

A CRITICAL ANALYSIS OF FIRST GENERATION BLACK MALE COLLEGE  
STUDENTS' PERCEPTIONS OF THEIR PREPARATION FOR  
COLLEGE LEVEL MATHEMATICS

by

Kyla L. Williams

A Dissertation Submitted to the Faculty of  
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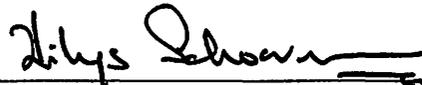
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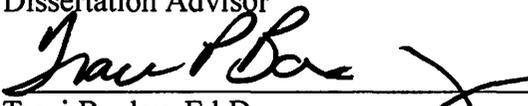
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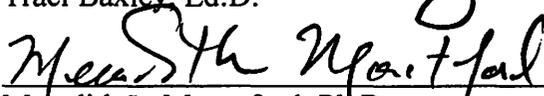
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This dissertation was prepared under the direction of the candidate's dissertation advisor, Dr. Dilys Schoorman, Department of Curriculum, Culture, and Educational Inquiry, and has been approved by the members of her supervisory committee. It was submitted to the faculty of the College of Education and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

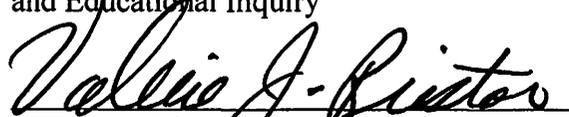
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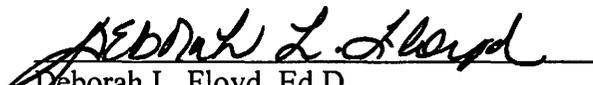
  
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## ABSTRACT

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President Obama's 2014 "*My Brother's Keeper*" initiative responds to the continuing educational disparities that the *No Child Left Behind* Act was intended to have addressed. The preoccupation with standardized testing and accountability over the past decade has revealed evidence of disparities in achievement between Black male students and their White counterparts. Critical Race Theorists have framed these persistent disparities as evidence of the opportunity gap and have advocated culturally responsive pedagogy that would facilitate students' academic success.

This study is contextualized in the particular concerns about the lack of preparation for college level mathematics among Black males. This multiple case study of eight first generation Black male college students examined students' perceptions of their attitudes towards and experiences in high school mathematics classes and their impact on their success in college. The eight participants, two representing each level of

mathematics preparation at a demographically diverse college in Florida, were interviewed twice: at the beginning and at the end of their first college mathematics course. Data from these 16 interviews were analyzed to identify reasons for their differential preparation.

Cross-case analysis revealed that students' attitudes towards mathematics were mediated by their perceptions of its relevance and their definitions of success in the subject. Students, especially those who were under-prepared for college mathematics, found math irrelevant to their lives. Students defined success in terms of grades and understanding. Student perceptions of their experiences in mathematics were impacted by test preparation, teacher-student relationships the race of the teacher, and perceived stereotyping by teacher. Framed within the perspective of culturally relevant pedagogy, this analysis reveals that the instructional patterns experienced by the students failed to interrupt practices that have traditionally marginalized Black male students. Finally, drawing on Critical Race Theory and Culturally Relevant Pedagogy to examine the disjunctions between high school graduation requirements and college preparation, the dominance of test preparation over conceptual understanding and the role of individual characteristics and parental influences in challenging deficit perspectives, the analysis reveals how the effects of the curriculum as a master script influenced participants' preparedness for college level mathematics.

## DEDICATION

I dedicate this dissertation to my daughter, Kaliyah, whose patience and love have been instrumental in shaping my life and aspirations. To my parents and grandparents who instilled in me a strong desire for education and nurtured my pursuit for self-worth and self-reliance. I am very grateful to all of you for being my strength. Love you.

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## CHAPTER 1. INTRODUCTION

According to the Florida Department of Education's 2010 report on performance on common placement test for Florida public high schools, 48.2% of Black males scored at or above the cut off score for mathematics, while Hispanics scored 66% and White students scored 81.6% (Florida Department of Education, 2013). This is also supported by the 2011 National Center for Education Statistics report, which is known as the nation's report card, regarding fourth and eighth grade students in US schools had alarming results for African-American students. The 2011 report card on the mathematical achievement levels by race/ethnicity indicated that African-American students are the lowest scoring of all student groups, with African Americans having an average score of 44.8% in fourth grade compared to 45.8% being the average for Hispanic students and 49.8% being the average for White students in public schools. A similar pattern is evident in the breakdown of scores in eighth grade, with African American students scoring 52.4% compared to 53.8% being the average for Hispanic students and 58.6% being the average for White students in public schools (National Center for Education Statistics, 2011).

There have been several efforts made to close the achievement gap by the implementation of the *No Child Left Behind Act* of 2001. The 2002 updates concerning the *No Child Left Behind (NCLB) Act* of 2001 (NCLB, 2002) and the Adequate Yearly Progress accountability, which measures inequalities in achievement, have gained increasing attention in the education system. Hallinan (2001) indicated that this gap

“remains a defining mark of racial inequality in public education today” (p. 51).

Anderson, Medrich, and Fowler (2007) suggested that the achievement gap historically has focused on how African American students have performed nationally on standardized tests such as the Standardized Achievement Test as compared to their White peers. NCLB (No Child Left Behind, 2002) was designed to improve the academic performance of children in US elementary and secondary schools, and to ensure that no child is trapped in a failing school. NCLB has shifted the focus to how well multiple groups (based on race, ethnicity, socioeconomic status, primary language, and ability/disability status) are achieving on these standardized test in comparison to their White or otherwise privileged peers from the same school, while trying to decrease the achievement gap among majority and minority students. Apple (2004) characterized the education situation:

An unyielding demand—perhaps best represented in George W. Bush’s policies found in the No Child Left Behind—for testing, reducing models of accountability, standardization, and strict control over pedagogy and curricula is not the order of the day in schools throughout the country. In urban schools, in particular these policies have been seen as not one alternative, but as the only alternative (p. x)

The author of the report, “Tracking Achievement Gaps and Assessing the Impact of NCLB on the Gaps: An In-depth Look into National on State Reading and Math Outcome Trends,” (Lee, 2006) concluded that neither a significant rise in achievement nor a decrease of the racial gap is being achieved under NCLB. Lee (2006) also concluded that the basic trends in both achievement and gains are almost exactly what they were before the act became law, which did not show any significant gains in mathematics for minority

students. McMillian (2004) also found that the NCLB Act is not “wise schooling” for African American male students. McMillian posited that the NCLB Act reproduces the current social order where European Americans are the standard and “others” must live up to this standard.

Proponents of NCLB argue that one way to reduce the achievement gap is to eliminate the "soft bigotry of low expectations" from society and educators (Paige, 2003). This argument coincides with research (Ladson-Billings, 1994) suggesting that low teacher expectations negatively affect students' academic achievements, which Ladson-Billings attributes to a lack of culturally relevant pedagogy.

The effort to ensure the right to equal education also supported by President Barack Obama and the White House in Executive Order 13.621 entitled “White House Initiative on Educational Excellence for African Americans” (2014) in which it is recognized and acknowledged:

Substantial obstacles to equal educational opportunity still remain in America’s educational system. African Americans lack equal access to highly effective teachers and principals, safe schools, and challenging college- preparatory classes, and they disproportionately experience school discipline and referrals to special education. African American student achievement not only lags behind that of their domestic peers by an average of two grade levels, but also behind students in almost every other developed nation. Over a third of African American students do not graduate from high school on time with a regular high school diploma, and only four percent of African American high school graduates interested in college are college-ready across a range of subjects. An even greater number of African

American males do not graduate with a regular high school diploma, and African American males also experience disparate rates of incarceration. (Exec. Order No. 13.621, 2012)

In February 2014, President Barack Obama launched a 5-year, \$200 million initiative, *My Brother's Keeper*, to address persistent opportunity gaps faced by males of color and to ensure those males who are willing to work hard get ahead and reach their full potential. The *My Brother's Keeper Initiative* is a joint effort between the White House administration and the philanthropic and private sectors that will connect young males of color with mentors, support networks, and the skills needed to go to college (The White House, 2014). President Obama's launching of this initiative will also ensure that males of color will have access to a high quality early education to get these students prepared for school at an early age as well as increasing the number of high school males of color graduates and preparing them for college.

The White House's initiative can also be linked to the two tenets of critical race theory (CRT) that are central to the theoretical framework of this study. They are (1) racism is normal and (2) a need exists to account for the unique voices of color used for this study (Delgado & Stefancic, 2001). Powell-Mikle (2003) observes that the first tenet, "racism is ordinary/normal" (p. 3) underscores that racism is harder to prove and easier to blame on its victims. Critical race theorists argue that because racism is such an ingrained feature in society, it is embedded in the practices and values of the American educational system. CRT is based on the notion that racism is normal in society and in the educational school system as a central tenet of this framework.

Despite discussions concerning the achievement gap among Black male students and the *No Child Left Behind Program*, Black male students still are the lowest achievers of mathematics and are more likely to drop out of school. Many researchers (Bruce, Getch, & Ziomek-Daigle, 2009; Lubienski, 2002; Thompson, Gorin, Obeidat, & Chen, 2006) have conducted studies that focused on the achievement gap between White male students and Black male students in the subject of mathematics. These studies have concluded that student demographics, educational influences, and educational backgrounds are factors that influence this achievement gap. Although demographics, educational influences, tracking, and teacher expectations have been linked to the underachievement of Black male students in mathematics, this study focused on the perceptions of Black male students regarding their own attitudes toward and experiences in mathematics; specifically, their perceptions of their own preparedness for college mathematics.

### **Research Questions**

In an effort to ascertain the attitudes and experiences of first generation Black male college students toward mathematics, through a multiple case study using qualitative methods, the following research questions were explored:

1. How do selected first generation Black male college students perceive their attitudes toward mathematics and their impact on their performance in mathematics?
2. How do selected first generation Black male college students perceive their experiences in high school mathematics classes and their impact on their performance in mathematics?

3. How do selected first generation Black male college students perceive their preparedness for college level mathematics?

### **Statement of the Problem**

Despite the increasing attempts to shrink the achievement gap in mathematics among Black male students and their peers, research on Black male college students reveals that they often experience difficulties with mathematics throughout grade school such as mathematics anxiety, language barriers in understanding mathematics concepts, and a misalignment of mathematical cultural identity (Jett, 2009; Stinson, 2008; Powell-Mikle, 2003). According to the National Center for Educational Statistics (2011), Black male students have been the lowest performing ethnic group in the area of mathematics across all grade levels. The disparities between the achievement of Black male students and Caucasian male students, frequently referred to as the achievement gap, also is found among various measures of mathematics achievement.

Educators are responsible for providing students with experiences that are immediately valuable and which better enable the students to contribute to society (Dewey, 1997). Dewey (1997) discusses the need for educators to understand the nature of human experiences and how it affects student behavior. Dewey's theory asserts that experience arises from the interaction of two principles, continuity and interaction. Continuity refers to each experience a person has that will influence his or her future. Interaction refers to the situational influence on one's experience. Therefore, one's present experience is a function of the interaction between one's past experiences and the present situation. Attitudes form directly as result of a student's attitude.

Hilliard (2001) suggested that teacher expectations have been linked to low achievement among Black male students, along with community factors such as a lack of positive mentors and resources. Critical race theorist Ladson-Billings (2006) suggests reframing the idea of the racial achievement gap as one of educational debt. She asserts that the “racial achievement gap” unfairly constructs students as “defective and lacking.” Therefore, Ladson-Billings and Tate (1995) maintain that this gap between Black male students and their peers is due to an opportunity gap in the educational system and is largely due to social inequalities.

In the state of Florida, these difficulties have led to 48.2% of Black male students scoring at or above the cut off score for mathematics to enroll in college level mathematics courses after graduating from high school and enrolling in college, with 51.8% of Black male students not being prepared to enroll in college level mathematics courses (Florida House of Representatives, 2011). Students are required to take college mathematics courses as a pre-requisite for courses such as accounting, economics, physics, and as general education courses required to obtain a college degree. Black male students who are not prepared to enroll in college level mathematics once being accepted into a college or university will have a difficult time earning a college degree.

Within the context of this study, the researcher’s intent was to add new knowledge to the database of first generation Black male college students’ attitudes toward and experiences in mathematics. According to Fishbein and Ajzen (1975), attitudes can be described as “a learned predisposition to response in a consistently favorable or unfavorable manner with respect to a given object” (p. 6). According to Littlejohn (2002), attitude is “an accumulation of information about an object, person,

situation or experience...a predisposition to act in a positive or negative way toward some object” (p. 32). Participant attitudes toward mathematics were influenced by experiences that were encountered in their high school mathematics courses, and therefore affected participants’ academic performance and achievements.

### **Purpose of the Study**

For the purpose of this study, the qualitative multiple case study design was used in an effort to examine selected first generation Black male college students’ perceptions of their own attitudes toward and experiences in mathematics. This study sought to move beyond the focus on test scores highlighting achievement disparities and to focus on the perceptions of these Black male college students regarding their experiences in and attitudes toward mathematics in order to identify, from the students’ perspectives, the factors that contributed to these academic disparities. It was the researcher’s hope that obtaining this understanding would lead to efforts to increase the number of Black male students who are prepared for college level mathematics and decrease the number of Black male students who are not prepared to enroll in college level mathematics courses. In addition, the results of this study will help to inform the current understanding of Black male students’ perceptions about their own attitudes toward and experiences in mathematics.

The researcher held 16 in-depth interviews with eight participants to gain a better understanding of their mathematics experiences and how these experiences have influenced the college mathematics courses in which they were enrolled. Each participant was interviewed at the beginning of the Fall 2013 college semester to gain a better understanding of their attitudes toward and perceptions of their high school experiences

in their prior mathematics courses. The participants also were interviewed a second time at the end of the same college semester to gain a better understanding of the perceptions of their attitudes toward and experiences in their college level mathematics courses.

### **Theoretical Framework**

The researcher used critical race theory (CRT), critical race theory in education, and culturally relevant pedagogy to serve as theoretical frameworks to explore the perceptions of first generation Black male college students' attitudes toward and experiences in mathematics through the perspectives of Black male college students. The theoretical framework that informed this study was broken into 3 layers. The first layer being the origination of CRT, the second layer explored CRT in the realm of education, and finally the third layer examined the incorporation of CRT in education through culturally relevant pedagogy.

### **Critical Race Theory**

CRT developed in the mid-1970s as a number of lawyers, activists, and legal scholars across the country realized, more or less, that the “heady advances” of the civil rights era of the 1960s had stalled and were being rolled back (Delgado & Stefancic, 2001). Realizing that new theories and strategies were needed to overcome the subtler forms of racism that were gaining ground, early writers such as Derrick Bell, Alan Freeman, and Richard Delgado put their minds together to accomplish this task. These writers, along with others, held conferences and meetings at which the group discussed internal problems and struggled to clarify central issues of racism. Derrick Bell (1992), a legal scholar and civil rights advocate, became concerned with the progress of the racial reform that took place after the civil rights movement. Because of Bell's persistence in

acting upon these concerns, Bell is considered the father of CRT (Delgado & Stefancic, 2001).

The critical race theory movement is a collection of activists and scholars interested in studying and transforming the relationship among race, racism, and power. The movement considers many of the same issues that conventional civil rights and ethnic studies discourses take up, but places them in a broader perspective. CRT is a framework that can be used to theorize, examine, and challenge the ways that race and racism implicitly and explicitly impact social structures and practices (Delgado & Stefancic, 2001).

According to Harry and Klinger (2006), race has been an essential ingredient in the construction of US public education. Brantlinger (2006) explained that race plays a considerable role in the lives of children across the country, particularly African American students. The US educational system has had a significant amount of difficulty providing equality for African American students and providing them with the needed support that would enhance their chances of being successful academically (Brantlinger, 2006).

CRT investigates the social construction of race and the role it plays in the education policies that affect students of color. The term achievement gap refers to any significant and persistent disparity in academic performance or educational attainment between different groups, such as white, Black and Hispanic students, for example, or students from higher-income and lower-income households. Ladson-Billings (2000) and others have urged us to look at larger, systemic disparities such as opportunities to receive an education commensurate with their needs and cultural experience facing

families and students of color rather than at achievement gaps. Generally speaking, achievement gap refers to outputs - the unequal or inequitable distribution of educational results and benefits, while opportunity gap refers to inputs - the unequal or inequitable distribution of resources and opportunities. Therefore, for the remainder of this study, the term achievement gap will be referred to through the lenses of CRT as an outcome related to an opportunity gap.

Critical race theory builds on four main tenets. CRT has taken many forms, but the key tenets as explained by various scholars such as Delgado (1995), Yosso (2002), Ladson-Billings (1995a), and Tate (1997) have remained the same. These four tenets are (1) racism is the norm, (2) interest convergence, (3) social construction, and (4) the unique voice of color or storytelling, are noted consistently within most versions of critical race theory. The first tenet of CRT asserts that racism is normalized in American society (Delgado & Stefancic, 2001). This tenet recognizes that race is common and part of everyday life. This tenet also is known as “ordinariness,” which acknowledges racism as being “ordinary” in life (Delgado & Stefancic, 2001). The second tenet of CRT, interest convergence, asserts that culture will change only in the interest of the dominant group (Lopez, 2003). Interest convergence contends that racial relations maintain a White-over-Black hierarchy that provides benefits to the elite groups with the most power. The social construction tenet of CRT posits that race is “historically and socially constructed by how people are perceived and treated in everyday life” (Marable, 2002, p. 22). The last tenet of CRT underscores the importance of the unique voice of color, also known as legal storytelling. The legal storytelling movement urges Blacks and brown writers to recount their experiences with racism or injustice. According to Delgado and

Stefancic (2001), “the unique voice of color holds that because of their different stories and experiences with oppression, African American, Indian, Asian, and Latino/a writers and thinkers may be able to communicate to their White counterparts matters that the Whites are unlikely to know” (p. 9). The desired purpose of the current study was to examine the experiences of Black male college students’ in mathematics and attitudes toward mathematics based on their lived experiences. Therefore, the two tenets that are especially germane to this study are:

1. Racism is the norm, not the exception, and
2. A need exists to account for the unique voices of color, which Delgado and Stefancic (2001) and Ladson-Billings and Tate (1995) have referred to as legal storytelling or counter stories.

**Racism Is the Norm, Not the Exception.** Critical race theory delves into the invisibility of everyday racism. Hylton (2008) suggested that the “everydayness” of racism serves as a challenge to critical race scholars and activists as it focuses on “not only the more obvious, often overtly racist politics of the right, but also the more complex nuances finessed by the liberal left” (p. 350). Such racisms are products from “ingrained cultural attitudes” (p. 350) in which these attitudes are a product of a global system molded from years of racial colonialism and capitalism. Critical race theory allows scholars to analyze race and racism from a wider social perspective, which includes how racism is pervasive. From the perspective of CRT, the plight of Black males in schools is an expression of racism (Bell, 1992; Crenshaw, Gotanda, Peller, & Thomas, 1995; Delgado, 1995). Duncan (2002) stated that counter narratives explains the plight of Black male students as a persistent and troublesome outcome, CRT holds that their

situation actually is a manifestation of the racial politics that are intrinsic to the day-to-day functions of US society. Delgado (1995) concluded that society perceives a strange population as one that is too different from the mainstream and, therefore, has little concern and consideration for it, even when the group is vulnerable and endangered. Duncan (2002) explained that much research literature constructs Black males as an essentially different population and contributes to the perceptions that their plight in education is unremarkable, which suggests that Black males are too different from other students to succeed.

**Unique Voice of Color.** The unique voice of color or “storytelling” thesis holds that because of their different histories and experiences with oppression, Black, Indian, Asian, and Latino/a writers and thinkers may be able to communicate to their White counterpart’s matters that Whites are unlikely to know (Delgado & Stefancic, 2001). Storytelling, as described by Delgado (1995), was created by the out group, the members of the socially marginalized group, and was aimed to subvert the reality of the dominant group. CRT scholars believe and utilize personal narratives and other stories as valid forms of evidence. The term “voice” is the assertion and acknowledgement of the importance of the personal and community experience of people of color as sources of knowledge (Dixson & Rousseau, 2006). Storytelling has been a type of medicine to heal the wounds caused by racial oppression. The voices of people of color are required for a complete analysis of the educational system. Delgado and Stefancic (2001) suggested that Black male students need people to “truly listen to them” (p. 41), allowing those who suffer wrongs to express their grievances and to be heard on their own terms counters the powerlessness that constitutes a condition of oppression; it also provides those who do

wrong to others with an opportunity to participate in redressing the situation. Storytelling is used as a means of understanding multiple positionalities of individuals or groups of individuals, particularly those stories of socially and politically marginalized persons living at the intersections of identities. Through the use of participants' voices, this study sought to understand the experiences that were encountered in participant mathematics classes that influenced their mathematical achievement.

### **Critical race theory in education**

According to Ladson–Billings (1999), liberal discourse is deeply invested in the current educational system, which relies on the law and the structure of the system to provide equal opportunity for all. Liberalism equates to the “rights of man” or “whiteness as property” with individual, political and property rights, as well as with the freedom, to pursue one’s self-interest unrestrained. Liberalism can be associated with freedom, equality, individual rights and meritocracy, in which these ideals are firmly embedded in the Western culture and historical society (Zamudio et al, 2011). The major critique that critical race theory has of liberalism is that liberalism constructs an image of society as fair and providing equal opportunities for all where individuals rise and fall according to their own merits. According to Critical race theory, liberalism views inequality as a natural product of fair competition and also fails to examine capitalism, racism, and patriarchy as the structural causes of inequality. The liberal notion on education suggests that education provides equal educational opportunities on the basis of an idealized meritocratic society. However, critical race theorists in education contradicts the liberal notion by examining the contradiction that exists between the promise of schooling as the great equalizer and the concrete reality of educational inequality (Zamudio et al., 2011).

Critical race theory asserts that racial inequalities determine the educational experiences of minority children. According to Brayboy, Castagno, and Maughan (2007), these experiences translate into poorer schools, deficient teaching, lower achievement, and inadequate preparations for meaningful economic engagement. Brayboy et al's (2007) study on education found that "although there have certainly been structural changes to schools throughout the past 100 years, inequality has remained, with students of color consistently provided a lower quality education in a system that purports to provide equal educational opportunities" (p. 165). Ladson-Billings and Tate (2006) also explain that a school's curriculum is also a form of intellectual property that demonstrates Harris' (1993) absolute right to exclude, "The quality and quantity of the curriculum varies with the 'property values' of the school" (Ladson-Billings & Tate, 2006, p. 54). Ladson-Billings (1999) discusses five areas in which critical race theory can be applied to educational approaches: curriculum, instruction, assessment, school funding, and desegregation. Specific to this study, culturally relevant pedagogy was used to examine the instruction area of how critical race theory is linked to education.

### **Culturally Relevant Pedagogy**

Culturally relevant pedagogy is a term Ladson-Billings (1994) describes as "a pedagogy that empowers students intellectually, socially, emotionally, and politically by using cultural referents to impart knowledge, skills, and attitudes" (pp. 17-18).

Facilitating culturally relevant pedagogy essentially means that teachers create a bridge between students' home and school lives, while still meeting the expectations of the district and state curricular requirements.

According to Ladson-Billings (1995b), culturally relevant pedagogy rests on three criteria or propositions: (a) Students must experience academic success; (b) students must develop and/or maintain cultural competence; and (c) students must develop a critical consciousness through which they challenge the status quo of the current social order. For students to be academically successful, they must be provided with the tools to achieve academic proficiency, regardless of social inequalities. Ladson-Billings (1995b) maintains that culturally relevant teaching “requires that teachers attend to students’ academic needs, not merely make them ‘feel good’” and that it is imperative to have students “choose academic excellence” (p. 160). Students can develop and/or maintain cultural competence by having teachers who encourage students to learn to maintain their cultural integrity. Teachers can also build students’ cultural competence by linking students’ culture with learning. Finally, Ladson-Billings (1995b) contends that culturally relevant teachers “engage in the world and others critically,” and in order to do this, “students must develop a broader sociopolitical consciousness that allows them to critique the cultural norms, values, mores, and institutions that produce and maintain social inequities” (p. 160). While critical race theory discusses the theory to how students should be taught and the need for cultural education to be ingrained in to the curriculum, culturally relevant pedagogy puts those theories into practice in the classroom. Culturally relevant pedagogy maintains that teachers utilize the backgrounds, knowledge, and experiences of the students to inform the teacher’s lessons and methodology (Gay, 2000).

### **Scope and Limitations**

The study included within its scope the investigation of first generation Black male college students’ attitudes towards mathematics and their experiences in

mathematics. There were two limitations within the study that must be identified. The first limitation is that student participants may have been acquaintances of each other; therefore interview responses may have been biased, due to possible discussions pertaining participant responses. The second limitation included the researcher being a mathematics instructor at the college site used for this study. The researcher was awarded a sabbatical leave during the data collection process of this study, therefore the researcher was not an instructor of any of the participants.

### **Delimitations**

According to the National Center for Education Statistics (2011), mathematics achievement gaps are higher than reading opportunity gaps among Black students and their peers. Therefore, although there are multi-subject opportunity gaps among ethnicities, this study included only the opportunity gap related to mathematics. Black male students are considered to be the lowest achieving race and gender in the educational system (NCES, 2011). This study also was limited to gathering data from Black male college students to report the findings about the attitudes and experiences of Black male students toward mathematics.

### **Significance**

According to Fennema and Thomas (1998), researchers must continue to study how students learn, participate, and think about mathematics. Policymakers and educators must become knowledgeable about the challenges and issues of succeeding in mathematics, considering the gender and race of students. Jett (2009) conducted a qualitative multiple case study that analyzed the experiences of successful, high-achieving African American male students who were graduate students in a mathematics

or mathematics education program. He explored how these students gained access to college mathematics, how they achieved in college mathematics, and how their race and/or racism affected (or not) their performance in college mathematics. This study focused on Black male students, however, the current research study identified the perceptions of first generation Black male college students' attitudes toward and experiences in mathematics. This study provides educators with a better understanding of why there is such an opportunity gap between Black male students and their peers in mathematics at the undergraduate level. With regards to the opportunities in the future, the study may provide educators a framework that may increase Black male student success in mathematics. As educators and policymakers incorporate different standards and rules for mathematics, they should take into consideration the obstacles that Black male students face in achieving mathematical skills needed to succeed in high school mathematics as well as in college level mathematics.

This study also revealed to Black male students the challenges that they may encounter when trying to succeed in mathematics. The study explored how Black male college students viewed their experiences in high school mathematics and their perceived level of preparedness for college level mathematics.

### **Role of the Researcher**

The researcher is a graduate student in the College of Education at Florida Atlantic University where she is pursuing her doctoral degree in curriculum and instruction. The researcher works at the local state college used for this study, where she has witnessed tremendous opportunity gaps in the subject of mathematics between Black male college students and their male peers.

In the winter term of 2010, the researcher was asked to teach a developmental mathematics course at the local state college, which would be a part of the learning community environment entitled Brother to Brother. This developmental mathematics course consisted of 15 Black male students who were recent high school graduates from local high schools. Although the class was a mathematics course, the students and the professor often engaged in discussions pertaining to their high school mathematics experiences and how/why they felt they were required to take a remedial mathematics course in college.

These discussions alerted the researcher to a problem related to the students' preparation for college level mathematics and the impact of this preparation on their academic success as well as on their self-concept. As a mathematics instructor at the college level, further investigation into these students' prior experiences with mathematics became a matter of professional relevance.

### **Definition of Terms**

*Attitude:* an accumulation of information about students' experiences in mathematics, a predisposition to act in a positive or negative way toward student mathematics experiences.

*Black males:* racial category used broadly to describe study participants who are perceived by educators to be Black or African American and have self-designated themselves as Black or African American as opposed to any other racial group category. In this study, Black males include African American descendants of slaves as well as Caribbean or African descendants who have self-designated themselves as Black or African American.

*Case study:* an in-depth study that enables the researcher to investigate a contemporary phenomenon within a real life setting (Yin, 2003). For the purpose of this study, the Black male student participants are the case within the preparation for college level mathematics or lack thereof.

*Critical race theory:* a theoretical perspective that seeks to transform relationships among race, racism, and power (Delgado & Stefancic, 2001). A framework that can be used to theorize, examine, and challenge the ways that race and racism implicitly and explicitly impact social structures and practices (Delgado & Stefancic, 2001).

*Culturally relevant pedagogy:* a term created by Gloria Ladson-Billings (1994) to which essentially means that teachers create a bridge between students' home and school lives, while still meeting the expectations of the district and state curricular requirements.

*Experiences:* Events or occurrences in which participants had previously encountered in mathematics.

*Preparedness for college mathematics:* mathematics knowledge and skills needed to qualify for placement into entry level college credit courses that meet general education requirements, without the need for remedial coursework in mathematics.

## CHAPTER 2. REVIEW OF THE LITERATURE

Using the theoretical framework of critical race theory (CRT) and culturally relevant pedagogy (CRP), this study examined the perceptions of first generation Black male college students' attitudes toward and experiences in mathematics. This literature review examines Black male students' achievement in mathematics through the lens of critical race theory, the incorporation of culturally relevant pedagogy, and the schooling of Black male students in grade school and their transition to higher education. This literature review is divided into four sections. The first section will summarize literature relating to CRT in education to underscore why this study focused specifically on Black males. The second section will summarize literature pertaining to CRP in education and the role CRP plays in increasing academic success. The third section will examine research on mathematics achievement among Black male high school students in the K-12 in the US educational system. The final section will examine remedial mathematics, mathematical success, and the mathematical experiences encountered in college level mathematics courses. This chapter concludes with a chapter summary, which synthesizes and focuses on the main findings and methodologies of prior research.

### **Critical Race Theory in Education**

Critical race theory is a framework that can be used to theorize, examine, and challenge the ways that race and racism implicitly and explicitly impact social structures and practices (Delgado & Stefancic, 2001). Zamudio et al (2011) suggested that critical

race theorists view mainstream education as one that serves to reproduce unequal power relations and academic outcomes. CRT also challenges educators and readers to consider the relationships that exist among race, the justice system, and society. Critical race theory in education is a framework that highlights aspects of institutions and schooling that describe the causes and effects of racial educational inequality. Critical race theorists call for educators to fulfill the commitment of the Civil Rights Movement of ensuring equal opportunities for all students regardless of their racial background. Conscious of the legacy of the unequal treatment of White students versus students of color in terms of access to high quality curriculum, instruction, educational funding, and school facilities, critical race theorists have focused on ensuring the same (rather than different) opportunities for all students. Ladson-Billings and Tate (2006) demonstrated the relevance of CRT to education. The authors argued that race was un-theorized in education. Ladson-Billings and Tate proposed that CRT could be employed to examine the role of race and racism in education. Other scholars such as Delgado and Stefancic (2001), and many others began to use CRT to explore the role of race and racism in the production of inequality. Ladson-Billings and Tate (2006), have been at the forefront of engaging and incorporating CRT in education. These scholars brought together a movement of critical race theory studies in education (CRSE).

The CRSE movement has followed a path of focusing not on who is being taught, but what is being taught (Ladson-Billings & Tate, 2006). CRSE asserts that racial inequalities in society determine the educational experiences of minority children and continues to exist in today's school system. CRSE scholars study links between schools, schooling, and the social context. Ladson-Billings (1999) suggested that the emphasis on

“sameness” (p. 21) in instructional practices was important because it helped build the argument for “equal treatment under the law” (p. 21). Educational equality theory claims that Black children are lower performers in academics than White children because Black children’s schooling opportunities and experiences are not equal, regardless of the fact that “equal educational opportunity has been one of the main tenets of public school education” (Ogbu, 1978, p. 49). Ogbu (1978) dismissed the thought of educational equality by noting that education fails to examine the cumulative effects of historically unequal education opportunities as well as the effect of historically unequal access to jobs on education achievement. Ladson-Billings (2006) asserted that the so-called “achievement gap” (Ladson-Billings, 2006, p. 3) is more accurately portrayed as an historically accumulated “educational debt” still owed underrepresented minority and poor students. Ladson-Billings addressed the claims that the academic achievement gap is to be blamed on the shameful products of a long history of discriminatory gaps in education along with opportunity gaps in education. Woodson (1990) also found that the educational system in America is guilty of “miseducating” people of color in order to maintain the dominant cultures status quo. Woodson continued:

The so-called modern education, with all its defects, however, does others so much more good than it does the Negro, because it has been worked out in conformity to the needs of those who have enslaved and oppressed weaker peoples. For example, the philosophy and ethics resulting from our educational system have justified slavery, peonage, segregation, and lynching. (p. ix)

DuBois (1935) agreed with Woodson’s conclusion and found the US public school system to be biased and unjust. Likewise, Noguera (1997) also found that many

Black male students are labeled as deficient, disadvantaged, dysfunctional, or, in many cases, different, which often time leads to inferior educational services. These labels, in turn, close the doors to social mobility for Black males. Ellison (1952) noted:

I am invisible. Misunderstood, simply because people refuse to see and listen to me. Like the bodiless heads you see sometimes in circus sideshows, it is as though I have been surrounded by mirrors of hard, distorting glass. When they approach me they see only my surrounding, themselves, or fragments of their imagination – indeed, everything and anything except me. (p. 8)

Agreeing with the disadvantages of Black male education, hooks (2004) asserted, “Even before Black boys encounter a genocidal street culture, they have been assaulted by the cultural genocide taking place in early childhood educational institutions where they simply are not taught” (p. 39).

Brayboy et al.’s (2007) study on education found that “although there have certainly been structural changes to schools throughout the past 100 years, inequality has remained, with students of color consistently provided a lower quality education in a system that purports to provide equal educational opportunities” (p. 165). According to Brayboy et al., biased and unjust educational experiences are reflected in poorer schools, deficient teaching, lower achievement, and inadequate preparations for meaningful economic engagement.

Powell-Mikle (2003) added to the literature on African American students’ mathematics achievement by stating that literature that focuses on the mathematics underachievement of African American students would rather blame the students for their failure instead of examining perceptions to help alleviate the problem. Powell-Mikle

(2003) stated, “Blaming African American students for their academic failure removes responsibility from society, the schools, and the teachers of these students” (p. 3). In addition to a blame the victim mentality, and the expectation that Black students must acquiesce to the mainstream, deficit perspective views Black students’ culture as “pathological and insufficient” (Lewis, James, Hancock, & Hill-Jackson, 2008, p. 139). The research of these scholars lends credence to the CRT assertion that racism is normal in education. These scholars illuminate the unequal educational opportunities that are bestowed upon Black male students. Not only are they not given equal quality education, but these Black male students are being blamed for their mis-education.

The second tenet of critical race theory central to this study involves the unique voice of color, also known as storytelling or counter narratives. Duncan (2002) and Howard (2008) assert that, “The first step toward changing the conditions that undermine the achievement of Black male students is listening to what they have to say about their academic and social experiences in schools” (Duncan, 2002, p. 141). Duncan (2002) and Howard (2008) conducted qualitative studies that explored the academic and social lives of Black male students. Using critical race theory, their studies examined the experiences and stories that students, teachers, and administrators used to explain the exclusion of Black male students in US society and social institutions such as schools. Duncan (2002) attempted to identify the participants’ points of conflict that, in part, help to sustain the conditions of oppression, while Howard (2008) explored the utility and appropriateness of CRT as a methodology tool to examine the disenfranchisement of African American males enrolled in the U.S. public education system. Through the participants’ voices, both researchers found that these Black male participants were aware of how race shaped

the manner in which they were viewed by their teachers and administrators. The teachers and administrators in Duncan's (2002) study explained that Black males were too dependent on others. Duncan found that the teachers at this school expressed that Black males are naturally academically and socially deficient and that these Black males themselves, largely if not solely, are to blame for their marginalization and exclusion at this school. The negative opinions of teachers and administrators fostered an inhospitable climate, which had a major impact on the Black males' academic achievement level. Duncan recognized that attempts to transform the academic and social experiences of Black male students must go further than incorporating programs and professional development workshops; Black male students need to be "listened to" to better understand their lack of academic achievement. Apple (2000) also advocated that listening to the stories and life experiences of these students, when permitted into the classroom and when given voice, can call to task the established or official knowledge of students in education.

Many studies report that Black males tend to be achieving at lower mathematical levels because of the stereotypes held towards Black males and how Black males respond to those stereotypes. When examining the education of Black males, society has suggested that Black males are too different from other students. According to Pino and Smith (2004), one explanation for this outcome is that Black students reported that they are fearful of being accused of "acting White" by their Black classmates and losing their cultural identity when demonstrating high achievements in mathematics. Bergin and Cooks (2002) reported that some students of color have resisted White hegemony and the school power structure by avoiding academic achievement and other behaviors that might

mean alliance with White culture. “It is difficult for Black students to develop a concept of their abilities that is different than the stereotype that the rest of society holds” (Robinson & Biran, 2006, p. 48). Ottley (2007) found African American students feeling isolated while at school and feeling as if they had to develop two personas, one to function at school and one to live at home. Some researchers have concluded that Black male students are expected to adapt to the majority, rather than not changing themselves to question the status quo (Arrington, Hall, & Stevenson, 2003; DeCuir-Gunby, 2007). DeCuir-Gunby’s (2007) findings also support the idea that the responsibility to fit in and not succumb to stereotypes falls squarely on African American students. This study also suggested that African American students cannot succeed in certain educational areas due to the stereotyping of the Black race.

Although the mathematics achievement gap among races has been brought to the forefront as an educational dilemma, this achievement gap does not affect all Black students. “Despite the highly documented underachievement and low-level course enrollment patterns of African American Males, it is not the case that all African American Males achieve at low levels” (Thompson & Lewis, 2005, p. 7). Thompson and Lewis (2005) conducted a study to document the story of a young African American male student’s success in mathematics. This study explored the relationship between mathematical achievement of African American males and their mathematics success. The study focused on a young African American male student who petitioned his high school to add advanced mathematics courses to the curriculum. The participant wanted to be successful in mathematics, but his school did not offer higher level classes in order for him to take advanced level classes. This study concluded with proving that some Black

male students are not given the opportunity to enroll in higher level mathematics courses because of the course offerings that are offered at the high school. This participant attended a predominantly Black school and, therefore, this school did not have the necessary high level mathematics courses to suit higher level mathematics students, which gives weight to the educational inequalities that plague the school system. The long standing unavailability of advanced level mathematics courses at Black schools highlights the extent of the normalized racism in the education system. Kelly (2009) also found that when examining predominantly Black schools, fewer students are enrolled in upper track mathematics courses. When Black students are enrolled in predominantly White schools, they are at an advantage for taking upper level mathematics courses. “A student’s chances of being enrolled in a high-track mathematics course are actually fewer in predominantly Black schools than in non-Black and integrated schools” (Kelly, 2009, p. 61). This proves to be true because predominantly Black schools do not offer high-track mathematics courses. From this study, one could conclude that the Black-White gap in course taking in mathematics can be explained primarily by differences in academic backgrounds as well as by the mathematics courses offered at the school.

Much like Thompson and Lewis (2005) and Lubienski (2002), Stinson (2008) conducted a study whose participants were Black male students who were successful in mathematics. Stinson’s study examined the socio-cultural discourses of these successful Black male students. Stinson used the unique voices of these participants as they reflected on their mathematics schooling experiences. One participant in Stinson’s study stated, “I was always . . . willing to learn . . . what I needed to do to achieve, and if the core curriculum [which included mathematics] was what they needed me to do, I was willing

to do it,” typifies the participants’ positioning of success in mathematics within their overall efforts toward success (p. 990). Stinson found that these Black male participants understood the racial structures embedded in society and these males discussed the discourses that surround Black males in society. Shujaa (2003) explains that these racialized structures embedded in society have historically been used to establish and secure hegemony within the dominant culture and within education. Shujaa further explains:

Students have to demonstrate the capacity to meet academic achievement benchmarks, such as standardized test performance at prescribed levels, a student must also play the game according to the rules that the politically dominant culture's elite establish and control. Students who rebel rarely make it. (p. 181)

Students who surrender to these racialized structures and stereotypes pertaining to the low expectations of Black male students will not be successful. As found in Stinson’s (2008), Black males must be able to recognize these discourses, but also be determined to overcome these strategies in an effort to succeed. Students will be able to overcome these obstacles through the incorporation of culturally relevant pedagogy.

Research studies in this section highlighted the challenges of mathematical success for Black male students due to racial inequalities in the school system. They reveal how, historically the US educational system has been a context for excluding certain students. Critical race theory in education recognizes racial inequalities ingrained in the educational system and attempts to ensure equal opportunities for all students regardless of their racial backgrounds. Scholars advocate culturally relevant pedagogy as a means for challenging and interrupting these patterns of marginalization.

## **Culturally Relevant Pedagogy**

Researchers (Ladson-Billings, 1995b; Irvine, 1990; Hilliard, 2001; Noguera, 1997) contend that Black students will continue to suffer academically as long as the US educational system and educational institutions refuse to acknowledge the culture based epistemologies of Black students and create educational curricula and pedagogies that are responsive to the Black culture. The incorporation of the epistemologies of Black students would include the application of cultural identities in education as well as acknowledging the social interactions between students and teachers. Perry (1993) posited that the academic achievement of Black students is directly related to their schooling.

The idea of incorporating culturally relevant pedagogy according to Ladson-Billings (1995b) is also to promote student success while engaging students in larger, social structural issues. Culturally relevant pedagogy rests on three criteria or propositions: (a) Students must experience academic success; (b) students must develop and or maintain cultural competence; and (c) students must develop a critical consciousness through which they challenge the status quo of the current social order (Ladson-Billings, 1995b). Several studies have concluded that incorporating these culturally relevant pedagogical strategies motivates students and are found to be success factors among students studying mathematics, especially African American students studying mathematics (Gutierrez, 2000; Tate, 1994).

Gay (2000) defines culturally relevant pedagogy as culturally responsive teaching as:

...using the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant to and effective for them. It teaches to and through the strengths of these students. It is culturally validating and affirming, (p.29)

Gay (2000) further explains that culturally responsive teachers realize the importance of academic achievement, but more importantly, the necessity of students' maintaining their cultural identity. Each of these concepts seek to meet the needs of Black students by utilizing students' culture to connect the curriculum and educational processes.

Within the discipline of mathematics and mathematics education, Tate (1994) explored the relevance of connecting mathematics to the lived experiences of Black students through culturally relevant pedagogy. He suggested that mathematics pedagogy should "provide students with opportunities to solve problems using their experiences" (p. 482). Tate (1994) further explains the need for traditional mathematics curricula to provide Black students with instruction that focuses on their culture and/or cultural traditions, which he claims the traditional mathematics curricula has failed to do. Additionally, the traditional mathematics curricula have also failed to elevate student success in upper level mathematics courses by not promoting the relevance of mathematics to students' everyday lives (Tate, 1994).

Rascoe (2012) introduces a term adept politics, which is similar to that of culturally relevant pedagogy to the extent of linking social structures to education, which explains that teachers who are adept to political strategies understand coping with behaviors and behavioral adaptations. These teachers, like teachers who exhibit strategies of culturally relevant pedagogy use their personal, professional, and social power to

encourage Black male students to succeed. When teachers incorporate their knowledge of Black males' academic behaviors, they begin to set the stage for adept politics. Adept political strategies aim toward transforming what and how a Black males thinks. The goal of adept political teachers is to influence students' personal theories on academic success. Ultimately, teachers who use adept political strategies understand their own power in and their influence on students' lives in a positive way.

### **Black Male Students' K-12 Mathematics Achievement**

In a review of data on the racial disparities in remediation in mathematics, Bahr (2010) found that small racial gaps in mathematics achievement that are observed as early as kindergarten widen over time such that, by college, Black and Hispanic remedial mathematics students enroll disproportionately in arithmetic, while White and Asian students enroll disproportionately in intermediate algebra or geometry. This finding shows that the opportunity gap not only exists in high school or upper level grades, but begins in elementary school. Bahr (2010) explains the significance of the remedial mathematics track is to restore opportunities to those who may be relegated to lower income living conditions. Bahr found that each educational grade level blames the previous grade levels for the gap in achievement. "African American youths and boys start with lower literacy scores than White youths and girls; these trajectories also diverge over time such that the gaps increase over time" (Matthews, Kizzie, Rowley, & Cartina, 2010, p. 763). Therefore, when graduating from high school and enrolling into college, Black male students do not excel in mathematics.

Mathematics proficiency is most often used as a tracking instrument, a basis for students furthering their schooling and having more job opportunities. By the eighth

grade, students have been tracked into distinct educational and vocational pathways (National Center for Education Statistics, 2011). Critical race theorists argue that the opportunity gap is linked to educational inequalities in race. Additionally, research explains that any racial disparities in mathematics preparation and achievement may be attributed to socioeconomic inequalities such as academic tracking, lower levels of parental capital, and the poorer quality of schools in minority communities.

A study by Garibaldi (1992) illustrated how teacher perceptions contribute to the opportunity gap among Black male students. In a study of Black males in New Orleans Public School System, Garibaldi surveyed and interviews students, teachers, and parents to obtain their perceptions about Black male student success in education. The study found that 40% of Black male students felt that their teachers did not set high enough goals for them, and 60% suggested that their teachers should push them harder. This study also found that when surveying a random sample of 500 teachers on whether they believed their Black male students would go to college, almost 6 out of every 10 teachers responded negatively. This result illustrates that teacher perceptions contribute to the opportunity gap among Black male students and that teachers also hold stereotypes toward Black male student achievement. Garibaldi suggested that teachers must change their attitudes about Black males' ability to succeed for the males to want to succeed. Teachers' negative attitude toward male student success inadvertently can "turn off" Black Male students' aspirations for their success.

Milner (2006) documented that one theoretical assumption that should be addressed is White educators' deficit thinking concerning the academic ability levels of students of color. Additionally, Douglas, Lewis, Douglas, Scott, and Garrison-Wade

(2008) used the theoretical framework of Milner's (2006) theoretical assumptions, which focus on problems that White teachers commonly experience when teaching students of color, particularly Black students in the K-12 educational settings. The Douglas et al. (2008) study found that Black male students also achieved at a lower level in high school because they were taught by teachers of different races, particularly White educators, who already have perceptions of Black student achievement.

The findings of the study by Douglas et al. (2008) highlight four themes among the responses of participants toward their experiences in high school. The first theme found that students felt they needed to be respected by White teachers; many students stated that they felt they were not respected because of the color of their skin. Milner (2006) agreed with these student perceptions by documenting that deficit thinking inhibits teachers from valuing the knowledge that students of color bring to the classroom. Although students felt they were not respected because of the color of their skin, they did however feel comfortable with the school environment and were satisfied with the environment of the school. These perceptions that Black students have about White teachers may get in the way of their academic achievement, especially if they believe that the White teacher is a racist. The second theme that emerged from the interviews conducted during this study was that students felt that their White peers also had negative perceptions of them because of the color of their skin and/or the type of clothes they wore. The last theme to emerge dealt with students feeling that the administrators did not try to establish a relationship with the African American students and were constantly at odds with the student population. The researchers made recommendations for White teachers who teach African American students. Like

Garibaldi (1992) and Gutierrez (2000), Douglas et al. (2008) recommended that teachers hold Black students to the same academic standards as their White peers.

Mathematics education researchers have given some attention to the mathematical opportunity gaps, but with limited quantity and depth (Lubienski & Bowen, 2000). Studies have reported achievement differences by race, but rarely have examined the processes underlying these gaps. Data collected by Lubienski (2002) found that Black students complete high school with less mathematical knowledge than their White peers, as measured by the NAEP assessment. Lubienski and Bowen (2000) conducted an analysis of equity research within mathematics education that concluded, “one gets the impressions that researchers look primarily at outcomes of these equity groups [ethnicity or class] and rarely examine how schooling experiences contribute to these outcomes” (p. 631). The schooling experiences of students in grades K-12 has been linked to their success in mathematics. The mathematics experiences in K-12 lead the path for students’ attitudes toward mathematics in the college setting.

The current study informs the literature review by examining participant perceptions of how their high school mathematical experiences impacted their mathematical success. The participant experiences revealed how the lack of culturally relevant pedagogy incorporated in their learning processes influenced their mathematical achievement. Participants’ voices specifically explained how the incorporation of proper instruction would increase their mathematical achievements.

### **Black Male Students’ College Mathematics Achievement**

One mission of the community or state college system is to educate students who are not financially able to enroll in a university. Another mission is to accept students

who do not have the required test scores to be accepted into a university. The community college system was formed in the early 20<sup>th</sup> century with the goal of providing a gateway to opportunities for students who otherwise would have been denied access to higher education (Phillippe & Patton, 2000). There are many students who enroll in community colleges because their test scores will not allow them to enroll in a university. This is a problem for many community and state colleges because they have to offer more remedial courses, and it is a problem for students because they have to pay for these courses for which they get no college credit. Where does the problem begin? Why are so many students not prepared for college when they graduate with a high school diploma?

The alarming number of students who are underprepared to take college level mathematics work in the state of Florida has become a problem in the school system and with the state legislators. It seems that the secondary curricula and standards have become diluted in order for students to graduate with a high school diploma. When graduating from high school, students are not prepared to enroll in college-level courses (Conley, 2005). Conley (2005) suggests that students preparing for college must understand the structure of knowledge and big ideas of core academic subjects, develop a set of cognitive strategies as they develop their understandings of key content, possess the academic behaviors necessary to successfully manage and engage with a college workload, and possess a contextual understanding of the navigational and cultural elements of gaining admission to and being successful in college. According to Conley (2005), students are not possessing or being taught how to possess these qualities and understandings while in high school to have a smooth transition to college. Evidence and research from the Florida House of Representatives (2011) also suggested that there is a

need to better prepare high school students for college. The state legislature has suggested ways to decrease the number of students who are required to take development education. One strategy is to raise the minimum GPA requirements for graduation. The second strategy is to raise the number of graduation credits needed for graduation. Even with these changes, the percent of students required to take remedial courses still is increasing in the state of Florida.

Conley (2005) found that the roots of the transitional difficulties in mathematics are found in the differing priorities of the developers of the high school and college curriculum. Committees that develop the state mathematics standards and exit assessments for high school focus on standards and mathematical skills that are important for high school graduates to pass standardized tests (Kirst & Reeves Bracco, 2004); whereas, college faculty are interested in ensuring students have mathematical mastery skills needed for success in various major programs and high-level college mathematics courses. These two differing priorities result in students being underprepared for college mathematics and make the transition from high school mathematics to college level mathematics more difficult.

Daley (2008) found that one reason students were underprepared for college mathematics classes is because the high school curriculum is not aligned with the community college placement test. When looking at the high school curriculum, studies show that the high school curriculum looks at the mathematics objectives broadly, whereas in order to get into a college level mathematics course, students need an in-depth understanding of certain skills. The main skills that are needed to pass college placement tests are mental arithmetic. High school students cover basic arithmetic, and some

students are allowed to use calculators. On the other hand, students are not allowed to use calculators on these college placement exams, which is a disadvantage to the students. States are trying to increase graduation standards by implementing mandatory proficiency tests, releasing report cards on schools, and awarding differentiated high school diplomas (Davis & Shih, 2007). This is a great effort to reduce remedial education placement in college, but evidence shows that some teachers are awarding passing grades to students who have not mastered the correct skills needed.

Hoyt and Sorensen (2001) conducted a study that supports the need for communication between colleges and high schools to come up with an instrument that outlines the skills needed to be successful in college mathematics. Hoyt and Sorensen (2001) examined the connection between high school mathematics courses, remedial education in college and students' high school preparation for college. The study found that although students had high remedial placement score and successfully completed college preparatory mathematics courses in high school, they were still placed in remedial mathematics courses when entering high school. Based on this study and prior research, researchers have raised questions about whether schools are preparing students well enough to succeed in college. In 1995, the National Center for Education Statistics (NCES) found that 29% of freshman entering into a 4-year college are required to take remedial education classes and 41% at the community college level (NCES, 1995). The colleges and universities blame high schools for low achievement, high schools blame the middle schools, the middle schools blame the elementary schools, and the elementary schools blame the parents for the poor preparation. This is what Hoyt and Sorensen (2001) have called the "chain of blame" (p. 26). The researchers examined students'

mathematics preparation, along with transcripts, from two different schools districts. The researchers examined the highest levels of mathematics courses taken in high school and preparation courses for standardized tests. The findings of the research study reveal that students who take more mathematics classes during high school are less likely to be required to take remedial mathematics courses in college. Therefore, Hoyt and Sorensen suggested that students take more mathematics classes in high school to be able to take higher level mathematics in college. A study by Roth, Crans, Carter, Ariet, and Resnick (2001) also found that students who completed only Algebra I in high school were less likely to be prepared for a college level mathematics course. In contrast, students who took Algebra II or higher in high school were more likely to be prepared for college level mathematics courses. Therefore, these researchers suggest that Algebra II should be a required course in high school. Researchers also suggest that students with average grades who have taken more challenging courses also are better prepared for college level work.

While the previous studies examine the difficulties in Black students' success in mathematics and remedial mathematics courses, McGlamery (2000) conducted a study to examine a 4-year project that succeeded in the recruitment and retention of African American males in upper level mathematics classes. Previous research has been conducted on the opportunity gap between African American male students and White students when entering college. White male students are entering college prepared to take college level mathematics courses, while many African American male students can only enroll in lower level mathematics courses because of their lower levels of preparation. "Students found it beneficial to interact with role models whose careers required

advanced mathematics” (McGlamery, 2000, p. 80). Also studying successful students, Perrakis’ (2008) study reported that the most successful components of the program were the small group projects, student centered mathematics, and the university/school partnership. The project helped 139 African American males to complete upper level mathematics classes and the program also proved that African American students can achieve in higher level mathematics courses. The reason why these students succeeded was because the teachers came up with vision statements and adhered to those statements in an effort to increase the level of mathematical achievement for these students. Similar to that of critical race theory, these teacher vocalized their expectations for student success and also incorporated a curriculum that was student centered.

Success in college for Black male students stems, in part, from their level of success in high school. Schwatz and Washington (2002) reported that high school rank indicates that men who were successful in high school probably felt more comfortable in the academic environment of college. Bonous-Hammarth (2000) reported that courses taken in high school serve as a building block for college inquiry in these fields. School adjustments to college and a sense of “fitting in” also appeared to be important in the success of African American men in college. “Positive interactions with professors, friends, administrators/staff, and the African American community are critical in contributing to one’s satisfaction” (Patitu, 2000, p. 89). Good, Halpin, and Halpin (2002) reported that if colleges offer multi-dimensional programs that use upper-class division mentors to model scientific and mathematical problem-solving strategies, this will assist African American students with enhancing their mathematical thinking skills and abilities.

Weinstein (2004) conducted a study at a large Midwestern university to focus on the students who were enrolled in a basic algebra course. As a basis for his study, he maintained that “the perspective of mathematics students, particularly remedial students, is often overlooked or ignored” (p. 231). The researcher analyzed the process of negotiation during tutoring sessions, negotiation over conflicting meanings of mathematics knowledge, and other possible arenas for negotiation. These findings dealt with how these students negotiated learning with those who were teaching them. From student interviews, students felt more successful with the tutor because the tutor acted as an instructor by catering to the student’s learning style and by giving the students positive feedback. Weinstein (2004) found that the give-and-take relationship between student and tutor could actually produce successful procedural and conceptual understanding with a change in the students’ perceptions of their own success.

Similar to Weinstein (2004), Flowers (2006) did a similar study on the African American males, which revealed that African American males who attended a 4-year institution were more likely to attend study groups outside of the classroom. African American males at 4-year institutions also were reported to have more social integration experiences and were more likely to participate in school activities and clubs than Caucasian students. This indicates that the focus of African American males is more on activities and clubs than on demonstrating gains in academics. African American students chose to get help outside of the classroom as opposed to the Caucasian students who paid more attention in class.

Treisman (1985) conducted a study that examined the mathematical performance of African American students in their first year of calculus. The purpose of this

ethnographic study was to determine what factors contributed to the differences between African American and Chinese students. Twenty African American and 20 Chinese American calculus students from the University of California Berkley were interviewed. In comparing the studying skills of the different students, Treisman found that the Chinese students had different studying methods while doing homework. The Chinese students often worked together in peer groups, sharing mathematical understanding, and taking difficult problems to teacher assistants, while the African American students often studied alone. Treisman's study indicated that for African American students to be successful in mathematics, these students need to approach the learning of mathematics differently. This study concluded that while society blamed the high failure rates on the students' lack of motivation, lack of educational background, and lack of family emphasis on education, a real core of the problem rests in the lack of group interactions to increase mathematical success (Treisman, 1992).

The success of Black male students is a joint effort between the students and the instructors. For students to be successful in college mathematics courses, "they should have both motivational beliefs and self-regulated learning strategies" (Kesici & Erdogan, 2009, p. 632). Palmer and Gasman (2008) reported that success in college does not lie in the hands of any one person; rather, the entire university community is responsible for deploying social capital in a way that promotes student persistence and retention. In this manner, colleges and universities incorporated the use of learning communities.

"Blaming African American students for their academic failure removes responsibility from society, the schools, and the teachers of these students" (Powell-Mikle, 2003, p. 3). In a study that examined successful Black engineering majors in their junior and senior

years of college, McGee (2009) found that the 14 student participants embraced “succeeding against the odds” mindset demonstrating positive racial identities and continuing in their spiritual upbringings. An additional finding was that students’ families were an important factor in their success.

A research team at the University of Maryland-Baltimore County also studied high achieving African American males (Hrabowski, Maton, & Greif, 1998). At this institution, researchers became concerned about the status of African American male students in college science, mathematics, and engineering (SME) majors and decided to learn more about this group by studying the habits of the highest achieving students who were enrolled in the Meyerhoff Program. The program provides scholarships to students, academic advising, and tutoring. By focusing on the highest achieving African American male students in this program, Hrabowski et al. (1998) hoped to identify attitudes, behaviors, habits, perspectives, and strategies in hopes of reversing the downward spiral that seems to be occurring among African American male students in education.

According to Hrabowski et al., the following factors are critical for success in college among African Americans in mathematics and science: an adequate high school academic preparation, analytical skills, strong study skills, time management skills, advising, academic as well as social integration, and motivation and support.

To further examine the success of African American college students in mathematics and family systems of supports, Ellington (2006) conducted a qualitative case study to examine the experiences of African American mathematics majors. Using semi-structured interviews and individual interviews, Ellington sought to understand how three students perceived their experiences throughout their mathematics education, and

how their perceived experiences impacted their success at the college level. The types of experiences that were examined included the students' personal, social, and cultural experiences. For the purposes of this study, Ellington interviewed two students who attended a predominantly White institution and one student who attended a historically Black college or university in Maryland. Ellington found that these students were successful in mathematics because they liked mathematics as a discipline or had a positive attitude towards mathematics. In addition to their attitudes toward mathematics, Ellington found that the students' parents, teachers, and peers provided the students with encouragement, which also led to their success in mathematics. These students also reported that they were motivated by their spiritual backgrounds instilled by their parents. Collectively, the parents of these students instilled in them the value of education, hard work, discipline, and giving back to their communities. In addition to the students' family influences, the students also benefitted from interacting with like-minded peers who also were high achievers in mathematics. The importance of family support is also evident in the study by Hines & Holcomb-McCoy (2013) who found that a two-parent home predicted positive outcomes for Black males. Finally, Mandara (2006) also noted that teachers' perception of parents being actively involved in their son's education increased their child's academic success.

In a qualitative study on success factors of Black male students in college, Harper (2012) documented 219 Black male student's academic achievement, to explore institutional programs, peer and family relationships, and the effects of these factors on student's academic goals. The factors included the ability to navigate on racially charged campuses, becoming engaged on campus through leadership opportunities, having family

and peer support, and developing positive relationships with peers and mentors. This study contributed to Black male education by recognizing current initiatives that aim to address the problematic condition of college success for Black males and factors that contributed to their success.

Studies conducted by Pino and Smith (2004), along with Stewart (2006), described how Black males or their families contribute to the underachievement in education, while McGlamery (2000) and Lubienski (2002) pointed out the role of schools in creating the underachievement outcome. Fordham (1996) found that some Black families, in essence, encourage their sons to accept racism in education by “accepting subordination and the attendant humiliation and preserve gender domination” (p. 148). Fordham (1996) explains that this becomes a generational curse because the parents also were taught to accept that they are minorities. The consequences of this acceptance construct identities that are not suitable for themselves, their peers, or their families and also continues to reflect negative images of Black adolescents. Fordham’s study examined a high school in Washington, D.C. to report how representation, or imagination, affects the academic performance of African American adolescents. In the study, Fordham explored African Americans’ culturally and politically constructed views of “Blackness,” and studied how successful students were able to succeed.

Stewart (2006) also found that academic achievement among youth is influenced by aspects of their family environment. This study was based on Bronfenbrenner’s (2005) ecological perspective, which considers the fact that the family is conceptualized as a context that directly and indirectly influences the behavior of youth, which increases the likelihood of academic success. Stinson (2008) discovered that successful African

American males found that observing or knowing family who benefited from education by achieving financial and societal success became influential to them. The life experiences of these successful individuals in Stinson's study found that their inner circles of family and community members provided proof that there was a payoff to education and, with determination, they, too, could succeed, rather than accepting that they were minorities.

Many scholars have chosen to move beyond the statistics on the achievement outcomes of Black male students and focus on their perceptions of the experiences that yield this achievement. Similar to the previous studies on Black male students who were successful in college mathematics, Warde (2008) also conducted a study that included focus group interviews with eleven African American male graduate students who were successful in obtaining their bachelor's degree. Warde's participants were to recount "the key events and/or experiences that contributed to their successful completion of a bachelor's degree" (p.61). This study yielded valuable insights pertaining to the participation of African American male students in college. The phenomenological investigation revealed four themes: (1) having an epiphany about the importance of higher education, (2) having access to the resources needed to attend and persist in an institution of higher education, (3) having a mentor, and (4) being resilient when faced with obstacles (Warde, 2008). These findings support other research findings of success factors among African American students (Brown, 2006; Fullilove & Treisman, 1990). Participants in the current study recount experiences that contributed to their academic achievements in college level mathematics. Through participant voices, utilizing

professors' office hours and also frequently visiting the mathematics tutoring lab were also factors that contributed to their mathematical success in college.

### **Summary**

The mission of the educational system is to educate everyone regardless of race, gender, and ethnicity. According to critical race theorists, this has not been the case. As proposed by CRT scholars, racism is embedded in all educational, political, economic, and societal facets. This study sought to explore this assumption evident in the central tenet of CRT that "racism is normal" (Delgado & Stefancic, 2001) underscoring hook's (2004) explanation of the "permanence of racism" (p.11) as a reality for people of color in the US. This study was embedded in the exploration of these racial realities within the education system, specifically with reference to the preparation of Black males for college level mathematics. The study is informed by the scholarly discussions of institutional racism in educational policy and practice, evidenced in both the achievement disparities among White students and those of color as well as the underlying explanation of those disparities as the manifestation of a historic opportunity debt. The study is also informed by the CRP framework, which requires educators to be culturally aware of race when planning curricula and to incorporate mathematical instructional policies and practices characterized by community building that enables all students to succeed. Moreover, CRP is credited with focusing on the role of traditional teaching practices that give privileges to majority races while marginalizing Black male students in curriculum and instruction. Guided by the principles of CRP, the study seeks to uncover the experiences that give rise to the perpetuation of these disparities or those that challenge them.

In doing so, this research evokes a second tenet of CRT: the value of the “unique voice of color” (Delgado & Stefancic, 2001) as a key component of our knowledge systems. Sometimes referred to as legal storytelling, it is an effective way to counter the master narratives used by policymakers to frame the experiences of the people of color. CRT posits that people of color use storytelling to reveal their humanity and to explain the fundamentals of racism that are embedded in racial policies and their experiences.

Across many research studies pertaining to Black male students and mathematics, mathematically successful students portray positive self-identities as learners of mathematics and/or positive mathematics identities (Thompson & Lewis, 2005). These positive attitudes show that successful Black male students view themselves as academically capable of doing and succeeding in mathematics. Hackett and Betz (1989) found that one’s attitude toward mathematics and one’s ability to succeed in mathematics can be defined as a person’s self-efficacy. A study done by Noble (2009) described the relationship between mathematics achievement and mathematical self-efficacy as a great contributing factor to understanding how Black male students perceive themselves as mathematics learners, and how these perceptions impact their mathematics learning. According to Martin (2009), people’s mathematics identity strongly parallels their racial identity, which therefore impacts their mathematical success.

A review of literature on the topic of the mathematical success of African American students in high school and college-level mathematics courses has revealed several socio-cultural factors such as family and community influences, along with parental expectations, which seemingly contribute to their underachievement or success. Positive peer interactions, family influences, and student-faculty interactions appear to

contribute significantly to the mathematical and general academic success of this population of students. Black male students tend to be unsuccessful in mathematics when they are stereotyped by society and educators expect them to fail. The current study further explored the perceptions of Black male college students' attitudes toward and experiences in mathematics; these Black male college students also discussed their own preparedness for college mathematics.

## CHAPTER 3. METHODOLOGY

The purpose of this study was to move beyond the traditional focus on the discrepancies in test scores to understand, from the students' perspectives, potential explanations for the disparities in academic preparation of first generation Black male college students. Qualitative research methods are effective in addressing issues related to the perceptions of human beings (Berg, 2007). These qualitative methods are suitable for uncovering the meaning of people assigned to their personal experiences (Berg, 2007). This chapter describes the research design, setting, and population used for analysis.

Qualitative research methods are used to gain insight into attitudes and perceptions and is defined as “a means for exploring and understanding the meaning individuals or groups ascribed to as social or human problem” (Creswell, 2009, pp. 3-5). Rossman and Rallis (1998) suggested that qualitative research has two unique features: (1) the researcher is the means through which the study is conducted, and (2) the purpose of the research is to learn about some facet of society. This researcher chose to use the qualitative case study design as a way to understand the perceptions of selected Black male college students as to their attitudes toward and experiences in their high school mathematics classes and their preparation for college mathematics classes.

### **Research Design**

This study drew on the case study design because as described by Creswell (2007), it enabled the researcher to investigate a past contemporary phenomenon within a real life setting and which is explored through one or more cases within a bounded

system. Yin (2003) suggested that a multiple case study design enables the researcher to explore differences within, between, and across cases. Merriam (1998) asserted, “The more cases included in a study, and the greater the variation across the cases, the more compelling an interpretation is likely to be” (p. 40). Therefore, this study used multiple cases to investigate the perceptions of eight first generation Black male college students’ attitudes toward and experiences in mathematics as well as their own preparedness for college level mathematics classes. The research questions that guided the study were:

1. How do selected first generation Black male college students’ perceive their attitudes toward mathematics and their impact on their performance in mathematics?
2. How do selected first generation Black male college students’ perceive their experiences in high school mathematics classes and their impact on their performance in mathematics?
3. How do selected first generation Black male college students’ perceive their preparedness for college level mathematics?

Yin (2003) also suggested that multiple case studies have a goal to replicate or not replicate findings across cases. Galloway and Sheridan (1994) added to Yin’s (2003) statement on multiple case studies by suggesting that this replication also enhances the validity and generalizability of the findings. The researcher used multiple case studies, where each student was considered a case, to determine if each student’s experiences in mathematics were different or similar. This study used the multiple case study research design to examine the differences and similarities that Black male college students experience in mathematics that influence their attitudes toward mathematics.

In this study, the researcher interviewed Black male college students to explore their perceptions of their own attitudes toward and experiences in mathematics within the school setting. The researcher decided to use the case study design to allow the researcher to describe, analyze, and interpret (Creswell, 2007) the experiences and attitudes of Black male college students toward mathematics. Merriam (1998) introduced two advantages of using a multi-case study. One advantage is to have the ability to analyze data within each case. This analysis focused on the attitudes and experiences of each participant or case in the study. The second advantage is to be able to do a cross-case analysis, which offered the researcher the chance to build arguments and to present similarities and differences across cases.

For the purpose of this study, a qualitative multiple case study research design was used to interview eight first generation Black male college students who attend a Florida state college and who were enrolled in a mathematics class. The study focused on male students as the case(s), the subject of Black male college students as the bounded system, and the individual participants who offered their experiences and attitudes toward mathematics as the unit of analysis. Therefore, each participant was considered a case in an effort to obtain a unique context about the perceptions of Black male college students toward mathematics.

### **Sampling Plan**

#### **Site**

The study examined first generation Black male college students' attitudes toward and experiences in mathematics. The study was conducted on the campus of one of Florida's state multi-campus colleges located in Southern Florida whose mission is to

achieve student success by developing informed students. Furthermore, it is the state college's goal to create students capable of contributing both knowledge and service in a service-based global society. A Florida state college was used in this study because students enrolling in a Florida state college are not required to have a minimum high school GPA or SAT/ACT score in order to be admitted, which is not the case for a student trying to enroll in the Florida state university system. Also students who do not meet the cut-off for test scores to enroll in the Florida state university system are required to attend a state college and enroll in preparatory classes to ready them for classes in the university system. This particular state college was used in this study because this college enrolls students from all surrounding high schools throughout the tri-county (Miami-Dade, Broward, and Palm Beach) area; therefore, the participants for this study may have different background educational experiences.

Before enrolling in college, students are required to take a college placement exam (if students did not report SAT/ACT scores) in an effort to place students in the correct courses. These college placement exams evaluate an incoming student's skill levels in reading, writing skills, essay writing, ESL (English as second language), and mathematics. From this evaluation, students are placed into their appropriate courses. In August 2012, 42% of students who enrolled in the Fall 2013 semester were required to take developmental English, reading, and mathematics courses, while 67% of students were required to take at least one developmental mathematics course. Each semester 75% of the college's mathematics courses offered are developmental mathematics courses. By high school graduation, students should have mastered the skills needed to pass these mathematics placement exams to prepare them for college level mathematics courses.

## **Participants**

The participants in this study were first generation Black male college students. The researcher decided on eight cases because the college offers three developmental mathematics courses (Developmental Math I, Developmental Math II, and Intermediate Algebra), in which some students, depending on their college placement exam scores, are required to enroll in before taking a college level mathematics course. Therefore, two participants were chosen from a Developmental Math I course, two students from a Developmental Math II course, two students from an Intermediate Algebra course, and two students who tested into a college level mathematics course. The participants were selected through a process of criterion sampling and stratified purposeful sampling. For the purpose of this study, each participant was viewed as an individual case. Table 1 describes each of the mathematics courses in which students were enrolled, their corresponding course ID's, and their course description.

Table 1

*Mathematics Course Descriptions*

<b>Mathematics Course</b>	<b>Course ID</b>	<b>Course Description</b>
Developmental Mathematics I	MAT 0018	A course designed to improve the student's abilities with arithmetic, basic algebra, and problem solving. This course teaches the student to understand and communicate concepts of arithmetic and algebra, both orally and written, and helps prepare the student for college-level mathematics and math-based courses. It is nontransferable. Due to the nature of this course, calculators are not permitted.
Developmental Mathematics II	MAT 0028	A course designed for the student who is comfortable with (1) performing arithmetic operations without a calculator and (2) solving linear equations in one variable. Problem solving involving real-life scenarios is an integral part of this course. This course enhances the student's problem-solving skills, and helps prepare the student for college-level mathematics and mathematics-based courses.
Intermediate Algebra	MAT 1033	A course designed for students with strong arithmetic skills and an algebra background, including solving linear equations in one variable and factoring polynomials. In this course, students will enhance their problem-solving abilities and their ability to communicate concepts of algebra in the language of mathematics, both orally and written.
College Algebra	MAC 1105	A college algebra course containing topics such as solving, graphing and applying linear, and quadratic equations, and inequalities; exponential and logarithmic properties..

After receiving approval from the Florida Atlantic University Institutional Review Board (Appendix A), sampling was conducted in two phases. First, the researcher

obtained a list of all pre-algebra, elementary algebra, intermediate algebra, and college algebra classes. The researcher emailed (Appendix B) the professors teaching these classes to ask for permission to speak to their classes in an effort to explain the research study and gather participants. Creswell (2007) described criterion sampling as one in which all cases meet a certain criteria; therefore, the researcher used criterion sampling using a recruitment tool (Appendix C) given to the students in the class to gain information on the students in an effort to see if the students met the four participant criteria for the study. When selecting the participants for the study, these four criteria included:

1. Self-identified as a Black man;
2. Member of the high school graduating class of 2013 (since the study was examining the participants preparedness for college mathematics, the participants experiences in high school mathematics classes had to be recent);
3. Have attended a high school with socioeconomic status (SES) percentage below 25% or above 75% (SES percentages were used to determine the high schools each participant attended and to ensure that students did not all attend the same high schools); and
4. Be currently enrolled as a student at the local state college in a mathematics course.

Creswell (2007) also described stratified purposeful sampling to illustrate subgroups and to facilitate comparisons, which was used to sort the recruiting tool by those who met the criteria for the study.

The researcher investigated the SES percentage of each high school located in the local county. From this information, the researcher listed the schools whose SES percentage is below 25% and listed the schools whose SES percentage is above 75%. The researcher then sorted the recruiting tool into categories of students who met the criteria for the study and who attended a high school from the list of high schools that met the criteria for the SES percentages. Of those assessments that met the four criteria, 20-25 participants were contacted via email and/or telephone call to ensure that they would be interested in participating in the study. Of the students contacted, eight were chosen using stratified purposeful sampling. The eight participants selected were contacted to participate in the one-on-one in-depth interviews. Following the recommendation of Glesne (2006), students known to the researcher (e.g., have taken a class with the researcher) or with whom the researcher has had a prior relationship were not included as participants in the study.

### **Data Collection**

Data for the study were collected in the forms of a recruitment tool, two in-depth interviews, and a follow-up questionnaire. The in-depth interviews were chosen as the primary data collection tool for this study based on their ability to yield more complete information (Bogdan & Biklen, 2007). According to Merriam (1998), the interview method is the best method of data collection when conducting case studies for a few selected individuals. Bogdan and Biklen (2007) explained that the open ended nature of the interview method is the most appropriate method for addressing questions that seek to explore individual perceptions.

The researcher began with a recruiting tool to recruit participants for the study. Once potential interview participants were identified, the researcher contacted them to explain the purpose of the study and to ask if the student would be interested in participating in the study. Prior to the interview, the researcher emailed each participant a consent form (Appendix D), which again explained the study and gave information about the timeline of the study. Interviews were held at a location that was convenient to the participant. Each interview lasted approximately 30 - 45 minutes. The researcher asked the participants permission to tape record the interview and assured them that pseudonyms would be used to protect their identity. Finally, the researcher contacted each participant to conduct a follow-up questionnaire.

### **Recruiting Tool**

The recruiting tool was used as a source for recruiting the participants for the study. The principal focus of the instrument was to determine which students met the demographic criteria to participate in the study. This assessment instrument was used to access:

- Student ethnic heritage,
- High school attended and graduating class,
- High school mathematics courses taken,
- Student's perception of mathematics,
- Student's perception of prior mathematics instruction, and
- Student ID number.

In an effort to gather participants, the researcher visited classrooms in which the researcher obtained permission from the professor and administered the assessment to the

students while explaining the research study and the participant's role, if chosen. In order to assure anonymity, the participants were not asked for their names or signatures, but were only asked for their school student ID number.

## **Interviews**

The study relied primarily on interview data gathered through two interviews with each of the research participants. The first interview focused on each student's high school experiences in mathematics. Since the students were recent graduates, their high school experiences were easier to recollect. The first interview also was used to examine how each student's past mathematics experiences influenced his attitudes towards mathematics. The second interview focused on the student's college experiences in mathematics. This interview focused on the student's own preparedness for college level mathematics.

**First interview.** Patton (2002) described the interview process as one that attempts to obtain information that cannot be observed directly. In the current study, participants were able to share with the researcher their mathematics experiences, perceptions, and attitudes toward mathematics. The initial interviews (Appendix E) were conducted as in-depth interviews in an effort to encourage participants to provide detailed and descriptive responses of their high school mathematics experiences. The initial interviews were conducted toward the beginning of the semester in an effort to understand each participant's mathematics experiences in high school mathematics courses, while his experiences were recent and easier to recollect. This interview protocol consisted of three questions that have multiple parts. Table 2 indicates how the interview questions corresponded with each of the research questions in the study.

Table 2

*First Interview Questions Corresponding with Research Questions*

Interview Questions (IQ)	Research Questions (RQ)
IQ 1 & 2	RQ 1 – Attitudes Toward Mathematics
IQ 3a, 3b, 3c, 3d, 3e, and 3f	RQ 2 – Experiences Toward Mathematics

Interview Questions 1 and 2 were designed for participants to explain their attitudes toward mathematics as a consequence of the experiences of their high school mathematics classes. Interview Questions 1 and 2 also pertained to the participant’s attitudes and feelings about mathematics in general, whereas Question 3 asked participants to describe their experiences from their high school mathematics classes. The participants were asked to describe their favorite and least favorite mathematics classes in an effort to determine if the types of mathematics classes taken influenced their attitudes toward mathematics. Interview Questions 3a, 3b, 3c, 3d, and 3f asked the participants to recollect the structure of their high school mathematics classes. These questions also allowed the participants to describe the teaching styles displayed by their high school mathematics teachers. Finally, Interview Question 3e asked the participants to express their opinions about their mathematical success and their mathematics instruction in an attempt to find out if the race of the mathematics instructor has an impact on the success of the Black male student in mathematics.

**Second interview.** The second interview (Appendix F) was conducted toward the end of the semester in an effort to examine the experiences the participants encountered in their college mathematics courses. Participants were able to discuss their perceptions of their preparedness for college mathematics courses. Participants shared the differences

and similarities in the high school mathematics experiences and their college mathematics experiences that have shaped their perceptions of mathematics. The study participants discussed their attitudes toward mathematics after being enrolled in a college mathematics class as opposed to their high school mathematics experiences. The participants were also able to explain whether they felt race was a determining factor in their attitudes towards mathematics. The interview protocol consisted of six questions. Interview Questions 1 and 3 aligned with Research Question 3 in an effort to obtain the participants' perceptions of being prepared to enroll in college mathematics classes. With six participants being enrolled in remedial mathematics classes, these interview questions allowed the participants to express their perceptions of their own preparedness for college level mathematics courses even though they were successful in passing their high school mathematics courses. Interview Question 2 was designed to allow participants to compare their high school mathematics experiences with their college mathematics experiences. The participants discussed techniques that could have been implemented in their high school mathematics courses in order to prepare them for their college mathematics courses. Finally, Interview Questions 4, 5, and 6 were closing questions that attempted to find out if the participants believed that race had an impact on mathematics learning and success. These questions are important in yielding information about race and mathematics, which also contribute to the tenets of critical race theory where mathematics education is concerned.

Table 2 indicates how the interview questions corresponded with each of the research questions in the study.

Table 3

*Second Interview Questions Corresponding with Research Questions*

Interview Questions (IQ)	Research Questions (RQ)
IQ 1 & 3	RQ 3 – Preparedness for College Mathematics
IQ 2 & 6	RQ 2 – High School Mathematics Experience
IQ 4, 5, & 6	RQ 1 – Attitudes Toward Mathematics

**Questionnaire follow-up.** After the second interview, the researcher conducted a follow-up telephone interview to clear up any remaining questions and to increase the validity of the transcriptions from the in-depth interviews. Transcriptions were shared with each individual participant in an effort to increase the validity of the interviews. The questions in the follow-up questionnaire were drawn from the responses from individual interviews and varied with each participant. The follow-up questions were used to gain clarification about participant responses and to ensure that participant voices were properly understood. Telephone interviews were conducted to thank the participants for agreeing to participate in this study.

**Data Analysis**

Yin (2003) suggested that when analyzing and interpreting multiple case designs, each case should be viewed as if it were a separate experiment, rather than a single sampling unit. With the suggestions made by Yin, each participant was viewed as a different case in the study. All interviews were transcribed verbatim and the researcher developed a list of codes, which are “tags or labels for assigning units of meaning to descriptive or inferential information” (Miles & Huberman, 1994, p. 56) that helped organize the data. The process of organizing data for analysis began with coding the

information collected. For the purposes of this study, the researcher used four levels of coding: open coding, constant comparative analysis, axial coding, and linking data to analysis.

The first level of analysis involved finding emergent themes, which Merriam (1998) referred to as open coding. Open coding is a line-by-line analysis of transcriptions of the interviews. To guide the study, the researcher looked for themes referring to attitudes, experiences, and college preparedness in the data from the transcriptions of each case/participant. The transcription phase of data analysis served as a tool to maintain the focus of the theoretical framework and research questions for the study. The researcher used different color sticky notes that were placed on the interview transcriptions to distinguish (a) recurring images, words, and phrases about the participants' attitudes toward mathematics; (b) recurring images, words, and phrases about the participants' experiences in mathematics; and (c) recurring images, words, and phrases about the participants' perception of their own college preparedness. Merriam (1998) also referred to this stage as a within case analysis in which the researcher analyzes each case separately.

The second level of analysis consisted of cross case analysis. Cross-case analysis is a research method that facilitates the comparison of commonalities and difference in the events, activities, and processes that are the units of analyses in case studies (Stake, 2006). According to Strauss and Corbin (1998) the art of comparison has to do with creative processes and with the interplay between data and researcher when gathering and analyzing data. The comparison in this step is between interviews within the same group, which means persons who share the same experience. It is important to compare

fragments from different interviews that the researcher has interpreted as dealing with the same theme and that have been given the same code, known as axial coding.

Strauss and Corbin (1998) referred to the third level of coding as axial coding. Axial coding “puts data back together” (Strauss & Corbin, 1998, p. 94) in an effort to form connections and to see the relationships between categories and subcategories. Axial coding was used in this study to examine how the categories and subcategories were linked within each participant.

The final level of the study included the researcher reporting the meaning of the cases. Lincoln and Guba (1985) referred to this stage as the “lessons learned” (p. 362) from the case. This level of analysis consisted of linking data to theory and theory to data. Therefore, answering the question: How did the data inform critical race theory in education and culturally relevant pedagogy.

### **Summary**

Chapter 3 outlined and described the methodology of the study. It further discussed the procedures that were used to collect and analyze the perceptions of eight first generation Black male college students’ attitudes toward and experiences in mathematics. The research design employed a qualitative multiple case study design, where each of the eight participants was considered as a case to make comparisons about the attitudes toward and experiences in mathematics.

## CHAPTER 4. FINDINGS

The purpose of this qualitative multiple case study was to examine eight first generation Black male college students' perspectives of their attitudes towards and experiences in mathematics education. The purpose of the analysis was to understand Black male college students' attitude towards mathematics, their high school mathematics experiences, and specifically how those attitudes and experiences impacted their own preparedness for college mathematics. Participants' attitudes were analyzed in an effort to gain an understanding into how the participants' attitudes toward mathematics affected their academic performances and achievements. Participants' perceptions were analyzed to identify themes that shed insight on the experiences that first generation Black male college students encounter in mathematics classes that lead to their mathematical success or failure. This chapter presents the findings from the analysis of data collected for this study.

The presentation of findings begins with case summaries for each participant (Anthony, Jonathan, Jason, Jeffrey, Michael, Peter, Samuel, and Timothy – all pseudonyms), which highlights the student's demographics, the student's proposed college major, and the information about the high school in which each student was enrolled. This portion of the findings also examines each participant's attitudes toward mathematics and their perceptions of their experiences in high school mathematics. The case summaries are followed by a discussion of the themes that emerged across the data pertaining to each participants' perspective on their attitudes towards mathematics and

their experiences in high school mathematics classes. The second section of the presentation of findings shows data analyses that emerged from the interview data. The findings were based on data collected from two in-depth individual interviews with each participant. In total, 16 interviews were conducted within the Fall 2013 semester. These themes were organized as responses to the research questions for the study.

## **Participants**

### **Case Summary #1: Samuel**

I think I'm pretty successful in math. I always maintained good grades in it.

Mostly because my parents made sure I was on top of things. I had the mindset to want to succeed for myself and take the time out to put forth effort to succeed.

(Samuel)

Samuel is a 20-year old student who is was enrolled in MAT0018 Pre-Algebra during the semester of this study. Samuel enrolled at this state college because he “wanted to do something with his life.” After graduating from high school two years prior to enrolling in college, he decided to get a job and not go straight to college. During the semester of this study, Samuel is still undecided about a major.

Samuel graduated from a public high school that integrated curriculum for talented students; he had transferred there in his junior year of high school. Before enrolling in this high school, however, Samuel attended a K-12 Christian school. This Christian academy offers a broad spectrum of programs that include college prep courses, honors and AP classes, fine arts, athletics, and Biblical instruction. While at the Christian academy, Samuel completed numerous mathematics courses that included Algebra I and II, financial algebra, and geometry. While enrolled in these mathematics courses at the

Christian academy, Samuel maintained a B average in each mathematics course. When Samuel transferred to a county public school his junior year of high school, he was not required to take any additional mathematics courses since he had completed his mathematics course requirements for graduation at the Christian academy. He did, however, decide to take Liberal Arts I. Although Samuel reported that he maintained a B average in this mathematics class, he described the structure and teaching of the class at the public school to be different from what he was used to at the private school he attended. Samuel described the differences between his experience in the academy and the public school he attended:

Well I have encountered different experiences because I went to the Christian academy from first to tenth grade and then I asked my parents if I would go to school and graduate with my neighborhood friends so I transferred to the public school for my eleventh and twelfth grade years of high school. And believe me the schools were totally different. At the academy, the classes were very small, well there weren't a lot of students in the class, so we had more one on one time with the teachers as opposed to at the public school. I mean the class sizes were really big, it was just more than I was used to so the teacher didn't really have time to make sure everyone in the class was on the same page. At the public school, I sat in the back of the class with some other kids. At the academy we were able to use manipulatives to show more real life stuff and we had hands on experiences with how certain math concepts were used in life. But at the public school the teacher will walk in the class, lecture and write notes on the board for

the students to copy, put example problems on the board, and we started doing our homework in the classroom if we had time. So the experiences were different. Samuel also recalled his parents expecting him to earn passing grades in school; therefore he was determined to pass his mathematics class. This parental influence also continued while Samuel was enrolled in college. Samuel explained that his college mathematics experience in the MAT0018 Pre-Algebra course was similar to that of his high school mathematics course at the public school. The course consisted of worksheets, which he referred to as busy work, that were to be completed in class; therefore Samuel was not motivated to attend classes regularly. Despite Samuel's lack of motivation to attend class, Samuel still maintained a passing grade.

#### **Case Summary #2: Anthony**

Math is very confusing and I've always hated it. You learn it today and it's gone tomorrow because you don't use what you learned. (Anthony)

Anthony is a 23-year old student who was enrolled in MAT0018 Pre-Algebra during the semester of this study. Anthony enrolled at this state college in an effort to pursue his Associate of Arts degree in general education and then to continue his college career by enrolling at a southern university to obtain his Bachelor of Arts degree in computer software engineering.

Anthony graduated from an urban high school located in the central portion of the county. This high school currently serves a 1% White, 98% Black, and 1% Hispanic student body. The school has maintained a "C" average for its school accountability school grade. The school is known as the first public school in the county to house an accredited International Baccalaureate diploma program as one of its magnet programs.

The school also maintains several community service-based organizations, one of which is a Brother to Brother service community organization for Black male students, of which Anthony was a member. When choosing mathematics courses to take in high school, Anthony based his class selection on his mathematics background. He explained:

I chose to take my math classes because of my math background. I would have to say having a better math background would have made me more successful.

Maybe if I would have been able to have some kind of tutoring early on, I would have been better at it or maybe even having teachers that took the time out to make sure that I understood. I would say my parents, but when they looked at my math homework, they were just as lost as I was. But my mom did finally decide to pay a tutor to help me somewhat pass in high school. Also if I was more focused and motivated like I am now in college, I most likely would have been better in math too. If I knew then what I know now, things would have been very different.

Unlike Samuel, Anthony struggled in his mathematics courses in which he maintained a “C” and “D” average, just to satisfy the graduation requirements. He also explained “Teachers weren’t worried about the students that were struggling in math; they catered to the high achieving students.” Anthony’s parents, like Samuel, also expected him to succeed; therefore his parents provided a mathematics tutor to help him in mathematics, but Anthony still struggled and therefore did not perceive himself to be successful in mathematics. As Anthony stated previously, he speculated that his attitude toward mathematics may be due to his student-teacher relationships that his high school teachers portrayed in classes. Anthony’s high school mathematics was similar to the mathematics experiences encountered by Samuel’s public school experiences. They both

experienced mathematics teachers whom they felt were not interested in all students succeeding in mathematics by the way the teachers structured their class.

As Anthony stated earlier, his focus and motivation in college is not like that of his focus and motivation from high school. Anthony described how his college teacher focused on the students' understanding of the material:

The teacher will play one of the math videos for us to watch, then he'll pause a video and ask if we understand what was taught. If everybody is good, we keep going with the videos. If people have questions about the video, then he'll re-teach it his way with the same examples and then do another example that is similar to it.

Anthony credits his understanding of mathematics in college to the teacher establishing a learning environment where students are comfortable asking questions for understanding. The college teacher attempting to make mathematics fun and giving examples that pertain to real world situations also were techniques that helped Anthony to focus on and understand mathematics.

### **Case Summary #3: Jeffrey**

I barely went to class or did any work, but I still passed. I don't even know how that was possible but hey, I graduated. None of what we learned in algebra seemed to apply to everyday life though. It's like we just had to take these classes to graduate from high school. (Jeffrey)

Jeffrey is a 19-year old student who was enrolled in MAT0028 Elementary Algebra during the semester of this study. Jeffrey enrolled at this state college in an effort to pursue his Associate of Arts degree in general education. Jeffrey does not know what

field of study he would like to pursue, but decided to attend college because he stated, “that’s what you’re supposed to do after you graduate from high school.”

Jeffrey graduated from a high school that is ranked within the top 1% of all public schools in the United States. This school has maintained a school accountability grade of “A.” This high school currently serves a 40% White; 23.7% Black; 30% Hispanic; and 6.3% Asian, multiracial, and Native American student population. Jeffrey felt that only basic mathematics is necessary for everyday life. Because of this belief, Jeffrey enrolled in the lowest mathematics classes offered at his high school, which were Algebra I, Algebra II, and geometry, in which he maintained a “C” average in each course because he felt he put little effort into passing.

Jeffrey described his high school teacher’s attitudes toward students learning as “teachers just pushed us through if we didn’t get it.” He also felt that his high school mathematics classes were very blunt in that the teachers would put information on the board and the students needed to figure it out. He doesn’t feel as though the teachers pushed or challenged the students to do and be better. Jeffrey also explained that his high school teachers put more effort into teaching the students FCAT materials instead of what was supposed to be taught in the class. Jeffrey also felt that he could have put more effort into succeeding in high school mathematics instead of solely depending on his teachers. Jeffrey explained that the college mathematical setting is more in-depth and elaborate than his high school mathematical setting because his college teachers took the time out to make sure the students understood the mathematical concepts and reasoning behind every step. He also explained:

The college mathematics teacher genuinely showed interest in helping students to pass and understand mathematics during class and student office hours. She broke the material down in a way that she wasn't dumbing it down, but making sure we understand. The teacher takes time to explain the steps of the mathematical concepts and explains why and how to get certain answers instead of just showing steps.

He also expressed that his college mathematics teacher also put effort into helping students by giving them every opportunity to earn extra points, which also made Jeffrey put more effort into passing the class. Jeffrey explained that if he had had the right teacher who believed in him and challenged him in mathematics in high school, he would have been successful in mathematics and more prepared for college mathematics.

Much like Samuel and Anthony, Jeffrey felt his high school teacher's style of teaching contributed to his attitude toward mathematics. According to these students, the quality time and expectations of the teachers increased the success level of their mathematics success. While Samuel and Anthony had parental influence, Jeffrey's parents expected him to do well in school, but, he explained: "My parents don't really know English and didn't grow up here so they don't really know much about the education over here, but my mom tries to stay on me." Teaching styles and parental influences are a contributing factor to these students' attitudes toward mathematics as well as their motivation to be successful in mathematics.

#### **Case Summary #4: Michael**

I am very successful in math because all my life I never failed a math class, I always made an A or B in all my math classes. I've heard that kids that come

from the islands are always excellent in math, so that might play a role in it too.

(Michael)

Michael is a 20-year old student who was enrolled in MAT0028 Elementary Algebra during the semester of this study. Michael enrolled at this state college in an effort to pursue his Associate of Arts degree in education. Michael currently is trying to decide if he would like to transfer to a state university to earn his Bachelor's of Science degree in physical education or if he would like to earn his Bachelor's of Science degree at the state college.

Michael graduated from a high school that is nationally ranked for its academic achievements through its IB Middle Years Program (Pre-IB), which is a prerequisite for the International Baccalaureate program that offers college-level academics to many of the county's most talented students in eleventh and twelfth grade. This high school currently serves a 48% Black, 43% White, 16% Hispanic, 4% Asian, 3% Multiracial, and 2% Native American student body. Michael chose to enroll in higher level mathematics courses in high school and always to maintain an "A" or "B" average in his mathematics classes, as well as scoring passing scores on the SAT and FCAT tests. He described in depth his attitude toward mathematics:

In high school, I loved every math class except geometry. I hated geometry with a passion. Even though I did all my homework and applied myself, I still didn't understand the concepts of it. I really didn't see the point of trying to find the angles and measurements of different types of shapes. Consumer math was my favorite math class because I was able to see how it applied to everyday life. And then some teachers just didn't really teach the subjects for that class at all. Some

teachers just taught from the FCAT prep book, like we didn't have textbooks for the actual class. Some teachers just taught FCAT.

Michael blames his lack of college preparation on the notion that teachers focused on FCAT. When asked what his high school teachers could have done differently to prepare him for college mathematics, he stated, "I really think that they should have worried more about me actually learning the material and understanding it rather than forcing it upon me due to the FCAT and SAT/ACT. We practiced more SAT/ACT problems throughout high school than anything." He explains that once enrolled in his college mathematics course, the course was not too difficult because the teacher offered office hours for students who needed extra help.

Similar to Samuel, Anthony, and Jeffrey, Michael's parents had educational expectations and encouraged him to obtain good grades in school, which contributed to his attitude toward mathematics. Michael's parents encouraged him to succeed in his schooling because of the educational background to which they were subjected. Michael explained:

My parents really stayed on top of me when it came to getting good grades. It was like when parents say they want their child to have a better education than they did. My parents are from Haiti and they really believed in getting a good education.

Michael and Jeffrey had similar experiences with respect to their parental influences. Both participants had parents who portrayed concern for their educational success, but were not U.S. natives and therefore were not accustomed to the U.S. educational system.

These parental expectations motivated the students to succeed and persist academically in high school.

### **Case Summary #5: Jonathan**

In a way I think that my high school teacher made an impact on my attitude toward math because the teacher did not put forth much effort into teaching the material, which is why I only cared to maintain a C average and why I probably don't have a strong attitude towards math. If the teacher had made it fun and interesting, maybe I would care for math more than I do now. (Jonathan)

Jonathan is a 22-year old student who was enrolled in MAT1033 Intermediate Algebra during the semester of this study. Jonathan decided to enroll at this state college in an effort to pursue his Associate of Arts degree before transferring to a state university. Jonathan plans to graduate from this state college in 2015 and transfer to a public university where he would like to earn his Bachelors of Science degree in computer engineering. After graduating with his BS degree, Jonathan would like to work for a computer software company such as Microsoft.

Jonathan attended a public high school that historically served as the only school Black residents of the county could attend. This high school currently serves 81% Black students; 10% white students; and 9% Hispanic, Asian, Native Americans, and multiracial students. This high school also houses medical and science/pre-engineering magnet programs. Although this high school offers an engineering magnet program, which includes numerous higher level mathematics courses, Jonathan enrolled in the minimum required number of mathematics classes that included Algebra I, Algebra II, and geometry. Jonathan, like Michael and Samuel, feels he has to use basic mathematics

in everyday life, mostly when dealing with money, and therefore only maintained a C average in his high school mathematics courses. Jonathan also feels that his mathematics average could have been better if he put forth more effort. Unlike, Jonathan's high school mathematics teachers, he explains that his college mathematics teacher forces the students to study and put forth effort into the class. He explained:

Like I said he gives a quiz at the end of every class to hurt or help our grade. I think it's to help our grade because it forces us to study and do the homework. He tries to help us as much as he cans in class and during his office hours. He also tries to give extra points whenever he can to help us boost our grade. I think he basically cares if we pass or not and gives us every opportunity to pass.

Similar to Jeffrey, Jonathan felt that his high school teacher's disinterest in teaching had a negative impact on his attitude toward mathematics, whereas the college teacher's willingness to help students succeed in mathematics, by forcing them to study, made a positive impact on their attitudes toward mathematics.

#### **Case Summary #6: Timothy**

I never liked math and maybe if I would have liked math from the beginning, I would have been a better math student in high school. But being lost in math from the beginning, like in middle school, just carried over to high school. (Timothy)

Timothy is an 18-year old student who was enrolled in MAT1033 Intermediate Algebra during the semester of this study. Timothy enrolled at this state college in an effort to pursue an Associate of Arts in sports management. After obtaining his Associate of Arts degree, Timothy plans to go overseas to hopefully become a professional basketball player or manage a professional basketball team.

Timothy graduated from a public high school that integrates an accelerated curriculum for “talented” students. This high school currently serves 40% White; 36% Hispanic; 18% Black; and 6% Native American, Asian, and multiracial students. The school’s curriculum consists of high caliber classes that include Honors and AP level. The core academics include math, social studies, science, and English. This school also offers a math college readiness course for high school seniors, in which Timothy chose to enroll to prepare him for college level mathematics. He explained the difference in the college readiness class, as opposed to his other mathematics courses:

The teacher in that college readiness class was way stricter than the other teachers. The teacher in this class basically lectured the entire time and did example problems on the board. By the time she finished talking, the class was about over. Now my other teachers on the other hand had a more laid back kind of class. They still lectured, but they didn’t talk the entire time. We were able to do problems on the board or in groups. Sometimes we had time to start our homework in class, but most times we didn’t. We were also able to talk to each other in that class and ask questions.

Timothy reported that the college readiness course structure was similar to that of his college mathematics course and therefore he believed that his college readiness course prepared him for college mathematics because of the similarities in the class structure.

Participants, specifically Timothy, Jason, and Peter, appeared to have a positive attitude toward their college preparedness if they have experienced positive attitudes toward their high school mathematics teachers. Once enrolling into the college mathematics classes, Michael, Jeffrey, Samuel, and Timothy were comfortable learning

mathematics because their college teachers portrayed a positive attitude toward their learning. The college mathematics teachers offered the students extra help when they were confused as opposed to the high school teachers who offered limited access after class.

### **Case Summary #7: Jason**

Math always came easy to me. Even if I didn't get a problem, once I spent time on it, I usually figured it out. Some concepts can be a little challenging but nothing I couldn't really figure out. (Jason)

Jason is a 19-year old student who was enrolled in MAC 1105 College Algebra during the semester of this study. Jason enrolled at this state college in an effort to pursue his Associate of Arts Degree in general education while taking religion classes for electives and then continuing his college career by enrolling at a Theology school to obtain his degree in religious studies. Jason eventually wants to become a preacher since he currently is a youth pastor at his church.

Like Anthony, Jason also attended the public high school that originally served as the only school that Black residents of the county could attend. This high school currently serves 81% Black students; 10% White students, and 9% Hispanic, Asian, Native American, and multiracial students. This high school also houses medical and engineering magnet programs. Because this high school offers an engineering magnet program, which includes numerous higher level mathematics courses. Jason enrolled in numerous mathematics classes that included Algebra I, Algebra II, geometry, and mathematical analysis.

According to Jason, his favorite subject is mathematics and he explained that mathematics always came easy to him. Jason recalled his involvement in his high school mathematics classes:

I was always the student that gets it and other students would get mad at me for asking too many questions or answering too many questions. They felt I was “showing off,” which I wasn’t, I just loved the subject. I guess you could say that some teachers appreciated me being in their class. Like I said I was the engaging student. But I’m sure that some teachers thought I was being disruptive. You could tell in their facial expressions.

Jason’s participation in his high school mathematics class and his love for mathematics prepared him for college level mathematics. When comparing his high school experiences with his college mathematics experience, Jason explained, “Not much has changed from my high school experience and my college one. The materials are tough and there’s more maturity in the class but besides that I still feel the same about math.”

Although Jonathan and Jason were enrolled in the same high school, Jason was enrolled in the engineering magnet program and therefore took more mathematics classes than were required for graduation. The magnet program classes were housed on the opposite side of the school campus and were taught by different teachers. Contrary to Jonathan’s experience of the teacher teaching students according to a standardized test, Jason did not experience this in his mathematics courses.

### **Case Summary #8: Peter**

I could say that I'm somewhat successful in math because even though it can be challenging at times, it's not something that's too impossible to figure out and understand. (Peter)

Peter is a 19-year old student who was enrolled in MAC 1105 College Algebra during the semester in which this study was conducted. Peter enrolled at this state college in an effort to pursue his Associate of Arts Degree in computer technology and then continue on to pursue his Bachelor of Science degree in computer technology engineering. He currently spends his time fixing and upgrading computers and would like to continue doing so but would like to have a degree in computer technology in an effort to pursue a career working with computers.

Peter attended a high school that housed only magnet programs, in which students were enrolled based on their academic standing in middle school. The school also is the second oldest high school in the county. The ethnic makeup of the school is 64% White, 24% Black, 4% Asian, 4% multiracial, and 4% Native American. This high school offers an International Affairs program, International Business program, International Communication program, many advanced placement, dual enrollment, and honors courses. Peter enrolled in numerous mathematics classes that included Algebra I, Algebra II, geometry, mathematical analysis, and statistics.

Like Jason, Peter had a positive attitude toward mathematics and also enrolled in higher level mathematics courses in high school. Peter, like Samuel and Anthony, explained that his attitude about mathematics and education in general was due to his parental influence and having teachers that took out time to help him learn the

mathematical concepts. He described his high school and college mathematics teachers to be similar. He explained:

I can say that all my math teachers were pretty cool. I don't think I had one bad math teacher. They all made the class feel comfortable with asking questions and tried not to make the class so boring. Having good math teachers that took time to help me actually learn the math contributed to my success in math.

Peter experienced teachers similar to Jason and Samuel by explaining his high school teachers took the time to break down the materials for everyone to learn. They also found ways that helped Peter to learn specifically, which contributed to his positive attitude toward mathematics.

Table 3 provides a summary of the characteristics of each of the study participants.

Table 4

*Participant Profile*

<b>Participant</b>	<b>Age</b>	<b>College Math Course</b>	<b>Attitude Toward Math</b>	<b>High School Information</b>	<b>High School Math Classes Taken</b>
Samuel	20	MAT 0018	Positive		Algebra I & II, Geometry, Liberal Arts, Financial Math
Anthony	23	MAT 0018	Negative	Serves: 1% W, 98% B, and 1% H	Algebra I & II, Geometry
Jeffrey	19	MAT 0028	Negative	Serves 40% W, 23.7% B, 30% H, and 6.3% Multiracial	Algebra I & II, Geometry
Michael	20	MAT 0028	Neutral	Serves: 48% B, 43% W, 16% H, 4% A, 3% Multiracial, and 2% N.A.	Algebra I & II, Geometry, Consumer Math
Jonathan	22	MAT 1033	Negative	Serves: 81% B, 10% W, and 9% H, A, NA, and Multiracial	Algebra I & II, Geometry
Timothy	18	MAT 1033	Negative	Serves: 40% W, 36% H, 18% B, and 6% NA, A, Multiracial	Algebra I & II, Geometry, College Readiness Math
Jason	19	MAC 1105	Positive	Serves: 81% B, 10% W, and 9% H, A, NA, and Multiracial	Algebra I & II, Geometry, Mathematical Analysis
Peter	19	MAC 1105	Positive	Serves: 64% W, 24% B, 4% A, 4% Multiracial, and 4% NA	Algebra I & II, Geometry, Statistics

*Note.* W = White, B = Black, H = Hispanic, A = Asian, NA = Native American.

As evident in the individual case descriptions, each participant was able to describe his attitudes toward and prior experiences in mathematics. A central theme in the participants' perceptions was the lack of relevance for upper level mathematics course that are taught in high school. Each participant also expressed their definition of being successful in mathematics and expressed their perceptions of their own mathematical success based on their prior mathematical experiences. Participants described factors that contributed to their mathematical success or lack thereof. Finally, participants were able to express their perceptions of their own preparedness for college level mathematics. Themes that emerged in the cross case comparisons of these eight cases will be presented next.

### **Attitudes Toward Mathematics Education**

As each participant discussed his attitude toward mathematics, the comments revolved around two issues that serve as emergent themes in the cross case comparisons. These themes are the necessity of mathematics and the definition of success in mathematics. Although participants' perspectives diverged within these themes, each of them contributed to these discussions, revealing the salience of these themes to these students' attitudes towards and ultimate success in mathematics.

Eight study participants revealed that the relevance of mathematics served as a central theme that influences student attitudes toward mathematics. Other participant perceptions that revealed common themes of mathematical success included one's ability to earn and maintain good grades as well as one's ability to understand mathematical concepts and content. In an effort to address the first research question regarding students' perceptions of their attitudes toward mathematics and the impact of these

attitudes on their mathematical success. This section will describe in further detail how these students' attitudes impacted their mathematics success.

### **Necessity of Mathematics**

The first interview yielded an observation that revealed an unfolding pattern in subsequent student interviews linking students' attitudes toward mathematics to their perception of its necessity for success in life and/or education. Of the eight participants, five stated that only basic mathematics such as addition, subtraction, multiplication, and division are necessary in everyday life, as opposed to upper level mathematics courses, which the students felt were not relevant to everyday life. Each of these five participants (Anthony, Jeffrey, Michael, Jonathan, and Timothy) were those who tested into pre-college level mathematics courses. In contrast, one participant (Samuel) who tested into a pre-college level mathematics course and the two students (Jason and Peter) who tested into college level mathematics courses noted that mathematics was necessary and portrayed positive attitudes toward mathematics, although for somewhat different reasons. The differences in reasons for their attitudes toward mathematics included the perceptions of the relevance of mathematics, the attitudes of their high school mathematics teacher toward students, the teacher's willingness to help students, their knowledge of teacher expectations, and their parental influences toward academics. Contrasting perspectives about the relevance of mathematics between Samuel and Anthony are represented in the following excerpts:

Mathematics is a good learning tool for life and is an easy subject to understand  
(Samuel)

Math is very confusing. You learn it today and it's gone tomorrow because you don't use what you learned and there's no point in learning it. I can understand needing to know basic math, but upper level math seems pointless. We don't even use it in everyday life. (Anthony)

The contrast in the perspectives of Samuel and Anthony is particularly relevant as they both tested into pre-algebra, whereas most of the other students agreed with the peer in the same mathematics level. The views of Samuel and Anthony were influenced by how they were taught. Both were introduced to and taught mathematics differently. Samuel had a teacher who used mathematical manipulatives and "hands on experiences" in class "to show how certain concepts were used in real life" that mimicked how mathematics is used in society. In contrast, Anthony noted that he was taught to learn mathematics to pass the class. Anthony stated, "Since most of the math we learn in high school deals with letters and  $x$  being equal to  $y$  and needing to know formulas, that's all we did was know them, not how to use them." Anthony's quote demonstrates how his level of learning did not give him an appreciation for mathematics because he was taught only the algorithms on how to solve a mathematics problem, instead of learning how it is applied to everyday life. On the other hand, Samuel expressed a positive attitude toward upper level mathematics because his mathematics teacher offered a better quality of pedagogical strategies for students to understand and apply mathematical concepts. The quality of pedagogical strategies has a direct impact on students' attitudes and understanding of mathematical concepts. These strategies allow students to understand how mathematical concepts are used in everyday life as opposed to rote memorization of algorithms.

Michael and Jeffrey both believed that upper level mathematics was unnecessary but basic mathematics is necessary. Michael noted, “Math is a basic subject that is required to complete high school.” He also believed, “Basic math seems more useful toward everyday use than any other math I’ve completed.” Jeffrey was more passionate about why he feels upper level mathematics is unnecessary. Jeffrey explained: “Math to me seems so unnecessary. The only thing we use in everyday life that we need math for is basic math like adding and subtracting and multiplying and dividing. I don’t see the point in Algebra I.”

Jonathan and Timothy have similar views about the purpose of learning mathematics concepts, which echoed the perspectives of Michael and Jeffrey. Jonathan and Timothy tested into intermediate algebra and attributed their dislike toward mathematics to being required to take upper level mathematics. Timothy stated:

I honestly feel that us being required to learn so much math is unnecessary. Only basic arithmetic like addition, subtraction, multiplication, and division is necessary when learning and being tested on mathematics, as opposed to learning about evaluating expressions and learning formulas. Because we are required to learn so much extra stuff, I don’t really like math. I just want to know the math that will help me in my major and in my life.

Jonathan agreed with Timothy and added, “Upper level math is not needed in everyday life, so why do we need to take all these math classes when we aren’t even going to use the material?”

The last two cases, Jason and Peter, both felt that mathematics was necessary to learn to succeed in life. Jason and Peter both tested into college algebra, which is the first

college level mathematics course offered at the state college. While Jason loves mathematics and always has been successful in the subject, the same has not been true for Peter. Peter explained:

Math is a necessary subject. It can be difficult without proper help but with the right instruction it can be fun. I can't say that I like or dislike math, it's just something that we have to learn, especially for everyday life. Well we don't need to know all the math concepts for everyday life, but basic math is necessary.

While Peter expressed that all upper level mathematics concepts are not used in everyday life, he did realize that learning certain mathematics concepts are useful in everyday life. He recalled how a public radio host/ actor publicly expressed how irrelevant mathematics was to him because he did not use his multiplication facts in his career. However, it is important to note, that learning multiplication facts is an important foundation for learning different aspects of mathematics, such as division, algebra, fractions, and other mathematical concepts.

These four participants (Michael, Jeffrey, Jonathan, and Timothy) lacked the benefits of understanding the necessity of learning upper level mathematics, when in fact mathematics is used so frequently in society, especially when the world has become so dependent on technology. According to Ladson-Billings (1999) the goal of culturally relevant pedagogy is to link mathematical relevance to students' everyday lives. The lack of knowledge about mathematical relevance limits student understanding of mathematics and therefore has an impact on student attitudes toward mathematics as seen by five participants (Anthony, Michael, Jeffrey, Jonathan, and Timothy).

The usefulness of mathematics and attitudes toward mathematics for these participants were based on the use of the concepts in everyday life; therefore, most of the participants in this study internalized the idea that upper level mathematics courses are not necessary. While these participants did not recognize the importance of enrolling in upper level mathematics courses in high school, it is important to note that two participants (Peter and Jason) enrolled in upper level mathematics courses in high school and therefore were prepared to enroll in college level mathematics courses in college. Not only does upper level mathematics courses prepare students for college level mathematics courses after completing high school, upper level mathematics courses also challenges student's prior mathematical skills and therefore helps to refine basic mathematical skills that enable students to transition those mathematical concepts into real-world applications. Finally, upper level mathematics courses encourages students to focus on theory and methods of specific disciplines in an effort to understand concepts that will enhance their career choices and opportunities. Participants in this study who did not understand the relevance of mathematics in their everyday lives were not able to connect the mathematics requirements to their everyday lives. Students' perspectives on the relevance of mathematics echo/support Tate's (1994) argument that traditional mathematics curricula have failed to optimize student success in advanced mathematics courses by not promoting relevance of mathematics to students' everyday lives. Therefore, students who are taught how mathematics is relevant to their everyday life may form positive attitudes toward mathematics. As revealed in the current study, students who did not understand the relevance of mathematics in their everyday lives developed a negative attitude toward mathematics. These negative attitudes therefore

impact the level of mathematics courses that students choose to study in high school, which in turn underprepares students for college level mathematics.

### **Definition of Success**

Previous research conducted by Martin (2009), defined students who are mathematically successful as “students receiving high grades in mathematics and expressing positive attitudes about mathematics learning” (p. 124). Similar to Martin’s definition of success, the current study’s data revealed participants’ belief that mathematical success is linked with earning good grades, understanding mathematical concepts and content, and/or liking mathematics as a discipline. Other definitions of mathematical success included how one’s ability to apply mathematical concepts, one’s ability to persist within the study of the discipline, and how one successfully teaches others mathematical content. The participant perceptions reveal how associating mathematical success solely on earning good grades influenced their attitude toward mathematics, as well as how their understanding of mathematical concepts influenced their attitude toward mathematics.

**Good grades.** Responding to the interview question about participants’ perceptions of their own mathematical success, each of the eight participants defined their mathematical success based on the grades earned in their mathematics classes. Anthony described being mathematically successful:

In my opinion, being successful in math is being able to maintain good grades and pass your classes with above average grades. Since I maintained mainly C’s and one D in math classes, I can honestly say that I was not successful in math at all.

Samuel also felt that maintaining good grades determined one's mathematical success. Although Timothy felt he was not successful in mathematics, he also associated his struggle to maintain passing grades in mathematics to define mathematical success. Similarly, Jeffrey felt unsuccessful in mathematics and also associated obtaining good grades with being mathematically successful.

Additionally, Michael associated being successful in mathematics with being able to score high points on standardized tests such as the FCAT or the SAT. Jason described in-depth his perception of mathematical success by stating:

Being successful in math is getting good grades of course, being able to understand the concepts, and then being able to help others that don't understand. For me I liked to help other people that didn't know because it helped me to understand a little better.

Those participants who felt they were not successful in mathematics because they did not obtain good grades were also the students who felt that upper level mathematics was not relevant to everyday life. One participant recalled how his attitude toward a mathematics class declined as his success (defined by grades) in his mathematics classes declined and vice versa. Anthony explains:

I had basically given up and just wanted to pass to get out of the class. I sat in the back of the classroom and just took the notes off the board.

Students who do not see their efforts pay off with high grades tended to resent the course and the subject, which was the case for Timothy.

The students' linking of success with good grades reflects a broader societal assumption that grades in high school are predictors of future success, or certainly

intelligence. For these students, this was not the case. Although they had passed their high school classes, these grades did not prove to be adequate predictors of how they would fare in college. The other underlying concern in equating success in mathematics to good grades is the narrow range of knowledge often encompassed in grades or test scores, especially when course material is not made relevant to real life experiences. When students do not link classroom knowledge to real world situations, that classroom knowledge is used to pass the class without having the correct understanding to link concepts to real world applications. Therefore that knowledge does not go beyond the classroom and the successful grades do not transfer into real world success.

A second problem with equating success with good grades is the reality that grades do not always indicate mathematical understanding. Often grades are given for effort, or for completing homework problems rather than solely for mathematical understanding. What this suggests is that a grade could push students toward compliance-oriented behavior, and distract from the importance of mathematical understanding.

**Understanding concepts.** Throughout the participants' definitions of mathematical success, five of the eight participants specifically expressed understanding mathematical content as a contributing factor to being mathematically successful. Instead of focusing on a correct procedure or solution, most participants saw the importance of understanding how and why a problem could be solved a certain way. This suggests that in regards to defining mathematical success, those participants recognized the relationship between conceptual and procedural knowledge. Anthony stated:

In my opinion, being successful in math is being able to understand and apply what is being taught and learned in your math classes. Math is very confusing and

I've always hated it. You learn it today and it's gone tomorrow because you don't use what you learned.

While Anthony felt that mathematical concepts are confusing because the concepts are not used, Samuel believed that understanding mathematical concepts was easy once you study and learn how to use the concepts. Similarly, Jeffrey believed that mathematics is a subject that is easy once you learn concepts. Jeffrey explained, "It's something I can't sit and look at it and then process it. It's something that someone would have to teach me on a daily basis for me to understand and for it to stick in my head." Jason and Peter both characterized mathematics as being a challenging subject, but they also noted that it was a subject that is not too impossible to figure out and understand with the proper guidance. These five participants saw the importance of understanding how and why a problem is solved a certain way. These participants also unknowingly portrayed the value of conceptual and procedural knowledge in understanding mathematics. Jason further explains:

I really never focused on the directions that the book gave me. The book is always so dumb and confusing. Once I [have] seen it done in front of me once or twice, it was a easy process for me to take it from there. My teacher used to always tell us to learn the concept and not memorize the steps.

Traditionally, the majority of assessment in mathematics learning has been based on students' abilities to manipulate knowledge in terms of algorithms. These algorithms are procedures that enable one to find answers to problems by performing a set of rules, without shedding light into a deeper understanding of why. However, Jason recalled his teacher explaining the importance of concept over procedure. While teaching procedures

are important also, students benefit from conceptual understanding because students will be less likely to forget concepts rather than procedures. If conceptual understanding is gained, a person can reconstruct a procedure that may or may not have been forgotten. On the other hand, if procedural knowledge is the limit of a student's learning there is no way to reconstruct a forgotten procedure. Therefore, conceptual knowledge as well as procedural knowledge is necessary for mathematical success.

The data revealed that students' attitude toward mathematics was linked to their perceptions of the relevance to their lives. The students who had the most positive attitudes towards mathematics were the students who had experienced success in their high school mathematics classes. All participants defined success in mathematics in terms of grades, although many students also emphasized the importance of understanding, underscoring the value of conceptual and procedure knowledge. The classroom content in which this is facilitated will be explored in the next section that focuses explicitly on the students' experiences within the mathematics classroom.

### **Experiences in Mathematics Education**

Culturally relevant pedagogy can help to emphasize the utility of mathematics among Black students by drawing upon the lived experiences of students. Within the discipline of mathematics and mathematics education, Tate (1994) argued for connecting mathematics to the lived experiences of Black students. He proposed that mathematics "pedagogy should try to provide students with opportunities to solve problems using their experiences" (p. 482). He further commented on the inability of traditional mathematics curricula to provide Black students with mathematics instruction that centers on their own culture, experiences, and traditions. The cross-case analysis of the data pertaining to

students' experiences with mathematics education at the high school and college levels revealed student-teacher relationships, perceived stereotyping, and the race of the teacher to be experiences common to student participants that may have contributed to their perceived mathematical achievement.

### **Student-Teacher Relationships**

Responding to the interview question about student-teacher relationships, participants expressed the importance of having a positive student-teacher relationship. This was especially pertinent in the first interview when all students noted that their high school student-teacher relationship directly influenced their attitudes toward and experiences in mathematics. Students who perceived themselves to be successful in mathematics (Samuel, Jason, and Peter) identified their teachers as contributing to their success in the following ways: the teacher genuinely cared about their mathematical success, had patience when teaching mathematics, and incorporated different teaching styles. Students noted that having a close student-teacher relationship with mathematics teachers makes students comfortable with asking questions. Students also noted how patient teachers positively influenced their mathematics classroom experience.

Jason and Peter, who both tested into college algebra, explained that their high school mathematics teachers made students feel comfortable asking questions in class. Although Jason explained that his high school mathematics teacher sometimes gave him negative facial expressions because he asked too many questions, he still felt comfortable enough to ask questions. Peter recalls how his high school mathematics teacher encouraged the students to ask questions so the students would be engaged in learning and the class wouldn't be boring, which no other participant mentioned about their high

school teachers. These two students' responses revealed that students felt comfortable asking questions and seeking extra help from teachers when the teacher encouraged and expected student participation.

Samuel, who attended two different types of schools, noticed the difference in his educational preparation. Samuel, stated:

At the academy I guess since the classes were smaller and the teacher helped everyone, the relationship was more comfortable than at the public school. At the academy me and my classmates always asked questions and we knew each other in the classroom. I mean the relationship wasn't uncomfortable at the public school. I guess because I didn't really know the teacher or really the students in the classroom I was more to myself, but I would say it was a regular student-teacher relationship. We went to class, learned what we were supposed to and that was it.

Samuel described "regular" as: "We went to class, learned what we were supposed to and that was it. There weren't any jokes or down time to get to know the teacher or anything like that. It was regular." It is important to note that what Samuel described as "regular" was antithetical to the more "comfortable" student-teacher relationships of the private school and not consistent with culturally relevant pedagogy. According to Samuel's experiences between the private school and public school, students were able to develop a comfortable student-teacher relationship when classrooms had fewer students. The lack of culturally relevant pedagogy was what Samuel perceived to be the "regular" experiences of students emerges as a concern in this analysis. It is also important to note that a class size with fewer students suggests that students have the potential to increase

mathematical success because teachers have a chance to incorporate teacher practices to benefit all students.

In contrast, those who did not experience success in high school mathematics (Anthony, Jonathan, Michael, Jeffrey, and Timothy) recalled their teachers not helping them to understand mathematical concepts, gave passing grades without the students earning them, exhibited no expectations for their students, and failed to challenge them in their academic abilities to succeed. All of these concerns were summarized in Anthony's perspective on the teacher-students relationship that he experienced. Anthony recalled:

There really wasn't a relationship, if that's what you want to call it. I had horrible teachers in math and they are part of the reason why I hate math so much now.

They didn't really teach, they talked. The teachers didn't teach us anything. The teachers weren't worried about the students who were struggling in math, they catered more to the high achieving students. They totally missed the purpose of teaching, especially in math. Teachers are supposed to help the struggling students as well as the students who understand, not to just ignore the ones that don't get it.

Anthony's perspective – as a student – on the difference between teaching and talking is pertinent. The link he makes between teaching and the struggling student is also instructive. Whereas “talking” to him clearly represented the teacher presenting information, “teaching” required a deeper connection with students to ensure that they learned from the teacher rather than merely hearing what the teacher was saying. Anthony underscores the need for a different type of student-teacher relationship that is committed to student understanding. It is also pertinent that Antony presents the perspective of a

student who was struggling, highlighting the necessity of a pedagogical commitment to all students.

Jeffrey and Michael also believe that the student-teacher relationship directly impacted their mathematical success. Jeffrey described the student-teacher relationship portrayed in one of his high school mathematics classes:

My teachers were blunt about everything. They put stuff on the board and you figure it out type of thing. The teachers were also too friendly. It wasn't a teacher-student relationship. It was more if I walk in class and I want to do the work, I do it and if I don't want to do the work, then I don't.

Jeffrey's perspective highlights similar view to that of Antony pertaining to that of teachers talking to the students. Jeffrey describes the link between the teacher putting information on the board and the students being required to learn the mathematical material on their own. This type of teaching is merely the transfer of knowledge and undermines to the objective of culturally relevant pedagogy in that it does not use a variety of teaching strategies to connect to each student's learning style. Jeffrey also refers to the student-teacher relationship as being 'too friendly' by linking the friendly relationships of teachers to that of teaching expectations. Jeffrey was unmotivated to put forth efforts to learn because the teacher did not motivate Jeffrey to learn.

Michael and Timothy agreed with Jeffrey in describing their student-teacher relationship experience. Michael describes his student-teacher relationship as "The teacher lecturing and answering questions and the student copying notes and paying attention in class." The teachers did not put forth much effort to make sure the students actually learned the material, nor did Michael report his teacher encouraging or engaging

the students in their learning process. Timothy described in depth the student-teacher relationship he encountered in his high school mathematics classes: He explained:

Well the teacher in the college readiness class seemed to have a nasty attitude or maybe that was just her way of teaching. There really wasn't a comfortable relationship in her class. She treated us like it was totally our responsibility to learn the material after she's taught it and if we didn't understand the material then it was up to us to find a way to get a better understanding. Now some of my math teachers before her class seemed kind of cool. These teachers were more lenient with us. They helped some of the students when we needed help. Only thing about them is that they seemed to cater more to the students that actually showed they cared and who kind of understood the material, which wasn't fair [because] for people like me that were lost, I was just lost and they didn't want to take the time to help me. Maybe they felt that I wasn't trying to learn, but I really just didn't know.

It is interesting to note the different teaching strategies that Timothy experiences when comparing the college readiness course to the traditional mathematics courses. Although Timothy recalls the difference in teacher attitudes, the college readiness teacher seemed place the responsibility for student learning and success on the student. Aligning high school standards to college expectations is a critical step toward giving students a solid foundation in the academics needed for success in higher level education, which ultimately makes the student become aware and responsible for the learning and also better prepares them for college. On the other hand, Timothy did feel more comfortable with teachers who portrayed a more caring and nurturing attitude toward student learning.

However, Timothy, similar to Anthony, also expressed that the teacher's focus catered to students who were already passing and understood the material. This can be seen as a critical issue for those students who put forth effort, by hiring private tutors, to understand concepts and succeed in mathematics, but are not given the necessary attention needed to succeed. Students such as Timothy, who experience teachers who cater to students who are already successful as opposed to struggling students, begin to lose interest in succeeding and become unmotivated with learning.

It is important to note, the participants Jeffrey, Michael, Timothy, and Jonathan, recalled their teachers not trying to develop a positive student-teacher relationship with their students. Jonathan explained that he maintained a C average in his high school mathematics course because he felt the teacher did not put much effort into teaching the material. The idea that teachers expect students to learn on their own or learn merely by lectures places all the responsibility of student learning on the students, which Freire (1994) terms as the "banking concept" of education, as opposed to placing the responsibility of student learning on the student and the teacher. The banking concept of education, focuses on educational experiences of the students whose teachers talked through the mathematical material and expected the students to receive, file, and store the information without proper understanding, aligns with the experiences in which the participants describe. Freire (1994) contends that there must be ample balance on the responsibility of student learning from the student and teacher. As Anthony suggests, the role of the teacher is to teach, not talk. Lecturing, a form of talking, accomplishes the transmission of material that would be largely based on recollection of material, which can also be considered as a form of the "banking concept;" whereas teaching essentially

provides students with practice by actively responding and participating in the classroom discussions with respect to mathematical concepts, which was not experienced by some of the participants. Gay (2000) defines teaching as using the cultural knowledge, prior experiences, existing strengths and accomplishments, and performance styles of diverse students to make learning more appropriate and effective for them. Culturally relevant pedagogy further extends the role of teaching by lecturing through the use of cooperative and involved learning.

Participants in this study felt successful in mathematics when there was a teacher willing to help them succeed. A positive student-teacher relationship is necessary in helping Black males to succeed in mathematics. Seven of the eight participants reported establishing a positive student-teacher relationship with their college professors and therefore felt comfortable with mathematics. Anthony, Jonathan, and Jeffrey each described their college mathematics teacher's strategies for teaching mathematics:

Everyone in the class is pretty much comfortable with him and he doesn't mind that we ask him questions in class. He helps us out when we don't understand and breaks down for us when we don't understand. He makes the material more understandable and actually tries to make the class fun. (Anthony)

He tried to help us as much as he can in class and during his office hours. He also tries to give extra points whenever he can to help us boost our grade. I think he basically cares if we pass or not and gives us every opportunity to pass.

(Jonathan)

I love my college professor. She is understanding of how certain people process things and it's not necessarily dumbing it down. It's creating a platform of needs

to be learned not what you want to teach and if they don't then it's their problem, it's more like the way she teaches like this is an expo bottle and this is what the bottle is used for. She teaches that it's like a cause and effect. If I teach it this way then he or she may or may not learn it that way. (Jeffrey)

Michael, Timothy, Peter, and Jason also expressed that the key to success in college is obtaining a comfortable relationship with the professor so the professor will see that you are willing to do anything that needs to be done to succeed and are seeking help from the professors by attending their office hours and also going to the math lab when the teacher is not available.

While those seven participants expressed having positive student-teacher relationships with their college professors, Samuel, on the other hand, did not establish a rapport with his college mathematics professor. Samuel was disinterested in establishing to relationship with his professor because:

I don't really have a relationship with my math teacher now. He's an old white man who looks like he needs to retire. I mean what kind of relationship would I form with him? I honestly just go to class when I know we have a test.

Samuel internalized that a relationship with his professor could not be established because of the teacher's age and race. Samuel's perception about the student-teacher relationship highlights the importance of the student being proactive about establishing a good rapport with their teachers. Samuel's perceptions also highlights the role of race, gender, age and other demographics in facilitating a successful student-teacher relationship.

Evidence was provided that positive teacher-student relationships were perceived by the students to directly influence their mathematical success. These relationships were also described in terms of specific teaching actions. In several of these cases, faculty and instructors provided additional academic support inside and outside of the classroom (office hours), encouragement, and guidance. In most cases, this additional support demonstrated a caring nature towards the students that seemed to directly impact their mathematical attitudes and experiences. This supports the findings of Levin and Levin (1991) that quality interactions with college faculty were the most important factor determining persistence among minority college students. Similarly, Powell-Mikle (2003) found that teacher availability and a willingness to answer questions adequately to be characteristics of caring and helpful teachers as perceived by the mathematically successful. Also, the students' feelings of teachers having low expectations support the writings of Anderson (1990), who asserted that schools have lower expectations for Black students in mathematics, which he found to be a contributing factor to the achievement gap in mathematics.

### **Perceived Stereotyping**

Noguera (1997) found that because of an internalized belief in racial stereotypes, many teachers, White and Black, hesitate to engage and interact in a close and nurturing way with Black males and often fail to provide them with superior educational services. Of the eight participants in the study, six of the participants acknowledged their awareness of stereotypes and reported experiencing stereotyping by their teachers. Jeffrey explained:

Some teachers look at you and automatically think that you can't learn because of your race so they end up dumbing down things for us and having lower expectations of us. Because of this stereotype, I fall into the category of being lazy and not wanting to do work, which is basically what I was doing in high school. I don't know how it would feel to be any other race, but I think as a Black male that my outcome is already predetermined by some people.

Samuel's experience also was similar to that of Jeffrey while attending the public school. Samuel described a typical mathematics class period would consist of him sitting in the back of the classroom and not asking the teacher any questions or answering any of the teacher's questions because he did not feel the teacher expected him to succeed or participate in class. Banks (2004) describes Samuel and Anthony's experiences through his six stages of ethnic identity. Samuel displayed actions that the stereotypes placed upon him by society, which Banks (2004) describes as stage 1 of the six stages of ethnic identity. Stage 1, termed ethnic psychological captivity describes people who have monocultural experiences, which is linked to people suffering the stereotypes associated with their groups.

As hooks (2004) asserted, "Even before Black boys encounter a genocidal street culture, they have been assaulted by the cultural genocide taking place in early childhood educational institutions where they are simply not taught" (p. 39). Similarly, Anthony appeared to understand how race plays a role in society when he stated:

Race has a lot to do with education in general, not just math. For me, I would say race plays a role in my success because in society, Black people are at the bottom of everything. Odds are already stacked against us. There is just so much pressure

[by society] put on Black males to succeed because of all the Black males that aren't successful.

Many teachers who view cultural differences as deficiencies assume that Black males cannot meet educational and cultural expectations of European American students (Van Keulen, 1995). Black males are characterized in ways that clearly communicate a lack of belief in their abilities; for example, "at-risk," "disadvantages," and "culturally deprived" (Irvine, 1990, p. 23). Participants perceived that teachers often form opinions about academic abilities of Black males with no regard for their actual academic potential, which was found to be the case in Gilbert and Gay's (1985) study. Peter related to this lack of cultural acknowledgment:

You know how people say that Black people are lazy, especially Black males. But then not all Black males are that way but because some are, people and society tend to put everyone in the same category. They act as if Black males can't succeed because of the experiences they have had with other people.

Because of many of these perceived stereotypes, three participants expressed their determination to overcome the stereotypes placed upon them:

No matter what class I start, I always show my teachers that I'm different from that because if I don't then I was just going to be considered another statistic.  
(Michael)

I was raised knowing that education is the way to go. It can be kind of hard because of the stereotypes about us, but it depends on the person. If that person, like me, is determined to show people that I'm not what they say I am, then I'm good. I won't let anyone stop me. (Peter)

I think we have to just work harder to succeed. We just have to surround ourselves with the right people and have the right circle. I wouldn't say it's different, I just think because of the way it is in society and how they look at Black males we just have to prove them wrong. Yes we have to work harder but it doesn't impact us in a negative way unless we let it. (Timothy)

The data revealed that participants' experiences with perceived stereotypes illuminated the challenges in succeeding in society beyond stereotypes that are placed upon Black males, especially by their teachers. These observations echo the perspectives of scholar who have expressed the notion of cultural identity when referring to societal stereotypes. These cultural identities become a complex feeling of belonging and defines the way an individual identifies or positions themselves in different cultural contexts. These six participants (Jeffrey, Samuel, Anthony, Peter, Michael, and Timothy) expressed the notion of being taught differently than others by teachers feeling the need to dumb down material and having lower expectations for Black males. Students who were aware of these stereotypes either chose to rise above the stereotypes or conform to them. These stereotypes were mostly described by the racial interactions between the student and teacher. Some scholars of culturally relevant pedagogy also compare being a culturally relevant teacher with the race of the teacher (Ladson-Billings, 1995b). The next section describes how participants felt the race of their teacher impacted their mathematical success.

### **Race of Teacher**

From the data analysis pertaining to participant perceptions about student-teacher relationships, the second interview revealed that four of the participants (Anthony,

Jeffrey, Michael, and Samuel) believed that the race of their teacher had an influence on their mathematical success, one of the participants (Jonathan) was undecided if the race of the teacher mattered, and three participants (Jason, Peter, and Timothy) believed that the race of their mathematics teacher had no influence on their mathematical success.

While cultural differences between teachers and students may account for key differences between the schooling of Black students compared to students of other ethnic backgrounds, Ladson-Billings (1995b) posits that the race of the teacher does not matter in her article entitled, “That’s just good teaching.”

Of the eight participants, five participants (Anthony, Jonathan, Jason, Michael, and Peter) experienced having two or more Black mathematics teachers, while three participants (Samuel, Jeffrey, and Timothy) did not experience having any Black mathematics teachers. Anthony and Michael, both of whom experienced having Black mathematics teachers, also believe that the race of their teacher influenced their mathematical success. Anthony discussed the difference between wanting to have a White mathematics teacher and having had a Black mathematics teacher:

If I could choose my math teacher, I would choose a White male teacher. I just think White teachers care more for Black students and try to help everyone when they see someone struggling. I think male teachers relate more to male students and try to push them to succeed. I think he [Black teacher] would push Black males too hard. White teachers are more soft and caring. Black teachers are stricter and push you too hard. I don’t know. That’s just how I see it.

Although Anthony would prefer a White male teacher, he also expressed how he would feel about having a Black male teacher, even though he's only experienced having a Black female teacher. He stated:

I think they would be more understanding of where we are trying to go because they have been where we are. They know what it's like for society to look down on you like you can't learn. But at the same time, they made it out. They made it through to be successful and I feel like they want that for us too so they would try to help us more. They would try to push us more to succeed and be better. I've had Black female teachers before and they weren't the best. I have a White male teacher now and I think he teaches on a general basis, but a Black male teacher would definitely challenge and push Black male students more.

Anthony believes that the race and gender of his teachers has an impact on his learning. While he feels White male teachers would be more caring, he also feels that Black male teachers would be more understanding. Anthony's perceptions of having a White male teacher as being caring demonstrates a nurturing and arm hearted sense of teaching, whereas his perception of Black male teachers as being understanding attests to a feeling of sympathy or comprehension through similar experiences. Anthony speculated that having a Black male teacher would challenge him more so than other teachers. Many people in society falsely believe that Black male teachers have a primary responsibility to encourage the social development of Black male students. Likewise, a teacher of the same race may serve as a more effective role model, boosting students' confidence and enthusiasm for learning, as also described by Anthony. It is also important to note that

Anthony believes that he would be successful with male teachers in general and therefore he feels he would be more successful.

Michael also believes that race influences mathematical success; however, he also believes that a student's mathematical success also depends on the students themselves.

Michael stated:

It seems as if having a Black male teacher is like competing for something. They are always trying to put you down or make you look powerless. I feel as if a Black male teacher would push a Black male student so hard to the point where he would fail. If the students really have to show and prove to their teacher that they want to learn then nothing would change, this is not high school so I doubt a professor would baby any student. However, the only thing that I think would change me learning math better is by having a female White teacher. For some reason it feels as if they feel sorry for us Black kids and if you show that you are willing to help then they seem like they would help you out more.

It is important to note how Michael's views on the race and gender of the teacher are not consistent to the perceptions of Anthony, even though neither participant has had experiences with having a Black Male teacher. Michael perceives that Black male teachers would push or have higher expectations for Black male students to the point of them failing whereas Anthony perceived having a Black male teacher would be understanding and would want to help them to be successful. Michael also believed that white female teachers are more nurturing than a Black male teacher. Chudgar and Sankar (2008) noted that male teachers were more focused on maintaining classroom authority by enforcing strict discipline, whereas female teachers are more nurturing. However,

Ladson-Billing and Tate (1995) support the propositions that gender-based explanations are not powerful enough to explain biases in school experiences and achievement.

On the other hand, Jason and Peter, who also both experienced having Black teachers, do not believe that the race of the teacher influenced their mathematical success. Jason explained his experience of having a Black male teacher and why he felt that the race of the teacher did not matter. He recalled:

All of my math teachers were African American and I guess you could say I was more comfortable learning from someone of my own race because back then I used to feel they can relate to me more. I had this one Black man teacher that was so cool to me. He didn't teach directly from the book. Well he taught the concepts that were in the book, but he explained it and taught it in a way that we would understand it. He broke everything down for us, which was the best way for me to learn because the textbook was always so confusing. But in actuality, I don't really think that the race of the teacher matters, all that matters is that I have a teacher that cares and can explain the material in a way that I can comprehend.

Peter experienced having only Black mathematics teachers and, like Jason, does not believe that the race of the teacher influences mathematical success. Peter explained:

Most of my math teachers were African American. Mostly female, I had one Black male teacher. He was pretty cool. So I don't think the gender of the teacher matters. When it comes to the race of my teacher, I think it's up to the students to learn and make the teachers way of teaching effective for them to learn. I believe effectiveness depends on the nationality. Math is a universal subject and because of that there are many ways to one answer. From what I've encountered so far,

every race teaches math differently and it's not always as effective the way one race would teach it compared to another.

Although, Jeffrey had not experienced having any Black teachers, he discussed his views on if he were to have a Black teacher, how he felt he would have been more successful in mathematics. Jeffrey explained:

I'm not sure if I would have learned math any differently. But I do remember that like when I played little league football, all the coaches were Black and because we were just alike, I wanted to be like them or they pushed me harder to be a better football player. I guess I would say if I had a Black man math teacher that it would be the same. I would maybe see that they are Black and they got their stuff together and maybe so could I. Or maybe they would have been on my case more and I wouldn't be so lazy and I would do what I had to do to pass or put more effort into passing.

Jeffrey's statement, along with Anthony, Michael and Samuel, is inconsistent with work by Irvine (1990), who argued that African American children are best taught by African American teachers who are more aware of their culture. However, Jeffrey did not have any experience with having a Black teacher; therefore he would not know if he would have learned any differently. Irving (1990) posits that African American students have a better chance of being successful if taught by educators who understand, rather than depreciate their cultural backgrounds. While Irving (1990) expresses beliefs that Black students have a better chance of success with Black educators, he also recognizes the importance of culturally relevant pedagogy in which he describes students being able to interact with educators who understand student's cultural backgrounds. Additionally,

Jeffrey compares how his football coach challenged him and therefore assumed that having a Black teacher would challenge him in the same manner.

In addressing the second research question regarding students' perceptions of their experiences in mathematics and their impact on their mathematical success, dominant patterns revealed that, despite differences in culture or race of the teachers, the participants in the current study believed that the student-teacher relationships influenced their mathematical success. Participants who described having positive student-teacher relationships felt comfortable with asking teachers questions and expressed that those teachers genuinely cared about their success. Six participants perceived experiencing stereotypes from mathematics teachers of a different race, which they perceived had an effect on their mathematical success (earning good grades and understanding mathematics) because teachers portrayed low expectations for Black males; however, Anthony being one of the six participants who expressed having experience with being stereotyped also preferred to have a White mathematics teacher. Perceived stereotyping suggests the way that student performance might respond to a teacher's race (Dee, 2004). Finally, four participants in the current study felt that the race of the teacher impacted their mathematical success by the belief that White teachers are more caring and nurturing, while Black teachers would have higher expectations and have a deeper understanding of student backgrounds because of similar races. While students believe that the race of the teacher impacts their mathematical success, it is important to note that two of the participants preferred White teachers.

Incorporating culturally relevant pedagogy can silence the belief that the race of the teacher directly influences the achievement of a student's mathematical success and

also plays a critical role in helping to close the cultural gaps that lead to misunderstandings between students and teachers. The use of culturally relevant pedagogy also provides opportunities for teachers to stress and reiterate behavioral and academic expectations through positive student-teacher relationships. The chief obstacle in Black male student mathematical success lies in their classroom mathematical experiences, which not only affects their attitudes toward mathematics but also how they perceive their mathematical success. Teachers can contribute to students having positive experiences in mathematics by being culturally aware of their students' background and the mathematical learning styles needed for success. Incorporating culturally relevant pedagogy into the classroom will instill in Black male students how mathematics is used in everyday life, as well as how those mathematics concepts will prepare them for life and college.

### **Preparation for College Mathematics**

This study focused on the experiences of eight college students, six of whom were deemed under-prepared for college level mathematics, despite having successfully completed their high school mathematics requirements. The following section discusses four factors that emerged in the participants' perceptions of their mathematical success that appeared to contribute to their preparation (or lack thereof) for college level mathematics. Two of the factors pertain to personal and individual characteristics while two relate to school-based experiences.

#### **Internal Characteristics**

Data revealed individual characteristics that participants possessed, which may have contributed to their level of success in high school mathematics and ultimately may

have affected their preparation for college level mathematics. These internal characteristics that were resonant across four participant cases (Anthony, Jonathan, Samuel, and Timothy) included being focused, putting forth effort to succeed, and having a sense of motivation.

For one participant, hard work and perseverance allowed him to overcome challenges and to succeed within the discipline. Peter described how he was determined to be successful in mathematics:

It can be kind of hard because of the stereotypes about us, but it just depends on the person. If that person, like me, is determined to show people that I'm not what they say I am, then I'm good. I won't let anyone stop me.

Unlike Peter, who was determined to overcome any obstacles, Jonathan, Anthony, and Timothy believed that if they had possessed a sense of self-motivation, they may have been successful in mathematics. Anthony stated: 'If I was more focused and motivated like I am now in college, I most likely would have been better in math too. If I knew then what I know now, things would have been very different.' Samuel further explained how he could have been more successful in mathematics: "Having the mindset to want to succeed for yourself. Taking the time out to put forth effort to succeed and believing that you can are ways people can be successful in math and anything else."

For these students, the recognition of internal factors that may have helped them to succeed in high school mathematics were discussed. Although these participants did not recognize these characteristics in high school, they attempted to incorporate these practices in college in an effort to be successful in college. These mathematical behaviors aligned with Martin's (2009) concept of mathematical identity. The participants

understood the importance of acquiring mathematical knowledge and thus employed various approaches to aid in succeeding in college mathematics. Four of the participants expressed how taking advantage of teacher's office hours helped them to have a better understanding of mathematics and therefore felt successful in their college mathematics courses.

### **Parental Influence**

In a system where, according to critical race theorists, education itself could be a process by which racism is perpetuated (Freire, 1994; Hylton, 2008), the role of parents becomes a crucial role in the success of Black students (Oswald, Coutinho, Best, & Singh, 1999). Because parents are the first teachers in a child's life, they are considered to be the primary educators of their child. Some research suggests that there is a significant, positive relationship between parent involvement and students' educational experiences, including improved academic outcomes (Barton & Coley, 2007; Henderson & Mapp, 2002). Of the eight participants, four credited parental influences as a factor in their mathematical success. During the first interview, Samuel, Michael, Jeffrey, and Peter discussed how their parents influenced their mathematics success. For these students, parents consistently conveyed high expectations, while providing both encouragement and academic support along the way. In most cases, parents conveyed high expectations of academic mathematics success to students by keeping track of their grades and providing support when needed, including hiring tutor. These parents portrayed characteristics of culturally relevant pedagogy, which these students did not experience at school. The reality of parental involvement is that this culturally relevant parental involvement exemplifies characteristics that are ignored in school for student

success. Goodwin and King (2002) describe culturally relevant parental involvement as parents wanting to be involved in their child's educational experiences as well as creating a partnership with the educational system to increase achievement. Samuel explained that his mathematics success in high school was mainly due to his parents' expectations of his grades. He stated, "I guess I'm pretty successful in math. I always maintained good grades in it. Mostly because my parents made sure I was on top of things like my grades and they always kept in contact with my teachers." Michael's parents encouraged him to succeed in his schooling because of the educational background to which they were subjected. Michael explained:

My parents really stayed on top of me when it came to getting good grades. It was like when parents say they want their child to have a better education than they did. My parents are from Haiti and they really believed in getting a good education.

With Jeffrey's parents also not being US natives, Jeffrey attributed his high school mathematical success to his mother by stating, "My parents don't really know English and didn't grow up here so they don't really know much about the education over here, but my mom tries to stay on me." These expectations motivated the students to succeed and persist academically in high school so that they would not disappoint their parents. Carreon, Drake, & Barton (2005) found that immigrant parents often have less knowledge than others of the codes and powers embedded in US school cultures. Although Michael and Jeffrey's parents did not know much about the US curricular codes, their parents did know enough to understand the importance of being an involved parent.

Having the same experiences as Samuel, Michael, and Jeffrey, Peter explained his mathematical success is solely due to his parent's involvement in his education. When

asked what were factors that contributed to Peter's mathematical success, he stated, "I would have to say that the way my parents raised me is that education is always the key, so my parents really stayed on top of my education and made me bring home good grades." Peter explained that his parents often would visit the school to make sure he was on track, as well as forming a comfortable relationship with teachers to ensure that Peter was on task.

As a result of high expectations and culturally relevant parental involvement, these participants felt pressure to do well academically. These parental expectations also served as a motivational factor. Through positive parental support of mathematics, students were found to have a better attitude toward mathematics and increased achievement.

### **Teaching to the Test**

A key factor that appeared to set in motion Ladson-Billings' (1995a) concern about the interconnectedness among, a dysfunctional curriculum, the lack of instructional practices, and ultimately poor performance on assessment emerged in participant discussions of how teachers "taught to the test." Although the ultimate goal of the teachers teaching to the test may have been to ensure that students have the necessary mathematical knowledge to complete high school, students explained that this constituted a dysfunctional curriculum that had a negative impact on their level of college readiness. Samuel thought he would be prepared for college once he graduated from high school, until he went to take the college placement test. He explained:

When I took the math placement test, I scored to where I had to take a prep math class, which means I ain't know nothing. I tested into pre-algebra. I don't know

what happened, I was good in math in high school but then when I got to college and took that test, I ain't know nothing. It's crazy. This teacher started teaching me how to add and subtract. I'm in class with people that don't know how to multiply. So I guess I wasn't prepared at all.

The disruption in expectation reveals a central concern about the curriculum, instruction, and assessments to which these students were exposed. Students were clearly surprised that their successful performance in high school did not lead to college readiness, a clear disjunction in curricular articulation. The perspective of Samuel and the other participants in this study provide further evidence of how as Ladson-Billings (1995a) explained a dysfunctional curriculum linked with a lack of instructional innovation leads to poor performance on the traditional assessment measures. This equation was found to be true in the voices of four participants who discussed their lack of preparation for college level mathematics due to their teachers focus on teaching FCAT concepts as opposed to teaching concepts that are supposed to be taught in those classes, while two of the participants felt they were somewhat ready for college mathematics after graduating from high school.

Anthony felt his high school mathematics teachers focused on the FCAT benchmarks instead of teaching the material for that class from the class textbook. He recalled: "Like in every single math class I took in high school, they taught strictly about FCAT, even in my geometry class it was all FCAT. Even after we took FCAT, they were still teaching out of the FCAT prep workbooks." Therefore, when Anthony graduated from high school and took the college placement test, he was unprepared for the types of questions on the test. Anthony stated:

I mean there were so many other things that we could have learned. Like the stuff on that college placement I had never seen before. I guess those concepts weren't in the FCAT prep book. And even if the teacher was going to teach straight from the FCAT benchmarks, they could have gone over tougher questions or something. It was so basic.

Jeffrey and Michael also believe that they were not prepared for college because of their high school teachers' focus on preparing students for the FCAT. More time was spent on working out of the FCAT prep books instead of working out of the textbooks that were provided for that mathematics class. Michael explains. He explains:

I really think that they should have worried more about me actually learning the material and understanding it rather than forcing it upon me due to the FCAT and SAT/ ACT. We practiced more SAT/ ACT problems throughout high school than anything.

Jonathan tested into intermediate algebra, which is also a remedial mathematics course. He expressed that his intermediate algebra class is very closely related to his high school mathematics class as far as the structure is concerned. Jonathan explained:

When I came to take the college placement test, I was so confident that I knew everything because I passed the FCAT and the test seemed easy, but then after I got my results, I ended up having to take a prep math class. But I guess it could have been worse because I could have had to start from the first prep math class but I'm in the last prep math class. So I guess I wasn't prepared for college.

Based on his success in FCAT-related mathematics, Jonathan assumed he was prepared for college level mathematics, but testing into a remedial mathematics course proved differently.

According to the six participants who felt they were not prepared for college level mathematics teaching to the test (which refers to teachers directing instruction toward the narrow body of knowledge and skills that are represented on a test) contributed to their lack of preparation for college level mathematics. Students highlighted several systematic practices that serve as indicators of a dysfunctional curriculum including the failure to use appropriate textbooks and materials, a narrow curriculum that was significantly lower in quality and caliber than was expected of college-bound students, and a diminished concern for student learning. The implications of these findings will be discussed in chapter 5.

### **Culturally Relevant Pedagogy**

Culturally relevant pedagogy emerged as a way of centering students' cultures and experiences in the classroom as a means for students to acknowledge why and how mathematics is used in their everyday lives. Incorporating students' cultures and experiences in the classroom will not only increase their academic achievements, but also allows students to explore and achieve goals beyond their high school mathematics courses. Ladson-Billings (1994) also defines culturally relevant pedagogy as a teaching practice that recognizes the diversity in a classroom and adjusts teaching methods to account for the cultural characteristics of students from diverse background. Culturally relevant pedagogy utilizes a teaching style that relates course content to the student's cultural context. Incorporating this type of pedagogy would then create a bridge between

a student's home and school lives, while still meeting the expectations of curriculum requirements.

While the researcher recognizes that the experiences of these students did not, in most cases, live up to the principles of culturally relevant pedagogy, what is now disconcerting is the fact that the lack of college preparedness for six students reveals patterns of education that fail to interrupt practices that have traditionally marginalized students of color, especially Black males. Student perceptions raised the importance of culturally relevant pedagogy in mathematical success. The perceptions of the six students, who were not prepared for college level mathematics, gave insight to how the lack of culturally relevant pedagogy failed for these students. Michael, who placed into elementary algebra after enrolling in college, explained how their high school teachers adjusted their teaching methods by “dumbing down” the material instead of having higher expectations for the students. Michael felt he was not prepared for college because of how the teachers babied students in an effort to help them to pass. Jeffrey, like Michael, felt he was unprepared for college because of the way the teachers “dumbed down” the mathematics content to teach the Black students. When asked what his high school teachers could have done differently to prepare him for college level mathematics, he responded, “In order for me to have been successful, the teachers should have taken a leadership role as the teacher to make us learn instead of giving us the option to learn.”

Ladson-Billings (1995b) attempts to synthesize how culturally relevant pedagogy is used in practice through the observations of eight teacher's classroom. Study participants described teachers portraying a lack of expectations for student success and “dumbing down” mathematical concepts. Ladson-Billings (1995b) explains that in a

culturally relevant classroom teacher and students are engaged in collective struggle against the status quo. Here teachers, recognize the need to decrease the academic gaps among Black students and therefore become capable of developing an informed empathy rather than a patronizing sympathy for Black students. Study participants also explained the lack of mathematical relevance to their everyday lives. Ladson-Billings (1995b) explains how the official curriculum can be legitimized through students' real life experiences. A culturally relevant teacher would build mathematical lessons that not only focused on the official curriculum, but also relied heavily on students' own lives and understanding of their lives. Finally, participants recalled the teachers' lack of teaching skills, as opposed to talking. Ladson-Billings (1995b) describes a culturally relevant classroom as one in which students and teachers participate collectively in literature and orature. Here students would be able to incorporate their learning gains into practical uses.

Conversely, the two successful students (Jason and Peter), who both tested into college algebra and who were the only two participants who felt prepared for college level mathematics, explained how they felt prepared for college level mathematics because of the curriculum, instruction, and assessment to which they were exposed in their upper level high school mathematics courses as opposed to their lower level mathematics courses. Jason explained that he felt prepared for college level mathematics classes by the teaching styles utilized by his high school mathematics teachers, which included their willingness to help students who did not understand and their influence to help students focus on the college level mathematics experiences that they would encounter. Given the opportunity to help other students in the classroom allowed Jason to

have a better understanding of mathematical concepts. The curriculum in the upper level mathematics courses were concepts that were taught in the textbook as opposed to the teacher preparing students to pass standardized tests. Peter felt that he was also prepared for college level mathematics because he enrolled in upper level mathematics classes in high school, where the classes were harder and the teachers had higher expectations for success. He explained the lower level mathematics courses taken in high school focused on students passing the FCAT, whereas his upper level mathematics courses focused on teaching the material that was supposed to be taught in that class. The upper level mathematics teachers taught students the actual curriculum from the class textbook, whereas the lower level courses taught students from the FCAT prep workbook. Peter also felt he was prepared for college level mathematics because his upper level mathematics teachers were patient with the students and tried to find the best teaching styles to help students understand and master certain mathematics concepts.

Participants explained their belief that the sole purpose of earning a high school diploma for some graduates is to enroll in college and obtain a college diploma. Earning a high school diploma is an indication of college readiness and you have what it takes to be successful in college. Evidence proves that this study demonstrates that students were under-prepared for college level mathematics due to their high school mathematics teachers' lack of culturally relevant pedagogy and "teaching to the test." The two students who felt they were prepared for college level mathematics explained how their parental influences and internal self-beliefs were contributors to their mathematical success. Through the perceptions of these participants, this study revealed how the presence (or

lack thereof) of culturally relevant pedagogy in participants' experiences linked to how students perceived themselves and how educators receive them.

In an effort to incorporate and increase the use of culturally relevant pedagogical strategies in the classroom, the complexities of race in the U.S. classrooms and curriculum must be explored. According to Zamudio et al. (2011), curriculum can be understood as the knowledge that is taught in the classroom or that can be understood as all the things students learn as a result of attending school, which currently does not incorporate racial experiences. At the heart of many curriculum debates is the question: Whose knowledge counts? Concerns about who has access to knowledge link back to critical race theory criticisms of a master narrative at play in curriculum, as well as instruction. Critical race theory raises questions that pertain to if the traditional trajectories for Black male students have been subverted. Historically, education has been oppressive and Black males are expected to fail (Duncan, 2002). This study confirms this belief through six participant exerts on the lack of expectations teachers held for them to succeed in mathematics. The views of these participants of experiencing low expectations for Black male students echo studies that have found this to be a double standard and interferes with the success of these students (Ross & Jackson, 1991; Kailin, 1999).

Culturally relevant pedagogy, like critical race theory, recognizes the value of the lived experiences of Black males in understanding and achieving academically in this world. Stanley (2007) explains that the master narratives in education is one that is created, interpreted, and accepted by those in power; however this master narrative is not the only voice of truth. Critical race theory, which posits that racism is normal and recognizes the unique voice of color, updates the culturally relevant pedagogy

framework. This study revealed that racism is normal in education through the lack of cultural and diverse acknowledgement in the classroom. Six of the participants explained their lack of interactions with their high school mathematics teachers in an effort to form positive student-teacher relationships, which critical race theorist would argue is a form of racial inequality as it pertains to Black male interactions in education. The uniqueness in these participants voices were revealed in their own perceptions of their mathematics preparation, or lack thereof. Two participants explained strategies that aided them in being mathematically successful, while six students revealed strategies that were not beneficial in preparing them for college level mathematics. The use of culturally relevant pedagogy in education is where race is acknowledged in the mathematics classroom in an effort to better prepare students for success.

### **Summary**

Chapter 4 presented findings uncovered through an exploration of eight perceptions of eight Black male college students about their attitudes toward and experiences in mathematics within two educational contexts. This chapter began with an overview of each case, which was followed by an examination of the similarities and differences of each case. This cross-case analysis revealed three emerging themes in students' perceptions. From the investigation, it was found that Black male college students' negative attitudes toward mathematics stemmed from prior mathematics experiences in their mathematics courses as well as from the inability to apply mathematical concepts to their everyday lives. The relationship between a teacher and student as well as internalized stereotypes that may be placed upon Black male students in academia were found to be a contributing factor in students' attitudes toward and

experiences in mathematics. The researcher also found that the majority of the Black male college students in the current study felt they were not prepared for college level mathematics as a result of their attitudes toward and experiences in their high school mathematics classes. Students also explained how they believed they were not prepared for college mathematics due to the “teaching to the test” strategies that they experienced in their high school mathematics courses. The students further explained that teachers should have higher expectations for their students to succeed.

## CHAPTER 5. DISCUSSION, IMPLICATIONS, AND LIMITATIONS

The purpose of this study was to examine the perceptions of Black male college students' attitudes toward and experiences in mathematics. This researcher's investigation confirmed these findings that the attitudes toward and experiences in mathematics had a direct impact on students' mathematical success and their own preparedness for college level mathematics. The following discussion is organized to highlight the most dominant findings of this study. This study's findings indicate that a majority of the participants perceived certain mathematical concepts to not be relevant to their everyday lives, therefore had a direct impact on their attitude toward mathematics and their mathematical success. This study's findings also found that participants perceived their mathematical instructional strategies experienced in their high school mathematics courses impacted their mathematical success, or lack thereof. Finally, this study's findings indicate that high school mathematics classes focused on standardized testing rather than preparing students for college level mathematics.

### **“I ain’t know nothing”**

The purpose of this study is to suggest that while eight Black male college students enrolled in college assuming that they had fulfilled the requirements for successful academic success, six of the participants were not prepared for college level mathematics. The devastating effect of that realization is exemplified in the quote made by Samuel, “I ain’t know nothing.” While Samuel reports that he did not know anything, the reality is that he knew enough to graduate high school.

When researching the disparities about mathematical achievement, on the one hand all participants succeeded high school, which means they were not part of the statistic, as Michael stated, which states that Black males are disproportionately underserved because the students did in fact pass. Through the voices of the participants, although these students did not feel successful in mathematics because they tested into remedial mathematics courses in college, the success of mathematics is seen in the participants succeeding enough in mathematics to graduate high school. Had these participants not gone to college, they would have remained successes in the narrative of educating Black male students in high school mathematics.

Once graduating high school and taking the placement test to enter college, these success stories of succeeding in high school mathematics courses become “I ain’t know nothing,” or not knowing as much as they hoped to enroll in college level mathematics courses. Two participants of this study remained successes in college by being able to enroll in college level mathematics courses when entering college. This quote, “I ain’t know nothing,” highlights not only an academic reality check or lack of preparation, but it also highlights the human emotional reality as it is experienced by the participants. The reality is that these students felt cheated, shocked, and let down.

### **“Why we gotta find x...”**

A major finding of this study revealed participants’ perceptions of the relevance of being taught certain mathematical concepts. The mathematical concept of solving for a variable, is used to find a solution to a mathematical problem. In mathematics, the letter “x” represents the unknown variable, where the goal is to find the solution to replace the

letter “x.” Participants revealed not understanding the purpose for trying to find “x,” or the solution to the mathematics problem.

The lack of mathematical relevance taught in the classroom impacted students understanding of mathematics, their attitude towards mathematics, their mathematics course takings, and also affected students earning successful mathematics grades in high school. The findings that six of the eight participants did not perceive advanced level mathematics as relevant speaks directly to Tate’s (1994) argument that traditional mathematics curricula have failed to optimize student success in advanced mathematics courses by not promoting the relevance of mathematics to students’ everyday lives. Students’ perception of the lack of relevance for higher level mathematics is alarming for a variety of reasons, which suggests persistent and systematic inequality in the educational system.

Relevance in the curriculum is linked mathematical understanding, which has a direct impact on student success. Teaching the relevance of any mathematical concept will lead to students having a better understanding of the process and reasoning for finding “x.” As Ladson-Billings (1999) suggests, the goal of culturally relevant pedagogy is to link schooling with students’ home lives, therefore making mathematical concepts more relevant to their every lives. The linking of these concepts to students’ everyday lives may lead to students having a positive attitude toward mathematics. Martin (2009) and Powell-Mikle (2003) found that positive attitudes toward mathematics lead to understanding of mathematics, as well as academic success. Attitudes toward mathematics play a crucial role in the learning processes of mathematics. Students’ attitudes toward mathematics also contribute to student perception of the relevance of

upper level mathematics. The students' perception of basic mathematics as being relevant signals an internalization of the social and academic tracking that typically relegates students of color to "basic" academic classes. The attempts to improve student attitudes towards mathematics at lower mathematics levels provides a basis for high level mathematical studies, and also can affect successful achievement in higher level mathematics. It is the attitude of the student that contributes to the student's perception about mathematics.

The lack of relevance of any subject area signals diminished success in that field. Culturally relevant pedagogy, as advocated by critical race theory scholars and critical multiculturalists (Gay, 2000; Ladson-Billings, 1995b), underscores the importance of personal relevance of the subject matter for academic success. The objective of culturally relevant pedagogy should not be to cover the curriculum, but to teach students in a manner that will allow students to explore the fascinating experiences they can encounter through the lens of mathematics.

### **"They didn't really teach, they talked"**

As explained in chapter 4, lecturing is a form of talking that accomplishes the transmission of material, which in this case is the transmission of mathematical algorithms to solve a mathematical problem. Six of the eight students perceived experiencing the transmission of algorithms, which participants perceived did not prepare them for college level mathematics. Whereas, teaching involves using prior knowledge, cultural knowledge, and incorporating different performance styles to ensure understanding and academic success. Two of the eight participants experienced being

taught mathematical concepts by the student-teacher relationships experienced and their teacher's willingness to help students understand.

Effective teacher preparation addresses the need for teachers to acknowledge the diversity of their students and to incorporate the multiple backgrounds and cultures into the learning experiences and classroom milieu. Gay (2000) suggested that culturally responsive teaching involves incorporating into learning experiences components about students' knowledge of their own cultures and their prior experiences in their current living situations as well as the learning styles of diverse students in order to make learning more appropriate and effective for students. All students in the current study reported their daily classroom setting to be predictable and repetitive in that students entered the classroom, the teacher lectured, and the students did the work, which obviously did not have a positive effect on the students' mathematical achievement. In an effort to incorporate culturally relevant pedagogy, Freire (1994) found that "Rather than seeing students as empty vessels, to be filled with the expert knowledge of teachers...students must make their own meaning; they must be producers of knowledge themselves" (p. 31). Moreover, teachers must consider that students have their own lived reality that can be incorporated into the learning process in an effort to help students understand educational concepts.

Ladson-Billings (1999) pointed out "If teachers are to be more effective with African American students, they must develop a positive identification with them—to perceive them to be like them, that is fully human and possessing enormous intellectual capacity" (p. 704). Ladson-Billings and Tate (1995) also suggested that effective teachers must have high expectations of both students and teachers, which was found to be evident

in the current study. Teacher interactions, as well as teachers' willingness to care for student academic success, were an integral part of the participants' success in mathematics education. However, two of the study participants who perceived themselves to be unsuccessful in mathematics argued that White teachers are more caring than Black teachers and White teachers had less expectations for them. It is important to note that both teacher's caring interactions and as well as portraying high expectations are necessary for student success. Students respond positively when teachers create an environment that is based on high expectations, caring, and concern, which in turn leads to student success. In an effort to achieve this, teachers are then challenged with expressing and providing high expectations for all students, as well as genuinely showing their concern for student achievement.

For participants in the current study who reported having positive student-teacher interactions, those interactions enhanced their mathematics knowledge and education, and therefore improved their academic success. These positive interactions were acknowledged in the two students that were successful in mathematics and who were prepared for college level mathematics. The two successful students explained how their teachers portrayed an increasing concern for student achievement and set higher expectations for student success. However, participants in the current study who reported experiences of having teachers who were nonchalant about student learning and who had a negative perception of their own student learning experiences and success perceived themselves to be unsuccessful in mathematics. Teachers who portray low expectations for student learning as well as a disinterest in teaching hinder students from learning and succeeding.

Previous research has indicated that positive student-teacher relationships are associated with positive academic performance (Powell-Mikle, 2003). The results from the current study are consistent with the findings of several studies documenting those benefits of positive student-teacher interactions among academically successful African American students in both high school and college (Gutierrerez, 2000). Drawing from participant interviews, positive student-teacher relