of mathematics (Hiebert, 2013).

Limitations of the Traditional Approach to Teaching Mathematics

Criticisms of the traditional approach to teaching mathematics have received a great deal of discussion and debate for decades (Hiebert, 2013). The traditional approach to teaching mathematics relies on textbooks and teachers as the primary source of learning (Boaler, 2015a). This limits students in terms of individuality and self-expression and hinders their ability to think critically and relate their learning experiences to real life. Other critics of the traditional approach to teaching mathematics often describe it as a one man show with the teacher as the sage on the stage (Azeem & Khalid,

2012). In such situations, there is little to no evidence of student discourse or discussion in the classroom. Researchers often emphasize the importance of discourse because of its ability to allow students to engage in critical thinking and make connections among the mathematical concepts being taught (Azeem & Khalid, 2012). Explicit instruction may limit students' ability to find solutions when problem solving (Bonawitz et al., 2011). Students may perceive the information provided by the teacher as the only information they need to learn (Bonawitz et al., 2011).

Reform Approach to Teaching Mathematics

During the early nineties, the mathematics education community embraced the guidelines for teaching mathematics established by the NCTM in its document *Principles and Standards for School Mathematics* (2000). These standards, especially, the content standards initiated a new era in mathematics commonly referred to as reform mathematics (Larson, 2012). This new vision for mathematics education included the idea that classrooms are learning communities where knowledge is created through challenging and engaging learning experiences and not the mere imparting of knowledge (Boaler, 2015b). The NCTM (2000) suggested that classroom time be devoted to helping students develop reasoning skills and learn problem solving strategies. The reform method of teaching mathematics prepares students to see connections between the various types of mathematics skills as well as connections between mathematics and other disciplines such as science (NCTM, 2000). More recently, a new set of guidelines for teaching mathematics was established through the Common Core Initiative (2010). Like the grade bands described in the NCTM Standards, the common core standards

place an emphasis on students' ability to engage in higher-order thinking and foster conceptual growth and development over rote memorization and procedural skills (Porter et al., 2011). Common Core Initiative Standards provide a framework for K-12 mathematics instruction (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

These standards outline the mathematical content that should be taught. In addition, they provide teachers with a framework that highlights how mathematics should be taught (Russell, 2012). Idealistically, these eight standards for mathematical practice are expected be integrated throughout the mathematical instructional process with the primary goal of helping students to develop these important processes and proficiencies (Common Core Initiative, 2010.) The NCTM (2014) identified eight similar teaching practices that mathematics teachers should implement to improve student learning. These teaching practices call for teachers establish goals that drive the mathematics classroom, create and utilize mathematics tasks that allow the students to use reasoning and problem solving skills. Additionally, these teaching practices should promote meaningful discourse through the use of purposeful questioning, encourage the productive struggle of the learners and build both procedural and conceptual fluency in mathematics. These prescribed methods of teaching mathematics have a theoretical basis that is consistent with Feuerstein's mediated learning experience theory.

Elements of the Reform Approach to Teaching Mathematics

In a reform based mathematics classroom, students seek to build their own knowledge (Grady et al., 2012). The teacher acts a facilitator encouraging students to delve deeper into their understanding and offer explanations that address the *how* and *why* (Polly, Margerison, & Piel, 2014). Teachers use problem solving as a teaching practice as opposed to a topic to be taught (Polly et al., 2014). There is student interaction with manipulatives, students solve new and novel problems, and students solve problems without a predetermined strategy (Ottmar et al., 2013). Further, there is discourse that allows the learner to explore different possible solutions, methods and problem solving strategies (Ottmar et al., 2013). Students explain and justify their work to one another and often gain understanding from this exchange of ideas (Boaler, 2015b). Teachers using this instructional method offer opportunities for student inquiry, depth of understanding and conceptual understanding of mathematical ideas (Ottmar et al., 2013).

Teachers are also encouraged to demonstrate acceptance of students' divergent ideas and challenge them to prove and explain their solutions. Students are presented with challenging problems to solve and given an opportunity to work in groups to share and exchange mathematical ideas (NCTM, 2007). Additionally, these challenging problems are often based in a real life context and require multiple strategies to solve them (Morgan et al., 2015). For some mathematics educators, this seems like an ideal mathematics classroom setting (Polly et al., 2014).

Benefits of the Reform Approach to Teaching Mathematics

According to the research, there are several benefits to the reform method of teaching mathematics. The Common Core State Standards Initiative (2010) has established a set of national mathematics teaching standards that are consistent with the principles and characteristics of the reform teaching model (Ottmar et al., 2013). This is significant since as of 2012, 45 of the 50 states in this country have adopted the Common Core State Standards (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). This means that most students in this country should be receiving instruction that is consistent with the reform method for teaching mathematics. Another benefit of the reform approach to teaching mathematics is that it allows students to construct new knowledge based on their prior knowledge. Because all students come with some prior knowledge, students can rebuild schemas as it relates to them (Polly et al., 2014).

The student-centered approach encourages students to be actively engaged with learning tools and. materials and to ask questions (Polly et al., 2014). This allows students to explore multiple pathways for solving problems (Lynch & Star, 2014). Researchers have indicated that student learning can be facilitated by using multiple strategies to find the answers to mathematics problems (Lynch & Star, 2014). The reform method of teaching mathematics is instrumental in promoting student discourse (Common Core Initiative, 2010). The types of conversations that the reform approach to teaching facilitates among student may be beneficial for students in several ways (Webb et al., 2014). By exchanging ideas with others, students are forced to monitor their own

thinking (Webb et al., 2013). Additionally, students must be able to adequately explain their thinking as well. Such explanations may result in students recognizing their own misconceptions or the incompleteness of their ideas (Webb et al., 2013).

Limitations of the Reform Approach to Teaching Mathematics

A search of the literature revealed the following limitations to the reform approach to teaching mathematics. According to a study conducted by Morgan et.al. (2015), there is empirical evidence to suggest that this instructional approach may not be the most effective approach for students with math difficulty. Results from their study seem to support past theoretical and empirical work that suggests that young children with math difficulty might benefit more from explicit, teacher-directed approaches to teaching mathematics (Morgan et al., 2015). Some teachers have expressed concern regarding this instructional approach. For example, teachers reported that children were often very active when using this approach which sometimes results in a lack of classroom management (Polly et al., 2014). Teachers were also concerned about the amount of instructional time that this teaching approach takes up because instructional time is already very limited. Further, some teachers noted that students' understanding of the concepts being taught was not always evident on traditional assessments when this form of teaching was the primary method of instruction (Polly et al., 2014). Another possible limitation of the reform method for teaching mathematics is the need for the teacher to attend to social skills in addition to attending to instruction. Students must also be able to develop the necessary social and self- regulatory skills necessary to facilitate learning (Ottmar et al., 2013). The teacher's job becomes two fold. The teacher must

teach the mathematics content, and teach the necessary social skills needed to promote the kind of discourse and interaction that is characteristic of the reform method classroom. This step can be difficult because little direction is explicitly provided on how to do this in most mathematics curricula (Ottmar et al., 2013).

A Balanced Approach to Teaching Mathematics

There are educators and researchers who have decided against taking divergent paths to teaching mathematics and have decided to endorse what can be called a balanced approach to teaching mathematics (Foster, 2012). A balanced approach to teaching mathematics describes a method that utilizes elements of both the traditional and reform methods for teaching mathematics (Foster, 2012). Math educators suggested that teachers work on developing students' procedural and conceptual fluency at the same time rather than teaching them in isolation (Bottge et al., 2014). The findings of the National Mathematics Advisory Panel (NMAP, 2008) also recommended a balanced approach to teaching mathematics. The panel contended that mathematical proficiency is achieved when educators understand that procedural and conceptual mathematical understanding are interdependent and represent different aspects of a whole. Further it is suggested that that procedural and conceptual knowledge are interdependent in nature, and that understanding in one knowledge type will result in understanding of the other knowledge type (Hiebert, 2013). A growing body of research is suggesting that students gain learning benefits from integrating direct and inquiry based instruction. One such benefit is critical thinking (Ku, Ho, Hau, & Lai, 2014).

An examination of studies in the literature found that the blended approach to teaching mathematics showed favorable results with elementary and middle grade level students experiencing math difficulties. In their studies DeCaro and Rittle-Johnson (2012) and Bottge et al., (2014) evaluated the effectiveness of mathematical instruction that combines both the traditional and reform methods of teaching mathematics. DeCaro and Rittle-Johnson's study employed a pre-test-posttest design in which students were randomly assigned to two research groups. The study focused more on the order in which these two methods were combined. The students were provided with both kinds of instruction but in different orders. For example, some students were allowed to explore a problem first with little to no initial explicit instruction. After a period of self-exploration, the students were provided with explicit instruction. In the other research group the students initially received explicit instruction, then were allowed to engage in self-exploration of the mathematic problem. Both groups demonstrated favorable gains in terms of procedural knowledge. However, the students who were allowed to explore a problem before receiving explicit instruction demonstrated higher gains in terms of conceptual knowledge.

Bottge et al. (2014) discussed the effects of blended instructional models on students' math performance. Similar to the study conducted by DeCaro and Rittle-Johnson, they also employed a pretest-posttest design. Their study involved 31 middle schools and a total of 335 student participants. The students who were identified as having disabilities were randomly assigned to a treatment and control group. In the intervention group students were provided with explicit individualized instruction

through the use of technology. This explicit instruction was followed by a hands-on problem solving activity that allowed the students to investigate and solve real life problems. These hands-on problem solving activities ranged from simple to very complex. Students often constructed objects needed to help them develop a solution to the problem. For example, one of the problem solving activities required the students to construct a rollover cage for a hovercraft. The control group was described by the researchers as business as usual (BAU). In these classrooms, the prescribed state mathematics curriculum was followed. The teachers in these classrooms were documented as using the math textbooks, interactive white boards, manipulatives and calendar math to teach mathematics. It was also noted that the mathematics standards being addressed in the control were parallel to the standards being addressed in the experimental group. The researchers' findings were that students who were taught using the blended instructional model outscored the students in the control group. The largest gains were noted in the areas of fraction computation, geometry ratios, and proportions. The findings of these studies were that students who were instructed using the blended approach to teaching mathematics experienced gains in the area of mathematics.

Elements of the Balanced Approach to Teaching Mathematics

The NMAP (2008) outlined five essential components for effective math curriculum and instruction that systematically merges elements of both the traditional and the reform based methods for teaching mathematics. These elements include: (1) explicit instruction, (2) the use of heuristics, (3) student verbalizations of their mathematical reasoning, (4) the use of visual representation to solve problems, and (5) sequencing or

providing a range of examples. Guided discovery is an instructional method that also utilizes elements of balanced approach to teaching mathematics (Fife, Rittle, Johnson, & DeCaro, 2012). Alfieri, Brooks, Aldrich, and Tenenbaum (2011) define guided discovery as a combination of inquiry based learning and explicit instruction. Initially, students are allowed to explore a problem solving activity. Afterwards, students are provided with some form of explicit instruction regarding the activity. Conversely, this method may be implemented by providing the explicit instruction first followed by an exploration activity (Fife et al., 2012).

Culturally Relevant Pedagogy

Ladson-Billings (1994) defined culturally relevant teaching as using pedagogy that incorporates the culture of the student population being taught. Culture in this respect is not limited to one's race or ethnic association, but it can encompass one's home life or community ties as well (Paris, 2012). Because traditional curriculum incorporates biased testing practices and teaches using curricula and textbooks written primarily by and for the dominant culture in this country, many students of other cultures are being underserved. (Esposito, Davis, & Swain, 2011). However teaching is enhanced for particular groups of students (African American, Native American, Latino and students of poverty) through the use of culturally relevant teaching strategies (Gay, 2013). However, culturally relevant pedagogy is not limited to use with a diverse population of students. When teachers have a classroom of European American middle class students and use the required texts and popular teaching strategies, they are using culturally relevant teaching for this population (Ladson-Billings, 1994). This supports the

contention that culturally relevant pedagogy is applicable to all students. According to Ladson-Billings (1995) culturally relevant pedagogy is dependent upon three tenets or criteria: students must have opportunities to feel successful in the classroom; they must develop and maintain their cultural identity and awareness; and they must develop a more complex understanding of the world as it relates to their lives.

Diverse student populations are now the face of classrooms in this country and this trend is continually rising (Rychly & Graves, 2012). A growing body of evidence shows that students of diverse populations are consistently underachieving in several academic areas compared to students in the dominant culture (Rychly & Graves, 2012). It is further evident that current curriculum and teaching practices do not take these students' experiences into consideration when implementing instructional practices (Rychly & Graves, 2012). A culturally relevant pedagogy however embraces the idea that learning experiences can be different depending on the specific culture being addressed (Smith, 2011). Teachers can make the learning process meaningful by developing and understanding of that culture and using that information to enhance their instructional practice (Ladson-Billings, 2014). Culturally relevant pedagogy encourages a translation of students' cultural backgrounds into instructional practices and should go far beyond simply acknowledging the different ethnic holidays (Ladson-Billings, 2014). This kind of teaching should be framed in such a way as to honor students' individual, community, and racial ethnic identities (Lason-Billings, 2014).

Elements of Culturally Relevant Pedagogy

Although a search of the literature has failed to reveal a detailed step by step guide for culturally relevant pedagogy, some generalizations from research studies have been made about what elements of a culturally relevant classroom are likely to look like (Ukpokodu, 2011). Through her research and findings on culturally relevant teaching, Ladson-Billings (1994) was able to provide an outline of core elements of culturally relevant teaching that are effective in facilitating academic achievement for diverse student diverse student populations in lower socioeconomic status. These include scaffolding instruction in a way that will facilitate success student learning; having a genuine compassionate attitude towards the students; promoting a healthy and positive interaction between the teacher and the students; encouraging a learning community that is characterized by cooperation, collaboration and student learning for all; making real life connections to student learning; promoting equity in the learning process and making a deliberate effort to integrate the students' cultural backgrounds into the curriculum. (Ladson-Billings, 1994). Teachers who effectively engage in culturally relevant pedagogy are able to recognize the wants and needs of their students because they have found a way to develop a deep relationship with their students while constantly engaging in introspective thoughts about their practices. One of the most basic yet effective strategies is informal conversation in which teachers share personal information about themselves to help form a connection with the students (Dunn, 2010). Several researchers have narrowed the concept of culturally relevant pedagogy to address the

cultural influences specifically on mathematics teaching and learning (Rubel & Chu, 2011).

Culturally Relevant Mathematics Pedagogy

According to Aguirre, Zavala, and Katanyoutanant (2012), culturally relevant mathematics pedagogy (CMRP) refers to "a set of specific pedagogical knowledge, dispositions, and practices that foster mathematical thinking, cultural and linguistic funds of knowledge, and issues of power and social justice in mathematics education" (p.114). This structure of teaching mathematics through culture utilizes the prior knowledge of students to help foster mathematical understanding (Harding-DeKam, 2014). CMRP incorporates elements of culturally relevant teaching and mathematics teaching practices. Rubel and Chu (2011) discussed three tenets of culturally relevant mathematics pedagogy. These tenets emphasized mathematics teaching that results in a deeper conceptual understanding, instruction that is focused on the experiences of the learners and the development of a more critical consciousness relative to mathematics (Rubel & Chu, 2011). In order for students to develop a deeper understanding of mathematics, they must be able to make connections between the concepts being taught and the procedures and facts necessary to perform the math required of them (Rubel & Chu, 2011).
It also describes the support of classroom activities that mathematically involve students in the problem solving process. The second tenet of CRMP is that students' experiences should be an integral part of the instructional focus. One means of accomplishing this component of CRMP is to draw on students' "funds of knowledge." Moll and Gonzalez (2004) referred to students' funds of knowledge as activities that relate to the students'

families, home life and culture that can be used to provide a context for framing mathematical tasks or problem solving activities (Turner et al., 2012). These activities may include cooking, gardening and sewing just to provide a few examples. Aguirre and Zavala (2013) suggested that the context in which the mathematics is presented should be authentic to the students' lives. Therefore, the problems can be contextualized in local or school issue that students find genuinely problematic (Aguirre & Zavala, 2013).

The last tenet of CRMP discussed by Rubel and Chu (2011) is for teachers to aid in the development of students' critical consciousness relative to mathematics. Developing this skill calls for the teacher to encourage the students to analyze issues of society through a mathematical lens. Culturally relevant mathematics pedagogy is dependent on teachers building a safe and caring classroom environment that simultaneously supports several components (Waddell, 2014). A classroom that demonstrates evidence of CMRP supports the mathematical knowledge to be taught as well as the different cultures that students brings. Additionally, it fosters high-level mathematics through student and teacher engagement where students take risks (Waddell, 2014).

In his case study, Matthews (2003) worked with four teachers to assist them with incorporating culturally relevant pedagogy in their mathematics classrooms after the teachers participated in a CRP professional development. The four teachers in this study taught at primary schools with student populations that were predominantly comprised of Black Bermudian students. One of the four teachers classified herself as a traditional mathematics teacher, one classified herself as a reform model mathematics teacher and

the last two teachers classified themselves as a mixed of both the traditional and the reform approach to teaching mathematics. Through observations and interviews, the researcher sought to determine how these teachers effectively incorporated the three main tenets of culturally relevant pedagogy into their mathematics classroom. Those tenets included developing the students' ability to think critically about mathematics and critical consciousness, building on the students' mathematical and cultural awareness, and examining teachers' thoughts on infusing elements of the students' culture and experiences into their instruction.

Fostering the students' ability to think critically about mathematics and critical consciousness involved the students exploring ideas, formulating conclusions and justifying their thinking. These processes were meant to extend beyond mathematics to also include thinking critically about problems and issues in society. Building on students' cultural and mathematical knowledge referred to the teachers' attempt to fuse the students' cultural knowledge with what they were learning in their mathematics classrooms. The third facet examined the teachers' views on bridging the student's culture into mathematics instruction and what that infusion of culture would be implemented in their classrooms. The findings of Matthews's (2003) study were that the teacher participants in the study were receptive to implementing culturally relevant pedagogy in their mathematics classrooms, but that implementation of CRP varied by teacher. This variation was dependent on each of the teachers' own understanding or interpretations of each of the tenets of this model of CRP. For example, two teachers attempted to foster critical thinking in their classrooms. The teachers infused general

information about the students' culture into their mathematics classroom, but failed to have the students think critically about societal issues as suggested by the literature on CRP. Matthews also noted that teachers' efforts to foster their students' critical consciousness was dependent on the teachers' own personal perception or notion of critical thinking.

Motivated by a lack of literature on professional development opportunities to help mathematics teachers incorporate CRP in their classrooms, Timmons-Brown and Warner (2016) investigated how much teachers benefitted from a workshop on culturally relevant pedagogy. The study focused on a 2012 professional development workshop that was titled, "Helping Mathematics Teachers Become Culturally Relevant Educators: New Tools for a New Generation." The target audience for this workshop was elementary, middle and high school mathematics teachers. One of the main goals of the workshop was to address challenges teachers expressed about effectively implementing CRP in their mathematics classrooms and to support them in their efforts of implementation. The possible challenges that teachers faced included: time constraints imposed by an already demanding scope and sequence of the state mathematics standards, a willingness to address and incorporate societal issues involving injustice and inequality into an objective mathematics curriculum, and developing a connection with their students that included learning about their lives outside of school.

In this sequential explanatory mixed method model, workshop participants were administered surveys at the beginning and conclusion of the workshop conference. The researchers also conducted in-depth interviews of workshop participants. Through these

data collection methods the researchers ascertained three perceived benefits of the workshop by its participants. The first benefit was teachers feeling more confident about their knowledge and understanding of CRP. Second, the teachers indicated that they were willing to communicate with teachers at their own schools as well as with teachers at other schools about their experiences and success with incorporating CRP into their mathematics classrooms. The last benefit discussed in the findings was that teachers expressed feeling motivated to foster more meaningful student to student and student to teacher relationships in their classrooms.

Hubert (2013) conducted a case study where she examined students' perspectives of culturally relevant teaching and its effects on students' attitudes towards mathematics. Five African American students were interviewed for the study. These students were selected because of their participation in a culturally relevant mathematics intervention program. The students were exposed to approximately 16 hours of instruction using this approach to teaching mathematics. The results of the study were that the majority of the students interviewed selected culturally relevant pedagogy as their instruction of choice when compared with the traditional method for teaching mathematics. The student participants indicated that CRP was beneficial in increasing their interest in mathematics. Further, students expressed that they developed a deeper understanding of the concepts being taught because they were contextualized in real life situations that were reflective of their home life.

Literature Related to the Method

The extent to which the current literature informs specific strategies for teaching African American students mathematics is severely limited. This is evident by the lack of studies that examine effective mathematics strategies for addressing these students' instructional needs as well as by the ages of some of the related studies. Most of the studies that addressed teaching mathematics to African American students were qualitative and employed a case study methodology. The participants were teachers who were considered effective mathematics teachers of African American students. The researchers in these studies primarily used observations, surveys and interviews as means of collecting data. Each of the studies was framed in terms of culture. The researchers explored the influence of the students' cultural experiences on their understanding of mathematics.

Moses (1990) conducted a case study in which he attempted to link the impact of culture on African American students' ability to learn and develop a meaningful understanding of mathematics. The study focused on eighth grade students in an Algebra class. Moses developed a program that related the math the students were learning to their everyday lives and experiences. He found a direct a connection between linking mathematics instruction to the students' culture and experiences and their deeper understanding of algebra.

Murrell (1994) also conducted a case study that investigated the role of culturally relevant teaching as a means of promoting academic success in mathematics for African American students. In his ethnographic study, Murrell focused on African American

male middle school students in an effort to determine the effects of mathematics classroom discourse on students' conceptual understanding of mathematics. The researcher conducted classroom observations, recorded classroom discourse between teachers and students, and conducted interviews with teachers and group interviews with the student participants. Murrell (1994) found that although teachers used specific techniques to engage students in mathematics discourse, the student participants were not able to engage in discourse that extended beyond yes or no responses for the most part. Murrell concluded that a lack of application of culturally relevant pedagogy in the mathematics classroom may leave African American students at a profound disadvantage. Similar to Moses, Tate (1995) investigated the link between students' culture and learning mathematics. This study involved one teacher who had been deemed as an effective mathematics teacher of African American students. Through observations and interviews, Tate discovered that the teacher was able to engage the students collaboratively in mathematics, foster a successful interaction between the teacher and students, and promote problem solving.

Enyedy and Mukhopadhyay (2007) conducted a study of culturally relevant mathematics teaching. Unlike the previous researchers, this study used a mixed method design. The study was designed to facilitate student understanding of the relevance of mathematics to their lives. Twenty-five high school students participated in the study. Data were analyzed from video case studies, and pre and post tests were used to assess what students had learned. Enyedy and Mukopadhyay concluded that the students did gain important mathematical experiences as a result of the use of culturally relevant

mathematics teaching. They were able to articulate the mathematical concepts associated with the task, and they expressed an understanding of how mathematics connects to their everyday lives.

Shepard (2013) conducted a qualitative study in which he explored the extent to which prospective teachers infused African American students' cultural experiences into their mathematics instruction. This study also employed principles of phenomenological studies as well. The participants in the study were eight prospective teachers who acted as mentors and academic assistants to the students. Interpretative data were collected from each study participant. Participants used journals to document their interactions and experiences with the students. Based on the data, the researcher found that the prospective teachers paid particular attention to each students' experiences and made concerted efforts to integrate those experiences into their teaching. The participants were able to prioritize their instructional strategies to integrate the students' personal interests, intellectual strengths and prior knowledge. Second, they were able to effectively address student misconceptions. These findings were consistent with the recommendations of the NCTM (2000) and of researcher Ladson-Billings (1997). One limitation noted from the findings of the study was that effectively integrating culture into the mathematics curriculum can be quite demanding for teachers.

Summary

Feuerstein's mediated learning experience theory refers to the way in which a mediator, guided by clear goals for the learner, can facilitate meaningful learning in the context of intentionality, culture, and experiences. As a result of these opportunities to

learn, the learner is able to acquire strategies that enable him/her to generalize his/her acquired knowledge to new situations. The learner begins to interact with his/her environment with minimal guidance from the mediator (Feuerstein, 1979). Consistent with Feuerstein's mediated learning experience theory, the review of the literature linked students learning of mathematics to classroom instruction and the interactional relationship between the teacher and students.

The review of the literature signaled major shifts relative to teaching African American students mathematics. First, there was an emphasis on reframing the achievement gap in terms of a lack of opportunities for these students to learn mathematics (Jackson & Wilson, 2012; Milner, 2012). By viewing the achievement gap through this lens, less emphasis is placed on the students as the problem and more attention is given to identifying and developing instructional practices specifically designed to support the learning of mathematics by African American students. This focus on instruction should also take the experiences of the learners into consideration and be driven by intentional learning goals for these students. (Shepard, 2013). Further, when specifying forms of instructional practices for African American students, attention should be given to the nature of the interactions between the students and the teacher in the mathematics setting (Jackson & Wilson, 2012).

Although the literature identified several important developments in the teaching of mathematics, a significant gap in the literature continues to exist (Berry et al., 2013). The review of the literature revealed that the current instructional approaches and recommendations for teaching mathematics are generalizable to society as a whole. As a

result, the current research base regarding mathematics instruction remains at a general level and therefore does not adequately specify forms of instructional practice that engage African American students in substantial and meaningful mathematics (Jackson & Wilson, 2012). Therefore, the instructional approach that facilitates the most academic progress for African American students at the elementary intermediate level (Grades 3-5) could not be ascertained from the existing literature. In this study, I attempted to add to the literature by addressing this existing gap.

In the next section, a description of the research design and methodology used in this study is presented in Section 3. Participant selection criteria, data collection instruments, measures taken for ethical protection of the participants, and the overall context of the study are explained. Data collection methods and analysis are also discussed.

Section 3: Research Method

There is a concern that African American students do not experience academic achievement in the area of mathematics (Young & Young, 2016). National assessments such as the NAEP as well as international assessments such as the PISA have signaled a significant achievement gap between the two groups. Although divergent theories have emerged in an effort to explain the achievement gap, most research points to what goes on inside these students' mathematics classroom as not only a possible cause of the achievement gap, but also as a possible solution to closing the gap as well (Williams, 2011). Because researchers have indicated that teachers are a critical determinant of student learning (Blazar, 2015), a logical next step is to consider how what teachers do in their classrooms can impact student achievement in the area of mathematics. In this study, I examined the instructional practices of classroom teachers who have been successful in promoting achievement in the area of mathematics with African American students. A single research question guided this case study: What are the instructional strategies used by teachers of African American intermediate level students who demonstrate academic proficiency in the area of mathematics? A case study approach was used to pursue this question.

Study Design

In this study I employed a case study design that was both exploratory and comparative in nature. Because this study was designed to explore the instructional practices of effective mathematics teachers, a qualitative study was deemed appropriate because it sought to provide an in-depth description of a specific practice or program

(Meriam, 2009). Additionally, the focus of this qualitative research study was on a real-life phenomenon; therefore, a case study was used to provide an intensive description of the phenomenon being studied (Yin, 2009). According to Creswell (2009) purposeful sampling is generally used in qualitative studies because of its usefulness in helping the researcher to adequately select participants and research sites that can effectively facilitate the understanding of the problem of the research study.

My goal in this study was the discovery of effective teaching strategies for African American students in mathematics. Therefore, I required purposeful sampling. It was necessary to select teachers who were considered effective in order to observe effective strategies. Without purposeful sampling, the goal of this case study may not have been achieved.

Participants in the Study

Participants in this case study were third, fourth and fifth grade teachers at three urban elementary schools in one state in the Southeastern United States who were considered effective teachers based on their students' academic performance on a previously administered and scored Milestones Assessment. The teachers invited to participate possessed 5 or more years of teaching experience with their primary instruction being in mathematics. These teachers also met specific No Child Left Behind criteria and possessed empirical data demonstrating student achievement at high levels of proficiency on the state administered standardized test. Principals were asked to recommend Grades 3-5 teachers whose students have demonstrated high growth and/or achievement in mathematics.

Additionally, the teachers invited to participate in this study were teachers who were currently teaching in a mathematics classroom where the current population was at least 98% African American. In addition to teaching a 90 minute block of mathematics each day, the teachers are also responsible for teaching 45 minute blocks of science each day. At each of the research sites, the teachers are departmentalized. Teachers are a part of a grade level team. Each grade level is comprised of four teachers. Two teachers on the grade level team teach both language arts and social studies while the other two teachers on the grade level team teach both mathematics and science. Each teacher is responsible for teaching two blocks of their designated content areas. Therefore, each participant in the study is responsible for teaching two mathematics and two science classes each day.

There were 12 teachers at three research sites who met the specified criteria for this study and who were ultimately invited to engage in an in-depth study process. One third grade teacher, two fourth grade teachers and three fifth grade mathematics teachers made up the participants in this study. These were the first six teachers to respond affirmatively to the invitations to participate in the study.

Context of the Study

This study took place in three public urban elementary schools in a state in the Southeastern United States. The schools are Title One Schools with over 98% of their students receiving free or reduced lunch. The schools were in a low socio-economic community composed of a predominantly African American population. Approximately 98% of the schools' populations were African American with 2% of the population of the

schools classified as Hispanic.

Researcher-Participant Relationship

My role as the researcher in this study was two-fold: observer and interviewer. By confining my primary role in these two capacities, I was able to effectively collect information that could potentially help both students and teachers as well as reduce the potential of personal bias. As an observer, I observed the teacher and the class as they engaged in their daily rituals and routines in the mathematics classroom. I positioned myself in the room so that I was as unobtrusive as possible. This minimized the possibility of distractions. Additionally, I wanted to encourage the participants to engage in normal activities as if I was not there. For this reason, I strictly confined my role to observer only, and I did not attempt to participate in any other way during the observations. I took copious notes that accurately reflected what I observed.

In the role of interviewer, I simply asked questions that allowed the participants to respond openly and honestly. Follow-up questions were asked with the sole intention of gaining clarity or further elaboration relative to the participants' responses. Establishing an open and honest researcher-participant relationship was critical in conducting this qualitative research study. This type of relationship was established through courteous exchange of information, discussion of confidentiality, and establishing boundaries such as how, when and where contact was made. Prior to conducting the interviews, I provided the participants with a consent form that informed them of their rights as research subjects. This consent form outlined the specific roles and responsibilities of the participants (Hatch 2002); it also explained what I would be doing in the research, when,

and for how long. In order to keep the discussions on track and to help participants stay focused (decrease instances when participants may start discussions about concerns that are not related to the focus of this project), I secured the participants' permission to record the discussions and transcribed the information. This enabled me to facilitate the interviews without missing key information. In addition to audio recording the participants' responses to the interview questions, I took notes as well.

Measures for Ethical Protection

Ethical protection of the participants was considered throughout the development of this proposed study. Prior to beginning the study, approval from Walden's IRB was obtained (approval #10-14-16-0135474). Written approval from the school district was also obtained. Participants were asked to sign a letter of informed consent ensuring their privacy (see Appendix B). I completed a course on the protection of participants conducted by the National Institutes of Health to become familiar with procedures to protect the rights of participants. The confidentiality of the participants was protected through the use of pseudonyms and the assignment of one digit numbers (1, 2, 3 etc.). The observation field notes and interview notes had any identifying information removed. Data from the observations and teacher interviews were stored on my password-protected computer and in a locked file cabinet located in my home.

Participants were informed that they could have withdrawn from the research process at any time without consequences. Participants have the opportunity to request complete access to their data. All data collected from this study will be retained by the researcher for a period of 5 years and then will be destroyed.

Data Collection

In this case study. I examined the strategies used by intermediate level mathematics teachers (third, fourth, and fifth grade teachers) that have been effective in promoting student achievement in the area of mathematics. Data were collected during a 6-week period. To better understand what type of strategies effective teachers use with African American students, I collected and analyzed three different types of data: interview, observation and document analysis. Participants were assured of confidentiality and provided detailed information about potential risks, and protection from any administrative reprisals.

Upon receiving permission from the schools' principals, I began to collect data for this case study. I began with an invitation email sent through the school email to the prospective teacher participants. This email contained a consent form that explained the reason for the research and a request for their participation. The first six respondents to accept the invitation to participate in the study were selected for the study. Follow up emails were sent to the six selected participants to schedule dates and times of the observations and interviews. Twenty-four hours prior to the participants' scheduled observations, each participant was asked to email a copy of the lessons plans that would outline the lesson that was observed.

Interviews

Although observations of the teachers were conducted to gain insight into how the strategies each teacher was using would impact student learning, there were situations and experiences that could not be observed. For example, certain opinions, feelings or

thoughts of the teachers were not readily revealed through the singular use of observations. Therefore, interviews with the teachers were conducted. According to Jansick (2004), the three types of questions for interviews are descriptive, contrasting, and structural. In order to gather interview responses, the interview questions in this study were descriptive in nature. Descriptive questions allowed the participants to provide dialogue that was not limited to a set of standard answers. The main objective of the interviews was to gain knowledge and data regarding the teacher's thoughts on their instructional practices in their mathematics classrooms (see Appendix A).

The interviews were initially scheduled to be conducted directly following each teacher's observation period. Three of the interviews were conducted directly after the observations; however, due to time constraints two of the interviews were conducted at the end of the school day while the other was conducted during the teacher's planning time. The interviews that were conducted following the observations were conducted in a conference room. The other interviews were conducted in each of the teachers' respective classrooms.

Prior to the interviews, the statement of consent was reviewed for understanding and the teachers were once again advised of their right to terminate the interview process at any time. Two recording devices were used to conduct the interviews: a digital recorder and a voice recorder on a smartphone. During the interview process, copious notes were taken. The interviews were scheduled to last approximately 30 minutes; however, most interviews exceeded this expected time frame as most of the teachers took time to elaborate in detail about the instructional strategies that they use in their

classrooms as well as provide a rationale for their use of these strategies based on their own experiences and student success. Further, the interviews helped to clarify and confirm the observed strategies and elaborate on any strategies that may have been overlooked during the observation process. When time allowed, I transcribed the participants' responses from the interviews. A typed written transcription was saved on my password protected computer and the hard copies were stored in a locked file cabinet in my home. Within 24 hours of each interview. I followed up with each of the participants via email and asked them to verify the accuracy of the transcriptions relative to their respective interviews.

Observations

Each of the participants was observed during one 60 minute math lessons. This allowed me to get a true reflection of what goes on during the scope of each teachers regular 90 minute instructional block. Observations were employed because it was necessary to actually observe the teaching practices of the participants to get a clear understanding of the instructional methods and strategies being implemented in their classrooms. During each observation, a written record was created. Field notes pertaining to the teachers' use of strategies, activities and interactions with students were written discreetly using a field notes guide (see Appendix B). As soon as time permitted, I expanded my field notes into a descriptive narrative. Once I expanded my field notes, I typed them into a word processing document on my password protected computer and the hard copies were stored in a secure location.

Document Analysis

Lesson plans and unit plans were provided by each of the participants and served as document analysis data. I collected the lesson plans 24 hours prior to the observation process. The plans were analyzed to document the mathematics skills and strategies that teachers targeted in their lessons. This allowed me to situate the observations in a larger context as well as afforded the participants the opportunities to reference the different strategies and methods included in their unit and lesson plans during the interview process.

Data Analysis

Qualitative researchers and theorists have explained the necessary steps that are needed to analyze qualitative data (Creswell, 2009; Glaser & Strauss, 1967). Using these researchers' recommendations as a guide, I followed multiple steps to analyze and interpret the data collected from the teachers. Data analysis is a way to process qualitative data so that what has been learned can be communicated to other people (Hatch, 2002). Information to answer the guiding research question in this study was obtained through the use of three data collection techniques: interviews, observations, and document analysis.

I prepared and organized the data for analysis by typing the notes taken during the observations. The interviews were audio-taped and transcribed within twenty-four hours after the interviews were completed. The transcriptions allowed me to gain a deeper understanding of teachers' perspectives of the problem addressed in this study as well as accurately reflect the ideas and experiences expressed by the participants. I analyzed the

lesson plans provided by the teachers and noted any consistencies relative to the research question. Using the research question as a guide, I placed the information from the three data sources into chunked categories using key terms and concepts provided by the teachers. While reviewing the data collected from the interviews, document analysis, and observations, I used open coding to develop categories. Open coding allowed me to break down the data into categories in order to interpret them (Creswell, 2009).

The NVivo® software was also used to support the analysis of the data. Constant comparisons were made by the software in an attempt to identify themes or patterns that existed among the data sources. The data were organized using nodes. *Nodes* is a term that is referenced in the NVivo® software to indicate emerging themes or patterns among the data. The data were organized using parent and child nodes. The parent nodes represent the more general topics, while the child nodes represent more specific topics that relate to the parent nodes. This hierarchy of nodes was essential in helping me to identify the themes and patterns for this study. Finally, the major themes in the data were identified and their relationship to the research question was outlined.

Validity of Research

Validity in qualitative research is the method used to determine the accuracy of the researcher's findings (Creswell, 2009). Steps were taken to ensure that data taken were precise and accurately reflected the views and responses from the participants. Strategies that were used in this study to ensure validity were triangulation of data, member checking, and controlling researcher bias. Merriam (2009) defined member checking as returning collected data and interpretations of the data back to the

participants to confirm the accuracy of the data. This process includes sharing interpreted data such as emerging themes and patterns as well as transcripts from interviews and allowing participants the opportunity to offer responses about the interpretations.

This approach was critical in establishing credibility of the study. To ensure and maintain the participants' confidentiality, each participant was asked to review the transcriptions and my interpretations of their respective interviews during the member checking process. Within 24 hours, I followed up with each of the participants via email and asked them to verify the accuracy of the transcriptions relative to their respective interviews. This process allowed the participants the opportunity to read over and review their respective transcripts to determine if anything was missing and to clarify or expound on details if necessary. Each participant indicated that the transcriptions of their respective interviews were accurate and complete to the best of their knowledge. Therefore, no further clarifications, corrections or additions to the interview transcripts were needed.

Preliminary findings regarding emerging themes and patterns were not provided to the participants to review. It is important to note that conversations regarding preliminary emerging themes were conducted with two of the teacher participants from the study. However, these conversations were informal and did not follow the formal protocol of this facet of the member checking process, and therefore created a limitation of this study.

To control for researcher bias, I made a conscientious effort to avoid using leading questions during the interview process. Instead, I framed each question in a

neutral manner. I simply asked the interview questions and allowed the participants to respond. Follow up questions were asked with the sole intention of gaining clarity or further elaboration relative to the participants' responses. The use of the three data sources was instrumental in ensuring that the data obtained were accurate and valid.

Reliability

Reliability, according to Merriam (2002) is an indicator of the probability that similar studies would deliver similar results. Merriam further asserted that reliability in a qualitative study can be a problem because human behavior constantly changes and, therefore, the findings from a similar study may not present the same results. In a qualitative study, the data may be interpreted in more than one way. Reliability in this study was supported through the use of multiple methods of data collection and member checking.

Summary

In this section, I presented the method by which the study was conducted, in an effort to identify teaching methods used by the most successful teachers of mathematics when working with African-American elementary school students. In the next section, Section 4, the findings of the study are presented. The findings build logically from the research question and design. They are presented in a manner that addresses the research question.

Section 4: Results

The purpose of this qualitative study was to explore and record the instructional strategies of mathematics teachers who have been successful in promoting academic achievement in African American students in the area of mathematics. The problem addressed in this study was that student achievement in the area of mathematics has been low for African American students at an urban school district located in a southeastern state in the United States. A single research question was designed to explore the instructional strategies used by teachers of African American intermediate level students who demonstrate academic proficiency in the area of mathematics. I focused on the instructional strategies of effective teachers of upper elementary level students in three urban schools in a southeastern state in the United States. Section 4 includes the data collection process, the findings, patterns, relationships and themes, and evidence of quality.

A strict protocol was implemented in an effort to avoid any ethical issues in the study. After obtaining IRB approval, I submitted an application to the district formally requesting permission to conduct research in the district. The application was reviewed by the office of research and evaluation over a period of 6 weeks and approval to conduct research in the district was granted. The first six teachers to respond to the invitation to participate in the study email were selected. Each selected participant read and acknowledged their understanding of the participant consent form and voluntarily gave their consent to participate in the study. To maintain and ensure confidentiality, pseudonyms were used for the participants, schools and school district.

Participant Profiles

The description of the research participants in the study is presented in Table1. The participant selection was in accordance with the participant selection criteria indicated in Section 3. Accordingly, the sample was composed of six teachers who were teaching in a mathematics classroom where the current population is at least 98% African American for at least 90 instructional minutes each day. These participants had at least 5 years of experience teaching mathematics and are Grades 3-5 teachers. Five out of the six participants were females, and their years of experience were between 5-25 years. The average years of teaching was approximately 14 years and the average number of years spent primarily teaching mathematics was approximately six years (see Table 1).

Table 1

Participant Profiles

Participant	Years of Experience	Years Teaching Mathematics	Grade Level
1	15	5	3
2	7	5	4
3	9	5	4
4	25	7	5
5	9	8	5
6	17	5	5

Data Tracking and Emerging Understandings

Qualitative researchers have explained the necessary steps that are needed to keep track of data so that a researcher can identify the themes that emerge as a result of

interactions with the participants (Creswell, 2009; Glaser & Strauss, 1967). Member checking and triangulation of data were used to ensure that the appropriate findings would emerge from the analysis. On the same day as the observations, I conducted interviews with each of the teacher participants. I electronically transcribed the data from the observations and the interviews. Within 24 hours, I followed up with each of the participants via email and asked them to verify the accuracy of the transcriptions relative to their respective interviews. I made comparisons between the data collected from the interviews and observations as well as the lesson plans provided by each teacher. The data collection process was grounded in the single research question for this study. The various data sources were utilized because of their potential to provide answers and insight for the research question. Although each of the data sources contributed to answering the research question, the interviews were found to be the data source that provided the most information regarding the strategies that the teachers used in their mathematics classrooms.

Document Analysis

An analysis of the documents provided by each teacher gave an overview of the current unit of study as well as the standards that would be the focus of each of their daily lessons. The documents indicated a 5-day lesson plan for the current week. The lesson plans generally communicated the learning goal, the related academic vocabulary, and a layout of what the teacher and students would be doing during each phase of the Gradual Release Model. The lesson plan provided by the third and fourth grade teachers also

included a suggested list of books that could be utilized as a read- aloud during the engage or as the *hook*. Some of the lesson plans also included the use of journal writing.

Methods of informal as well as formal assessments were indicated on all of the documents that were analyzed. The documents also contained evidence of how students would be grouped during small group instruction. The lesson plans seemed to indicate that students would be grouped based on their respective ability levels. This was indicated by the use of terms such as *remediation group, enrichment group, approaching* level, on level, beyond level, etc. Some lesson plans outlined in detail which students would be in which group by actually including the first names of the students who would be in each of the groups. The lesson plans detailed what activities the students in each group would engage in during the small group instruction. The lesson plans of the third grade teacher, two fourth grade teachers and one fifth grade teacher also indicated the use of centers during the instructional block. Although each of the documents shared similar elements, the particular format of the lesson plans varied by school.

Observations

Data collection procedures also called for me to observe the teachers in their classrooms during one 60 minute mathematics lesson. The goal was to observe the teachers using mathematics strategies in their classroom. (See Appendix B). During each of the mathematics instructional blocks, I observed elements of the gradual release model. The gradual release model is an instructional framework that is designed to strategically facilitate the transfer of responsibility of the learning process from the teacher to the students (Fisher & Frey, 2008).

This instructional model is employed by the school district as a whole. It is generally characterized by four essential elements. During the *I Do* phase the students are engaged in whole group instruction. The teacher starts the lesson by introducing the objective for the lesson and demonstrating and modeling the concept or standard that is the focus of the lesson. The *We Do* phase comprises the guided practice portion of the lesson with input from both teacher and students. The *You Do Together* portion of the model allows students to work collaboratively as partners or in small groups. The "you do alone" element gives students the opportunity to work independently and show what they know. Although the gradual release model provides the instructional framework for the classroom, the teachers still retain instructional autonomy in terms of use of strategies, materials, and resources.

The classroom observations were documented by focusing on the actual lesson of the day and the teaching strategies that were employed. Therefore, the content of the lessons being taught in each classroom varied depending on the specific grade level and the current unit of study as determined by the district's scope and sequence. For example, in the three fifth grade classrooms the focus of the observed lessons was fractions. In the fourth grade classrooms, the focus of the observed lessons was measurement conversions and in the third grade class the focus of the lesson being observed was partitioning fractions using a number line. During each observation, notes were recorded regarding the specific activities and strategies that each teacher employed. After each observation, the observed strategies and activities were sorted into categories

such as questioning, small groups, and whole groups. This process was critical in helping to identify potential emerging themes.

Interviews

Although the observations of the teachers provided critical insight as to the strategies the teachers use to impact student learning, the justifications or rationales for the use of these strategies were not necessarily readily revealed through the singular use of observations. Therefore, a third data collection procedure was employed. Each of the teacher participants participated in a scheduled 30-minute interview that was conducted after the classroom observations (see Appendix A). The interviews were initially scheduled to be conducted directly following the observation period. Three of the interviews were conducted directly after the observations; however, due to time constraints two of the interviews were conducted at the end of the school day while the other was conducted during the teacher's planning time. The interviews that were conducted following the observations were conducted in a conference room. The other interviews were conducted in the teachers' respective classrooms.

Prior to the interviews, the statement of consent was reviewed for understanding and the teachers were once again advised of their right to terminate the interview process at any time. Two recording devices were used to conduct the interviews: a digital recorder and a voice recorder on a smartphone. During the interview process, copious notes were taken. The interviews were scheduled to last approximately 30 minutes; however, most interviews exceeded this expected time frame as most of the teachers took time to elaborate in detail about the instructional strategies that they used in their

classrooms as well as to try to provide a rationale for their use of these strategies based on their own experiences and student success. Further, the interviews helped to clarify and confirm the observed strategies and elaborate on any strategies that may have been overlooked during the observation process. Additionally, teachers elaborated on strategies that may not have been observed during the lesson, but are frequently employed in the classroom and have been deemed effective by the teacher. Overall the interview process was important in helping to determine the teachers' views on their respective teaching strategies and the effect those strategies have on the positive performance of the African American students they teach.

Emerging Themes

Researchers and theorists who have engaged in qualitative studies stress the importance of keeping track of and analyzing data in an effort to efficiently identify the themes that emerge from the study and to ensure that meaningful findings will result from the analysis (Creswell, 2009). After transcribing the data from the interviews and observations, open coding was used to create categories based on the data. The NVivo® software was also used to support the analysis of the data. Constant comparisons were made by the software in an attempt to identify themes or patterns that existed among the data sources. The data were organized using nodes. *Nodes* is a term that is referenced in the NVivo® software to indicate emerging themes or patterns among the data. The data were organized using parent and child nodes. The parent nodes represent the more general topics, while the child nodes represent more specific topics that relate to the parent nodes. This hierarchy of nodes stored in NVivo 11 were essential in helping me to

identify the themes and patterns for this study. Emerging themes relative to the strategies used by effective mathematics teachers of African American students included: review/repetition, teaching tools, grouping for instruction, assessment of student understanding, student discourse, use of word problems and real life connections. The following table outlines the themes as they were grouped.

Table 2

Major Themes Stored in NVivo

Parent Nodes	Child Nodes
Review/Repetition	Daily Review from previous lesson, review quiz, daily spiral review, daily review from each mathematics domain
Teaching Tools	Technology, Manipulatives, Modeling, Use of Literature
Grouping for Instruction	One-on-One Instruction, Small Group Instruction, Peer- Tutoring
Assessment/Reteaching	Questioning/Probing (Informal and Formal Assessment), Using Data to Inform Instruction, Checking for Misconceptions, Addressing Misconceptions
Student Discourse	Number Talks, Classroom Discussions, Use of Academic Vocabulary, Explaining and Justifying Student Responses
Use of Word Problems	Multiple steps
Real Life Connections	None

The two sets of nodes were all linked to the guiding research question for this this study.

Themes and Patterns Related to Research Question

A single research question guided this case study: What are the instructional strategies used by teachers of African American intermediate level students who

demonstrate academic proficiency in the area of mathematics? The following is a discussion of the themes and patterns that emerged relative to the research question.

Review/Repetition

During several of the observations that were conducted, teachers were observed conducting some form of daily reviews. These daily reviews comprised the first ten to fifteen minutes of the instructional block and involved a review of skills that had been previously taught, skills that were currently being taught or skills from each of the mathematics domains. Participant 4 was observed starting her daily lessons using a number talk. Number talks are short problems that require students to address a mathematics problem. Students are not allowed to use pencil or paper to solve the problem, but are required to solve the problem using mental math. These purpose of number talks is to build number sense. Number talks are generally about 10 minutes in length. During the interview with Participant 4, she stated that the number talk was being utilized as a means of allowing the students to review a standard that had previously been taught.

Participant 6 was also observed conducting a number talk during her classroom observation. The students were solving a problem that involved multiplying a multi-digit number. The students were given several minutes to mentally assess and solve the problem. The teacher then polled the class to determine who had found one way of solving the problem. Next, she inquired as to who had come up with at least two ways to solve the problem and so on. The students responded to the teacher by a show of fingers to indicate the number of ways they were able to solve the problem. Students were then

polled for their products. Several students volunteered and were asked to discuss how they solved the problem in explicit details. The teacher transcribed what the student said. Later during the interview, the teacher stated that number talks serve multiple purposes during math instruction. One way the teacher utilizes number talks is as way to review multiplication and division. These are two skills that the teacher indicated during the interview that present a challenge for her students. This strategy allows her students to gain much needed practice of these skills each day.

Participant 5 indicated that he often starts the day with having the students engage in a math activity that includes some kind of spiral review. The review will usually focus on skills such as multiplying and dividing because these skills seem to be the hardest for kids to master. He further indicated that he engages in a daily review of these skills. He stated, "Kids need these skills as prerequisite for the other fifth grade math skills." He spends roughly 5 to 10 minutes on this kind of activity each day. Then the students complete a review quiz on the current standard as well. The teacher finds that repetition, routine and consistency are critical in helping students to master skills.

Like the other participants, Participant 1, 2 and 3 also began their lessons with a spiral review. Participant 3 was observed beginning with a *due now* that covered skills that had been previously taught. She indicated that this is necessary in an effort to help students retain previously taught skills. During the observation, the students and the teacher went over the review activity together. Participant 2 stated during her interview that she uses a spiral review each day. However, her spiral review is connected to the homework that she assigns her students Monday through Thursday. Each day she

collects and grades the students' homework. Then she goes over the homework the next morning as a means of reviewing the skills.

Participant 1 started the day with a daily review. The daily review was comprised of at least two problems from each of the mathematics domains for third grade. These domains included: numbers and operations in base ten, numbers and operations-fractions, measurement and data, operations and algebraic thinking and geometry. The teacher displayed the problems on the promethean board. The students attempted to work the problems individually and independently in their journals. After the students had adequate time to complete the review, the teacher provided immediate individual feedback and students were given the opportunity to share out their answers and discuss the strategies they used. The teacher then reviewed each problem with the whole group and explicitly modeled how to answer and address each type of problem. When asked why she used math problems from each of the domains the teacher stated, "If the students can do them during the daily review, then they should be comfortable attempting these types of problems on the test."

Teaching Tools

All of the teacher participants acknowledged the use of technology in their classrooms in some fashion. Participant 3 indicated during her interview that she regularly integrates the use of technology in her classroom. She said, "I like to utilize technology programs that allow the students to practice and that provide data that I can use to ascertain what skills are being mastered and what deficiencies still exist." She also indicated that she often uses technology as a center activity. During the observation, the

teacher was observed playing a video on her promethean board that was providing students with an entertaining way to remember facts related to customary conversions. The students appeared to be very interested and engaged in the video presentation.

Participant 1 also indicated during her interview that she utilized technology as a center in her classroom. One of the primary purposes of its use is for remediation of mathematics skills such as basic addition and subtraction facts. Participant 4 reported using technology to have the students practice responding to constructed response items as if they were in an actual standardized test setting. Additionally, the students used technology to complete assigned tasks, quizzes and tests in the Google classroom.

According to Participant 2, one means of integrating technology into the mathematics classroom is by using videos to reinforce a concept. For example, the teacher will introduce the standard, demonstrate and model the standard during the *I Do* phase of the gradual release model. However, she will then follow up by showing the students an instructional video on the same concept. She does this often because she thinks that it is important for her students to hear and experience the instruction in another way and because it gives them multiple opportunities to grasp the concept. All of the teacher participants acknowledged the use of technology in their classrooms.

Participants 1, 3, and 4 were among the three participants who indicated their preferred use of manipulatives in the classroom. Participant 3 explained that she likes to use as many manipulatives as she can. Because many of her students seem to be visual learners, she felt that it is important that the students see and touch the manipulatives as part of the mathematical learning experiences. She also uses virtual manipulatives.

Participant 2 commented on the use of manipulatives in her mathematics classroom as well: "The students get an opportunity to use manipulatives during every math lesson." During Participant 2's observation, the students were using rulers to measure the length of their desks and other objects. It was important to this teacher participant that her students have an opportunity to have these kinds of hands-on experiences. Participant 2 stated, "When I introduce the lesson, the students will have something to draw on and be able to make real connections to what they are learning." The teacher believed that the use of manipulatives gives the students the opportunity to acquire experiential knowledge and develop a schema for the standard being taught.

Another teaching tool that was utilized by several of the teacher participants was models. Models can be diagrams, graphs, flowcharts, etc. that help students make sense of mathematics. Modeling with mathematics is one of the eight Standards of practice as outlined by the Common Core State Standard Initiative (2010). Participant 4 was observed teaching dividing whole numbers by unit fractions and unit fractions by whole numbers using models. During the interview, the teacher stated that she was tempted to just show the students how to practice this skill using the standard algorithm. However, she understood that the standard requires the students to be able to perform this task using models. She uses models in her classroom to explain and demonstrate mathematics concepts when this strategy is specifically outlined in the standard being addressed. She believed that this is how the students will likely encounter the skill on the standardized test.

It was evident in the document analysis of Participant 1's lesson plans that she too utilized models in her classroom. She further elaborated on this strategy during her interview. She discussed a four step strategy that she has her students follow when completing word problems. The first step is to "do a model." When observing Participant 6 and Participant 3 there were visual models for different mathematics concepts displayed on anchor charts in their classroom. Participant 3 indicated that the use of models gives students another means of demonstrating their mathematical understanding.

Grouping for Instruction

During the interview process, I noted that all of the teacher participants expressed that they used small group instruction in their classrooms. The general consensus seemed to reflect that small groups are primarily ability based, and the small group instruction is a result of data acquired from some formal assessment. For example, students who demonstrate mastery of the skill may be grouped together to engage in an enrichment activity while students whose data reflects that they need reteaching are generally grouped together. All of the participants were observed engaging in one-on-one instruction at some point during their math lesson. Participant 1 was observed checking the students' work as they completed their independent practice in their journals. She provided immediate feedback to the students and gave the students the opportunity to go back and make corrections based on her feedback. I heard the teacher verbally making notes to herself regarding which math skill the students' errors were connected to and what remediation or reteaching method would be appropriate.

Participant 4 indicated that when he goes over his review quiz with his class, he addresses each problem step by step. He stops after each step and polls the class in an effort to determine who successfully completed each step and who did not. He uses this strategy to determine which of his students require small group instruction and which may need one on one instruction. He further discussed that he sits at a table when the students are working independently and allows the students to determine whether or not they require one-on-one instruction. If they do feel they need individualized instruction, they voluntarily come to the table to gain assistance from the teacher.

Participant 3 utilizes centers as one means of small group instruction. Students are grouped based on their understanding of the skill that is currently being taught. Some students may be assigned to work on a mathematics computer program in the technology center. Other students may work with manipulatives or in the enrichment center. She also engages in one on one instruction when she encounters a student who is reluctant to participate in class. She works with this student one on one during the student's lunch time. She noted that often the student does much better with the concept when it is just that student working with the teacher and that eventually the student's confidence level increases. This translates into the student becoming more engaged during regular classroom time.

Two of the teacher participants expressed the use of peer tutoring as a means of grouping students. Participants 2 and 6 both use this strategy as a means of allowing students to help each other. Participant 2 discussed how this peer tutoring process is actually a reciprocal process in which both students actually benefit. She said, "It is not

an opportunity to dismiss the struggling student, but it is an opportunity to promote growth for both students." She allows a student who seems to be comfortable with the skill to work with another student who may be still in the process of mastering the skill. It is her belief that sometimes students are more receptive to their peers when they are working to understand a concept and address their own misconceptions. She said, "A peer can sometimes say things in a way that a teacher cannot." She listens intently as the peer tutor works with the other student because she views this as an opportunity to assess the depth of both students' level of understanding.

Assessment/Reteaching

The use of assessment was another strategy that was consistently employed by all of the teacher participants in the study. The teachers' methods of assessment ranged from informal to formal. Assessment strategies included teacher questioning and probes, exit tickets, quizzes, and tests (pre and post). Homework was also discussed as a means of assessment. Three consistencies regarding assessment emerged during the interviews among all participants: assessment was ongoing, assessment occurs daily in some form, and assessment is used to make instructional decisions for their students collectively and individually.

Participant 4 stated that assessment strategies in her classroom include teacher questioning, exit ticket, quizzes and tests. Homework is also a means of informal assessment. She only assigns meaningful homework that relates to what is being taught in the classroom. She stated, "I check homework daily and require that students show their work even with multiple choice items." By checking the homework daily the

teacher is able to assess who is understanding what is being taught and who is not. This allows her to adjust her instruction accordingly. In some instances, based on the student response to the homework, the teacher may make the decision to reteach the concept. Participant 2 also uses homework as a means of assessment. After grading the homework, she analyzes it to determine if the students demonstrated understanding. If they did not, she will use the homework the next day in class as the review quiz.

Participant 3 administers pre and post tests on a weekly basis. She graphs the data from these assessments so that she can easily determine who is mastering the skills and who is not. She uses the data to provide reteaching opportunities for the students. She meets with each student and discusses the data so that the students are aware of their own progress. She stated, "I have data talks with my students at least once a week." It is important to the teacher that the students are always aware of where they are academically.

Another consistent response regarding assessment among the teacher participants was the use of questioning as a means of assessment. The teachers expressed that they often use this strategy to delve into the students' thought processes and to gauge the depth of their understanding of the concepts being taught. This questioning strategy is primarily used to elicit student responses that require them to explain and justify their answers and thinking. The teachers discussed how they require their students to show their work, explain, and justify their answers even when working with multiple choice items.

Participant 3 described how she asks the students to explain why they think that their answers are correct. Their explanation provides insight into possible misconceptions. She finds it easier to uncover misconceptions when the students verbally explain their answers as opposed to looking at their papers because she feels that this method of assessment minimizes the amount of time it takes to discover and address the misconceptions. She uses questioning to allow the students to realize their own errors and provide an opportunity for the students to self-correct. If the students still are unable to express understanding or self-correct in regards to their misconception, the teacher explains, models, or demonstrates in a different way based on what she was able to uncover using this assessment strategy. Participant 3 also discussed having the students come to the board and work out problems as a means of assessing misconceptions. She stated, "While in whole groups it is difficult to figure out who is really understanding and who is not, but by having the students come to the board I can assess who really understands and who does not." Checking for misconceptions is a major part of her assessment process.

Participant 5 commented on his use of questioning as an assessment method. He asks the students questions not as a means of determining the right or wrong answer necessarily, but as a way of determining the process the students used to arrive at their answer. He said, "As I have the students walk through or explain their process or reasoning I am trying to assess what misconceptions may exist so that I may quickly address them." Participant 5 believes that it is critical to quickly and accurately assess student misconceptions because they can easily impede student learning. Participant 5

indicated that he discusses common misconceptions related to the skill the students are working on up front. The teacher explained that he does this with the hope that by frontloading the students with the common misconceptions associated with the skill, the students will make a conscious effort to avoid the misconceptions while working on the skill.

Participant 4 indicated that she likes to use probes in her lessons. Probes are thought-provoking questions related to a skill the students are learning. Probes are a form of assessment that is composed of a question and responses that are designed to prompt students to use their prior knowledge and identify misconceptions that may not always be evident during regular instructional practices. The teacher stated that the students typically find these probes challenging, but generally are not discouraged by the challenge.

Student Discourse

Questioning is a strategy that the teachers in this study use to assess their students' understanding. However, it is also a critical strategy for promoting student discourse in the mathematics classroom. Student discourse emerged as a theme in this study. It was evident through the teachers' use of such strategies as number talks, use of academic vocabulary and encouraging students to explain and justify their answers and thinking.

The use of content vocabulary in the classrooms was an integral part of promoting student discourse in the classroom, according to the teacher participants in the study. Participant 5 discussed how he intentionally slows down and places a focus on the

content vocabulary. He also encourages the students to use the language of the standards when discussing or explaining their answers.

Participant 2 emphasized the importance of teaching the academic vocabulary. She believes that this allows the students to understand the language of the test. Often students are confused when they encounter this math language in a standardized test format. They may actually understand the skill, but the language distorts their understanding. She makes a concerted effort to find different resources that phrase test questions using the academic vocabulary as well as the language of the standard. Participant 5 shared a similar rationale for placing a distinct emphasis on having the students use academic vocabulary. Participant 4 often requires her students to demonstrate their understanding of a math concept by various means. This includes the use of words. Participant 4 believes that in order to successfully justify their understanding students must be able to appropriately incorporate the academic language in their responses. Participant 3 encourages the students to use the academic vocabulary when they are discussing their thoughts or answers. In addition, the students are required to use the academic vocabulary when they are writing their responses to the constructed response problems. She believes that by constantly requiring students to use the academic vocabulary this will become something that they do automatically and routinely. She said, "The students will get used to doing this." According to Participant 3, this consistent usage of academic vocabulary will enable them to successfully navigate through test language.

Participant 6 said that knowing what characteristics or properties a concept does not include is equally as important as knowing what characteristics the concept does include. For this reason, she often uses the Frayer model graphic organizers to facilitate student understanding and usage of the content vocabulary. By having students identify examples and non-examples of a concept, she suggested that students develop a deeper understanding of the math terms and are able to appropriately use them in discussions and in their written responses.

Using Word Problems

One of the most prevalent strategies that was either discussed in the interviews or observed in the classrooms was the use of word problems. All teacher participants identified using word problems as one of the strategies that they use in their classrooms.

Participant 1 uses a four step procedure that guides students as they attempt to navigate word problems. These four steps were evident in her lesson plans. Additionally, the teacher was observed reiterating the students' use of these steps in her classroom lesson. The steps are as follows:

1. Do a model.
2. Tell me what operations you are using to solve the problem.
3. Show your equation.
4. Solve.

The students must complete each step in order. According to Participant 1, "The student cannot go on to the next segment or step of a problem until I check each step and signal

to them to go on." By following these steps, the teacher believed that the students will have greater success with solving word problems.

During the interview, Participant 3 explained that her main instructional focus when teaching mathematics is primarily on helping students develop conceptual skills. Computational skills may be addressed daily for roughly four or five minutes in the morning. She places less emphasis on computation and more focus on word problems and performance based tasks. Participant 3 further elaborated during her interview that when she is working with word problems, she tries to make sure that the problems are rigorous. For the most part, she utilizes multi-step word problems. The students she currently teaches seem to understand single step word problems, but are often confused when the word problems involve more than one step. She allows her students to use whatever methods, models, or strategies they feel comfortable using to accomplish this task. She believes that it is important that the students engage in the constructive struggle. Therefore, she selects assignments and tasks that challenge students and make them think.

During the observation, Participant 5 used a word problem to introduce the lesson. The teacher allowed the students to silently read the problem first. Afterwards, he read the word problem aloud again for the students. When asked in the interview about why he reads the word problems for the students, the teacher revealed that the students in his classroom generally have difficulty with reading and that they are not reading on grade level. He felt that reading the problems to the students helps them with their reading skills as well as encourages the students to be persistent about solving the problem as

opposed to just giving up because they cannot understand what the words are saying. The teacher emphasized that he does not necessarily have the students go through the word problems and pick out key words that may signal to them what operation needs to be performed. Instead, he focuses on helping the students to understand that most of the word problems they will encounter will require them to perform multiple steps. He also emphasizes answering the question or questions that are specifically being asked in a particular word problem. He has noticed that students sometimes respond erroneously to word problems because their responses do not address what is actually being asked of them. During the interview Participant 5 elaborated that he prefers to use the word problems from the math text book rather than selecting them from other resources. He believes that the authors of the textbook have created and modeled these word problems along the same lines as the ones being used on the standardized test. This gives the students an opportunity to hear the language of the test.

Like the other participants, Participant 2 also indicated that she uses word problems as a strategy for teaching mathematics. One of her major focuses when utilizing this strategy is having her students identify the words that signal which operation or operations are applicable for solving the problem. Similar to Participant 5, she prefers to select the word problems from the district adopted textbook or from resources that specifically use the language of the standards. She too believes that word problems taken from these resources are likely to be aligned with the kinds of word problems the students will encounter on the test.

Real World Connections

Two of the six participants indicated that they often make real-life connections when teaching mathematics. Participant 6 discussed how she incorporates real-life props in her mathematics lessons. For example, when teaching a lesson on adding and subtracting decimal numbers, the teacher arranged her classroom as if it were a restaurant. She provided the students with menus from actual restaurants. The students were assigned word problems to solve based on the information from the menus.

Although Participant 5 prefers to select word problems from the district adopted textbook, he sometimes modifies the word problems so that they relate to the students and their lives. During the observation, I noticed that when using a word problem, the teacher incorporated a particular student's name in the narrative. During the interview, the teacher revealed that he utilizes this strategy in an effort to immediately engage the students in thinking about the word problem by making the students personally connected to the word problem. Additionally, this strategy acts as a signal to students that they will likely be called on first to provide their thoughts about the word problem.

During her interview, Participant 6 noted that the district adopted text book offers word problems that are situated in the context of real life; however these scenarios are not always a reflection of her students' perceptions or life experiences. For example, in her mathematics class the students were discussing a division word problem that presented a scenario in which students were asked to determine the number of buses needed for students going on a field trip. According to Participant 6, the problem read as follows: "One hundred students are going on a field trip using buses. Each bus holds 30 students.

How many buses are needed?" Participant 6 indicated that the student determined that three buses were needed. When the teacher asked the student to explain how many students would be seated on the three buses, the student explained that the three buses would hold 90 students. "What about the other 10 students?" the teacher asked. The student responded, "Three to a seat." The teacher initially laughed, but immediately noticed that the student was very serious about her response. The student explained that when their bus is filled to capacity and there are extra students remaining, those students are asked to sit three students to a seat as opposed to the normal two passengers to a seat. In this student's version of reality, an extra bus would not be requisitioned to accommodate the additional students. Therefore, her interpretation of the remainder in this division word problem was different from the expected or correct interpretation of the remainder. Participant 6 further explained that she had to stop and clarify for the student that sitting students three to a seat would not be the optimal solution to the word problem. She further explained that the extra students would be seated on an additional bus thus requiring a fourth bus. Participant 6 added that there are times when further explanation of word problems is necessary based on the students' perceptions of reality.

Review of Findings

The findings from the study indicated that each of the six teacher participants utilized six out of the seven strategies identified in the study. Participants 5 and 6 were the only participants who demonstrated evidence of the strategy of making real life connections to the learning as evidenced in the classroom observations, interviews and

lesson plans. The following table displays the strategies used by each of the teacher participants.

Table 3
Participant Usage of Identified Strategies

Strategy	1	2	3	4	5	6
Review/Repetition	X	X	X	X	X	X
Teaching Tools	X	X	X	X	X	X
Grouping for Instruction	X	X	X	X	X	X
Assessment/Reteaching	X	X	X	X	X	X
Student Discourse	X	X	X	X	X	X
Use of Word Problems	X	X	X	X	X	X
Real Life Connections					X	X

The review/repetition strategy was characterized by the use of daily reviews from previous lessons, review quizzes, daily spiral reviews and daily reviews from each of the mathematics domains. Teaching tools described the use of technology, manipulatives, modeling and literature. Grouping for instruction involved the use of small group instruction, one on one instruction and peer tutoring. Assessment and reteaching was evident through the teachers' use of questioning, checking for student misconceptions as well as addressing student misconceptions. Student discourse was promoted in three primary ways: the use of number talks, academic vocabulary, and student justification of answers. The use of word problems was implemented to provide students with opportunities to build mathematical knowledge through problem solving and the

application of problem solving strategies. Real life connections were used to allow students to connect what they were learning to their actual lives.

Evidence of Quality

Steps were taken to ensure that data taken were precise and represented accurate interpretations from the participants. Triangulation of data, member checking, and controlling researcher bias were used to ensure validity. Data collection from three data sources: document analysis, observations, and interviews were critical n providing a clear and accurate reflection of the data. Within 24 hours of each interview, I followed up with each of the participants via email and asked them to verify the accuracy of the transcriptions relative to their respective interviews. This process allowed the participants the opportunity to read over and review their respective transcripts to determine if anything was missing and to clarify or expound on details if necessary. Each participant indicated that the transcriptions of their respective interviews were accurate and complete to the best of their knowledge. Therefore, no further clarifications, corrections or additions to the interview transcripts were needed. Participants did not have the opportunity to review the initial interpretations of this data thus creating a limitation of this study. Finally, I ensured that the data were accurate by controlling researcher bias. I made a conscientious effort from the onset of the study not to allow preconceived notions or biases to interfere with the data collection process. This was especially important during the interview process. I was careful not to design or ask the questions in a way that would lead the interviewees. Therefore, during the interview process I simply asked questions and allowed the participants to respond. Follow up

questions were asked with the sole intention of gaining clarity or further elaboration relative to the participants' responses. Through the use of these methodological strategies, I was able to ensure the accuracy and credibility of the data that were collected.

Summary

I found that the six teacher participants in the study employed a combination of strategies in their mathematics classrooms. The three sources that were utilized in the data collection process were document analysis, observations, and interviews. Once the data from the interviews and observations were transcribed, open coding was used to create categories based on the data. The NVivo® software was also used to support the analysis of the data. Member checking and triangulation of data were used to ensure that the appropriate findings would emerge from the analysis. Seven themes emerged relative to the strategies used by effective mathematics teachers of African American students: repetition and review, teaching tools, grouping for instruction, assessment/reteaching, student discourse, use of word problems, and real life connections.

In the next section, I present an interpretation of the findings, along with recommendations for action and further research. I also share reflections on the study and my conclusions with regard to the problem of effective mathematics teaching for upper elementary African American students.

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Section 5: Discussions, Conclusions and Recommendations

For years, national data on mathematics achievement have consistently shed light on the underachievement of African American students in this academic area (National Center for Education Statistics, 2011). Jackson and Wilson (2012) suggested examining the amount of exposure students have to mathematics content and the instruction students receive as factors that may provide insight into helping increase achievement in this area. Although the existing research has addressed broad principles or orientations to teaching mathematics, it has failed to adequately identify specific instructional practices that support African American students' progress in mathematics (Jackson & Wilson, 2012). The focus of this study was to examine and record the instructional practices of classroom teachers who have been successful at promoting achievement in the area of mathematics with African American students. Seven strategies for teaching mathematics to African American students were identified in this study.

Interpretation of the Findings

Data were collected through a triangulation method that included document analysis, interviews and observations. Qualitative data analysis was used to make an assessment of the themes and ideas about the strategies that are used by effective mathematics teachers of African American students. An analysis of the data using themes and patterns were presented in Section 4. This section is an interpretation of the results, followed by the conclusions and recommendations that were made as a result of the findings of this study.

The teacher participants provided information regarding instructional strategies used to teach mathematics to African American students. Critical information was gleaned from each of the data sources. However, the interviews shed the most insight into the teachers' selected strategies, their rationale for the use of the strategies, and the effect those strategies have on the positive performance in mathematics of the African American students they teach. From the data collected, it became evident that these effective mathematics teachers of African American students used a variety of strategies. These strategies included repetition and review, teaching tools, grouping for instruction, assessment/reteaching, student discourse, use of word problems, and real life connections.

Although the primary focus of this study was on classroom instructional strategies employed by effective mathematics teachers of African American students, it became clear during the data analysis process that the instructional strategies that emerged during the study could be linked to the major instructional approaches for teaching mathematics that were reviewed in the literature. For example, I noted that direct instruction and guided practice were used during the observations of every teacher who participated in the study. Although these instructional components are a part of the gradual release model that the district requires the teachers to employ, both elements were found to be consistently embedded in the strategies that emerged from the study. For example, when the teachers engaged in review and repetition, they were observed immersing the students in direct instruction that lead to students engaging in some form of guided practice. The teachers started a lesson by introducing the objective for the lesson. Next they engaged

in demonstrating and modeling the concept or focus of the lesson. Then students participated in guided practice activities in which input from both the teacher and students were provided. The students often ended the lesson with some form of independent practice. The teacher also formally or informally assessed student understanding and provided immediate feedback.

These kinds of explicit instructional strategies are consistent with the traditional approach to teaching mathematics. According to the review of literature, the traditional approach to teaching mathematics places an emphasis on the acquisition and mastery of procedural skills (Grady et al., 2012). These skills represent an important step in helping to develop students' conceptual understanding of mathematics (Grady et al., 2012).

Other strategies identified in the study that are consistent with the traditional approach to teaching mathematics include daily and spiral reviews of previous lessons, modeling, questioning as a means of assessment, checking for misconceptions, addressing misconceptions, and promoting the use of academic vocabulary in the classroom. These strategies were employed by each of the six teacher participants in the study.

Although some of the strategies identified in the study were consistent with the traditional approach to teaching mathematics, other strategies appeared to relate more to the elements of the reform approach to teaching mathematics. As discussed in the review of literature, the reform approach to teaching mathematics is influenced by recommendations made by the NTCM (2000). This mathematics organization that positions itself as the public voice of mathematics education suggested that classroom

time be devoted to helping students develop reasoning skills and learn problem solving strategies. According to the literature, a reform approach classroom utilizes reaching tools such as manipulatives and technology. Problem solving is an integral part of classroom instruction, and learners are encouraged to engage in discourse as they seek to find ways to solve problems strategy (Ottmar et al., 2013).

There was evidence of this kind of teaching approach in each of the participants' classrooms. Each of the teachers in the study placed an emphasis on the use of word problems, student discourse, and technology. Participants 1, 3, and 4 indicated that they regularly employ the use of manipulatives in their classrooms. The use of these strategies was documented during the classroom observations as well as during the interviews. These strategies associated with the reform approach to teaching mathematics emerged as the teaching tools, making real-life connections, using word problems, and student discourse themes.

The seven main strategies identified in the study were categorized as characteristic of either the traditional approach to teaching mathematics or the reform approach to teaching mathematics. The six participants in the study used strategies that encompassed elements of both instructional approaches. For example, the participants in the study utilized strategies such as review/repetition and assessment/reteaching. These strategies signal the traditional approach to teaching mathematics. In addition, the participants demonstrated the use of strategies such as student discourse and technology which are reflective of the reform approach to teaching mathematics. This was a major

finding of the study. The literature refers to this kind of mathematics instruction as the balanced approach to teaching mathematics (Foster, 2012).

Studies conducted by DeCaro and Rittle-Johnson (2012) and Bottge et al. (2014) investigated mathematics instruction that utilized a balanced approach to teaching mathematics. Findings from both studies indicated favorable results for this kind of mathematics instruction. This finding in this study is also consistent with the National Mathematics Advisory Panel's recommendations for mathematics instruction. The panel concluded that both procedural and conceptual strategies are integral parts of students' mathematical understanding. Each of the teacher participants in the study conveyed that the goal of selecting and using specific strategies was ultimately to increase their students' understanding of mathematics.

Similar to the study conducted by DeCaro and Rittle-Johnson (2012), the teacher participants in this study seemed to implement both the traditional and reform strategies for teaching mathematics in a specific order. Each of the participants started their lesson with the strategies more associated with the traditional approach to teaching mathematics. For example, in each of the classroom observations, it was noted that the teacher began the lesson with some kind of review activity or assessment/reteaching activity. These activities often focused on previously taught skills or procedural skills that primarily dealt with computational operations such as multiplication, division, addition or subtraction. Next, the teachers moved into direct instruction followed by some form of guided practice. As the lessons progressed, the teachers began to use the strategies more associated with the reform approach to teaching mathematics. This was characterized by

the use of manipulatives, technology integration, student discourse, investigations and exploration of the lesson standard.

The teachers' conventional method for structuring their mathematics lesson is contradictory to one finding of DeCaro and Rittle-Johnson's (2012) study that indicated that having the students utilize the reform approach strategies prior to the traditional approach strategies greatly aided in the development of the students' conceptual knowledge. This was interesting to note because every participant in the study expressed the importance of incorporating word problems into their instruction because this is a concept that their students seem to struggle with the most, and solving word problems is a skill that calls for students to rely on their conceptual knowledge. There was one participant in the study who did begin his instructional block with a review quiz, but as he progressed into the main lesson objective he expressed that he often introduces the lesson with a word problem. More research is needed in this area.

Ladson-Billings (1994) offered a social cultural framework for teaching African American students known as culturally relevant pedagogy. Ladson-Billings (1994) outlined several components of CRP which include: scaffolding, teacher compassion, a positive interaction between teacher and students, establishing a learning community that involves the teacher and all students, promoting equity in learning, deliberate integration of students' cultural background into the curriculum, and making real life connections.

Based on the suggestions of the literature, there were elements of culturally relevant pedagogy in each of the teacher participants' classrooms; specifically, teacher compassion, scaffolding, promoting equity in learning, making real-life connections, and

creating classroom communities. The teachers in the study seemed to demonstrate compassion for their students. Each of the teachers in the study displayed an earnest desire for their students to achieve in the area of mathematics. Although positive student outcomes on standardized test was a primary focus of their instructional goals, their desire for their students to become better mathematics students was equally important. This was documented in the teachers' discussions during the interview process. Each of the teachers expressed their desire for helping students develop a deeper understanding of mathematics.

It was evident through the observations that the teachers used scaffolding during the learning process in an effort to ensure that the students could make connections between what they had previously learned and what they were presently learning. This emerged as the review/repetition theme. The teachers in the study were identified and selected because of their ability to promote equity in learning in their mathematics classrooms. Each of the teachers in the study was deemed to be an effective mathematics teacher of African American students. Effective suggests that they have been successful in promoting mathematics proficiency and achievement for African American students. According to the NCTM (2008) equity in learning is attained when students from all backgrounds experience mathematics achievement at the highest levels. Ladson-Billings (1994) included making real –life connections and building classroom communities as two core elements of culturally relevant pedagogy. During the interview process, Participants 5 and 6 discussed their use of the real-life connections as a strategy that they employ in their classrooms, and Participants 4 and 5 referenced the importance of

creating classroom communities that encompassed both the teacher and students. They were concerned with creating an environment where students feel comfortable taking risks.

There were elements and characteristics of culturally relevant pedagogy that were not evident in the findings of the study. These elements included teachers' beliefs regarding other cultures, teachers' integration of the students' culture into the mathematics lessons, and teachers' knowledge about their own culture. These elements were not referenced in the teachers' lesson plans or evident during the classroom observations. They were not discussed during the interview process.

A discussion of culturally relevant mathematics pedagogy (CRMP) was presented in the literature review as a possible means of increasing African American students' achievement in mathematics. These tenets of CRMP emphasized mathematics teaching that results in a deeper conceptual understanding, instruction that is focused on the experiences of the learners and the development of a more critical consciousness relative to mathematics (Rubel & Chu, 2011). Tenets 1 and 2 appear relevant to this study. One focus of the first tenet of CRMP is for teachers to engage students in mathematical activities that promote the problem solving process. This element was evident in each of the six participants' use of word problems. Participant 4 used probes as means of engaging students in problem solving. These thought provoking questions are often related to the skill the students are currently learning and push the students to think outside the box. Participant 1 used a four step procedure that guides students as they attempt to engage in the problem solving process. These steps include developing a

model, identifying the operations necessary to solve the problem, creating an appropriate equation, and ultimately solving the problem.

The second tenet of CRMP is that students' experiences should be an integral part of the instructional focus. Two teachers in the study demonstrated evidence of this instructional element in their classrooms. For example, Participant 6 discussed how she incorporated rea-life props in her mathematics lessons. During one math lesson, she set up her classroom like a restaurant. She provided the students with menus from actual restaurants from the students' community. The students were assigned word problems to solve based on the information from the menus. Participant 5 reported that she sometimes modified text-based word problems so that they relate to the students and their lives outside of school.

The third tenet of CRMP discussed by Rubel and Chu (2011) is for teachers to aid in the development of students' critical consciousness relative to mathematics. In a classroom that incorporates CRMP, lessons are designed around and driven by a societal issue. Students analyze these issues of society through a mathematical lens. They think critically about mathematics and its role in helping them to solve societal and world issues. Critical consciousness stretches the students' beyond their personal experiences and into a global dimension (Rubel & Chu, 2011). This facet of culturally relevant pedagogy as described in the literature was not explicitly evident in the study. Unfortunately, the current mathematics curriculum and the textbooks designed to accompany that curriculum are not written to facilitate students' attention to societal

issues (Aguirre & Zavala, 2013). Therefore, teachers would have to make a concerted effort to explicitly connect Tenet 3 to the mathematics learning in their classrooms.

Mathews (2003) examined the attempts of four teachers to incorporate a model of culturally relevant pedagogy into their mathematics classrooms. This model of CRP included three tenets: developing students' ability to think critically about mathematics and critical consciousness, building students' cultural and mathematical awareness, and integrating the students' culture into the mathematics instruction. From the perspective of Matthews' model, the development of critical consciousness can be viewed as a continuum that starts with students thinking critically about mathematics and continues to progress until students are able to extend their mathematical learning to pose solutions in the context of larger communal and societal problems. Fostering students' mathematical thinking is facilitated by focusing on a specific set of processes (NCTM, 2000). These skills include problem solving and interconnectedness of mathematics. Problem solving allows the students to explore multiple paths to solving problems. Students expand their mathematical thinking by thinking about the steps involved in mathematical problem solving. Mathematical thinking also takes place as the students begin to make connections between mathematical ideas and concepts and understand how each mathematics concept builds on another. As students' mathematical thinking matures, they will begin to recognize the relevancy of mathematics to situations outside of mathematics (NCTM, 2000).

Each of the participants in the study used strategies that are helpful in fostering their students' critical mathematical thinking skills. These strategies included number

talks, probes, connecting the math to real-life scenarios, and problem solving. For example, Participant 1 was observed in her classroom using a model that required her students to think about the steps in the problem solving process. She further discussed the use of this four step process during her interview. However, none of the teacher participants was observed or documented as having the students extend this critical mathematical thinking beyond the scope of mathematics to situations or problems in society. Therefore, the presence of the students' development of critical consciousness was not evident in this study. Furthermore, there was a lack of evidence in the study of the teachers building cultural awareness in their classrooms or of teachers incorporating CRP in their mathematics classrooms.

Moll and Gonzalez (2004) discussed a component of culturally relevant pedagogy known as funds of knowledge. This aspect of CRP refers to activities that relate to students' families home life and culture such as sewing, cooking and gardening. This feature of CRP was not evident in the study. According to Timmons-Brown & Warner (2016), teachers struggle with time constraints relevant to addressing the curriculum and test preparation. They are often too overwhelmed to add more activities to their existing instructional responsibilities (Timmons-Brown & Warner, 2016). Additionally, teachers may not possess an understanding of how to incorporate such activities into their instructional practices due to a lack of professional development opportunities relative to culturally relevant pedagogy (Timmons-Brown & Warner, 2016).

Some findings of the study were also consistent with the assertions of Feuerstein's (1979) mediated learning experience theory. Feuerstein's theory is predicated on a

specific exchange between the learner and what he referred to as the mediator. The parameters of Feuerstein's mediated learning theory include: intentionality and reciprocity, mediation of meaning, and transcendence. In this study, the presence of intentionality and reciprocity and mediation of meaning was evident. Like Feuerstein's mediator, the teacher participants' primary foci were the students (learner) and the specific strategies that were employed to help facilitate student learning. By employing specific instructional strategies, the teachers made a concerted effort to assist the students in interpreting and understanding the mathematics concepts being taught. This process involved addressing student misconceptions which emerged as a sub- theme in the study.

Feuerstein's second criterion is mediation of meaning. In this facet, the mediator helps the learner understand the significance of the learning experience. Often students are asked learn concepts and objectives, are given few opportunities to grasp the relevancy or importance of what they are learning. This criterion of the mediated learning theory was present in the study as well. It manifested primarily through the use of direct instruction, student discourse, and making real life connections. In each of the observed classrooms, the teachers used explicit instruction to introduce, explain and model the mathematics concepts being addressed. Students were given an opportunity to engage in discussions about their learning. This engagement of discussion involved students responding to the teachers' questioning strategies; however, it also afforded the learners the opportunities to pose and explore questions of their own. Participants 5 and 6 extended the students' ability to understand the importance of what they were learning by making real life connections to what the students were learning.

The third criterion of Feuerstein's theory is transcendence. This concept refers to the ability of the learner to bridge what they are currently learning to what they have previously learned (Presseisen & Kozulin, 1995). Similar to the third tenet of CRMP, transcendence is characterized by the learners' ability to use their acquired learning to understand and explore possible solutions to societal issues. This component of Feuerstein's mediated learning theory was not evident in the study. It was not analyzed in the documents, conveyed during the interview process or evident during the classroom observations. Teachers make an earnest attempt to help foster this criterion of Feuerstein's mediated learning theory in their classrooms. Participants 5 and 6 demonstrated this by trying to make real life connections to what students are learning in their classrooms. Although the desire to help students think critically about the world exists, there is a lack of clarity as to how to accomplish this aspect of learning on the part of teachers (Matthews, 2003).

Feuerstein's mediated learning theory also discusses two distinct modalities: the direct approach to learning and the mediated approach to learning (Skuy, 1997). The direct approach to learning presents a parallel to the reform approach to teaching mathematics. Like the reform approach, this approach places the student at the center of the learning experience. The teacher assumes the primary role of facilitator. As observed in each of the six participants' classrooms, the teacher posed questions while the students engaged in student discourse which allowed them to make conjectures and judgements and explore multiple ways to solve mathematical problems.

The mediated learning approach shares similar characteristics with the traditional approach to teaching mathematics. The teacher is at the center of this instructional approach. With this approach, there is the presence of explicit instruction and guided instruction. The teacher seeks to help the learners develop a deeper understanding of what is being taught. The teachers in this study were observed taking the time to break down or simplify concepts so that students were better able to manage and understand these complex skills. For example, Participant 5 discussed a strategy in which he reviews problems step by step to ensure that the students are understanding each of the components necessary for solving the problem. Participant 1 referred to a similar strategy in her interview as *chunking.* She segments instruction into small manageable parts for her students in an attempt to promote student understanding. The teacher participants indicated in their interview discussions that such strategies that mirror that traditional and mediated learning approach to teaching are critical in helping to promote student mastery of the standards. As noted with the traditional and reform approaches to teaching mathematics, both of these modalities were used in combination in each of the teacher participants' classrooms.

Summary of Interpretation of Findings

The instructional strategies utilized by the participants in the study were consistent with the instructional approaches to teaching mathematics that were suggested in the literature. Strategies and themes that emerged from the study were characteristic of both the traditional and reform approaches to teaching mathematics. This was a major finding of the study as the mathematics education community has long debated which of

the two strategies was most effective for teaching mathematics. The findings of this study seemed to indicate that the teacher participants employ a balanced approach to teaching mathematics. Ladson-Billings (1994) outlined elements and characteristics of culturally relevant pedagogy. Teacher compassion, scaffolding, promoting equity in learning and teachers' knowledge of their own culture were present in the findings of the study; however, elements and characteristics of culturally relevant pedagogy that were not evident in the findings of the study included teachers' beliefs regarding other cultures, teachers' knowledge relative to integrating the students' cultural background into the learning, and teachers' knowledge about their own culture. Culturally relevant mathematics pedagogy (CRMP) was discussed in the literature as a means of increasing the mathematics achievement of African American students. Rubel and Chu (2011) focused on three tenets of CRMP. Tenets 1 and 2 were evident in the findings of the study; however, Tenet 3, which addressed the students' development of critical consciousness was not evident in the study. However, there was evidence of students' thinking critically about mathematics as discussed in Matthews' model of CRP.

Feuerstein's mediated learning theory discussed an interaction between learner and mediator that is characterized by three important features: intentionality and reciprocity, mediation and meaning, and transcendence. Intentionality and reciprocity, and mediation and meaning were concretely present in the findings of the study. However, the third criterion, transcendence was not present in this study. There was evidence of the direct and mediated approaches to learning as well.

Implications for Social Change

The purpose of this study was to explore the instructional strategies of teachers who have been successful at promoting student growth and achievement for African American students in the area of mathematics. Seven major strategies were employed by six teachers who were identified as effective mathematics teachers of upper elementary African American students. The findings of this study have implications for social change on a local, state and national level. On the local level, these strategies have the potential to increase the number of African American students in the school district that was the location for this study who will be successful in mathematics. On the state level, the findings of this study could increase the number of African American students who score a level two, three, or four on the state standardized test. On a national level, the use of these identified strategies could help eliminate the deficit that separates African American students from white students in mathematics proficiency as indicated by the National Assessment of Educational Progress (NAEP). Higher achievement in mathematics for African American students could lead to an increase in the students' self-efficacy which may result in more students enrolling in advanced high school mathematics courses, attending college, and seeking careers in fields that require a mathematics background. Additionally, students may become equipped with the skills necessary to successfully thrive in a technologically advanced society. The findings of this study may improve teachers' pedagogical practices by shedding light on the potential benefits of incorporating culturally relevant pedagogy into their mathematics classrooms,

its potential effect on student learning, and the need for professional development in this area.

Recommendations for Actions

Teachers' continuous engagement in professional development opportunities is an integral part of ensuring that teaching strategies are effectively implemented (Allington and Cunningham, 2007). Therefore I recommend that the findings of this study in combination with the strategies suggested in the literature be used to develop a professional development opportunity for the teachers in the study participants' schools and ultimately on the district level. This would include a closer examination of the seven identified strategies and their connection with the major instructional approaches identified in the literature; specifically, the balanced approach to teaching mathematics and culturally relevant mathematics pedagogy. This professional development opportunity will allow the strategies to be shared with teachers in Grades K-5. By including all elementary level teachers, the chances of creating an alignment in teaching practices across the different grade levels will increase. The earlier the students are exposed to these strategies, the more likely an increase in student achievement in mathematics may be attained.

Additional professional development opportunities are recommended with a focus on helping teachers to effectively incorporate culturally relevant pedagogy into their mathematics classrooms. This professional development would include a focus on the elements and tenets of CRP as outlined in the literature and an examination of what these elements and tenets would look like in an elementary school setting. A specific

emphasis should be placed on helping students to develop critical consciousness and funds of knowledge as these components of CRP were not explicitly evident in the study. Additionally, the professional development should place a specific emphasis on assisting teachers in increasing their knowledge of their own culture as well as other cultures and developing ways to incorporate this knowledge into their existing mathematics instruction. Professional development opportunities that help provide clarity on fostering transcendence as defined in Feuerstein's mediated learning theory would be beneficial for both teachers and students.

A teacher leadership program is also recommended. This program would allow the teacher participants, who have already demonstrated success in teaching mathematics, to work with individual teachers to share the effective strategies that they utilize in their respective classrooms. These exemplary teachers could apply their knowledge and current skills of practice to provide one on one mentoring and coaching to other teachers. These teacher leaders will provide modeling in teaching practices that will lead to improvement in student learning in mathematics. This teacher leadership program would first be implemented on the school level. However, the ultimate goal is for this teacher leadership program to reach district-wide as well as state-wide implementation.

Researchers such as Martin (2009a) and Jackson and Wilson (2012) acknowledged that there is still much the mathematics education community does not know about how to effectively support African American learners in mathematics, and they have called for an in-depth examination of the instructional practices relative to these students. The findings of this study can contribute to this national conversation

regarding how to effectively support these learners. The findings of this study will be shared on the national level by presenting the findings at various national mathematics conferences such as those held and sponsored by the NCTM and the American Mathematical Society. Further, the findings will be prepared for publication in education and mathematics journals that are scholarly and peer reviewed.

Recommendations for Further Research

Although the mathematics research community has been instrumental in identifying instructional practices that have been shown to be effective in improving student achievement in mathematics, few studies have intentionally focused on identifying instructional practices that support African American students' achievement in mathematics. In this study, I identified seven strategies used by six effective teachers of African American students. These teachers were selected from three schools situated in the same cluster area of a single school district. Based on the findings from the study, I make the following recommendations for further research:

1. Future research studies should be designed to include a greater number of similarly identified teachers from schools across the school district. Additionally, similar qualitative studies should be conducted that extend beyond the district level to the city, state, and national levels.
2. Future studies should be designed to determine how to effectively combine the traditional and reform approaches to teaching mathematics in ways to benefit student learning.

3. More research is recommended that provides a closer examination of how transcendence and critical consciousness can be fostered in elementary level mathematics classrooms.
4. More research is recommended that provides a closer examination of each of the identified strategies in this study to determine which strategy if any has the most impact on improving student achievement in mathematics.
5. More research is recommended that provides a closer examination of the relationship between the identified instructional strategies in this study and students' motivation. Because education has placed such an emphasis on standardized testing and student achievement, the affective and motivational aspects of learning are often overlooked.

Reflections

As a teacher who loves mathematics instruction and serves African American students whose achievement level in mathematics often falls short of minimum state standards, I have always had an interest in exploring strategies that would help increase these students' academic achievement in mathematics. Therefore, my experiences with the process of conducting this study were excitement, curiosity, and extreme anticipation. I was anxious to know what the findings of the study would reveal. Because of my background as a mathematics teacher of African American students and my anxious anticipation regarding the findings of the study, I made a conscientious effort from the onset of the study not to allow preconceived notions or biases to interfere with the data collection process. This was especially important during the interview process. I was

careful not to design or ask the questions in a way that would lead the interviewees. Therefore, during the interview process I simply asked questions and allowed the participants to respond. Follow up questions were asked with the sole intention of gaining clarity or further elaboration relative to the participants' responses. The use of the three data sources was instrumental in ensuring that the data obtained were accurate and valid.

It was very interesting to find that six teachers at different grade levels from three different schools each used six out of the seven identified strategies in their classrooms. This made the findings particularly enlightening given that none of the teachers had interactions with one another relative to the topic of this study prior to their participation in the study. I believe the findings from this study can lead to long term implications for improving the achievement of African American students in mathematics. Overall, this study has been instrumental in validating and enhancing my role as a scholar, researcher and practitioner.

Conclusions

To close the existing achievement gap in mathematics that has persisted for decades for African American students, educators must work to ensure that these students have access to effective mathematics instruction (NCTM, 2008). In an effort to find ways to instructionally support African American students in meaningful participation in mathematics, I explored the instructional strategies of effective upper elementary mathematics teachers of African American students. In this qualitative study, I found

seven strategies that were utilized by these effective teachers and were attributed to the academic success of the students taught by these teachers.

These seven strategies were consistent with the instructional strategies to teaching mathematics that were suggested in the literature. These strategies utilized by the teacher participants displayed characteristics of both the traditional and reform approach to teaching mathematics which suggested that the participants primarily employ a balanced approach to teaching mathematics. In addition, there was evidence that the teacher participants employ elements of culturally relevant pedagogy as well as the criteria and modalities in Feuerstein's mediated learning theory However, there were elements of culturally relevant pedagogy and the mediated learning theory that were not evident among the findings of the study. As a result, recommendations were made regarding professional development opportunities that would place an emphasis on addressing those elements that were not evident in the study.

These strategies represent a significant step in assisting African American students in attaining high levels of academic achievement in mathematics. Because the teachers providing these strategies comprised a microcosm of the mathematics education community, more research in the area of effective strategies for African American students in mathematics is needed. This quest to increase student achievement in the area of mathematics will not end until all students are proficient in mathematics.

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Appendix A: Interview Guide

Academically, how would you describe your students?

What types of skills do students seem to master well?

What kind of skills or concepts seem to pose a challenge for your students?

Was the observed lesson indicative of what a normal math lesson looks like in your classroom?

Can you describe and elaborate on the materials or strategies you used?

How do you determine whether your students have mastered a math concept and how does this student mastery influence your instructional focus and strategies?

How do you ensure that your students are able to connect that skill to other skills that they are learning?

How do you establish a good working relationship with your students, especially with students you think might be struggling with math?

What actions do you take to help struggling students understand their own thinking in math, or is this something you don't find you need to do?

What do you do to help struggling students understand the importance of what they have learned in math?

How would you characterize the lesson that I observed earlier?

Can you discuss or elaborate on the specific strategies that you used during the lesson?

What was your rationale for using those particular strategies during the lesson?

Appendix B: Classroom Observation

Date:

Time:

Participants:

Location:

Notes to Self	Observation
	Instructional Strategies/Activities: Teachers interactions with students: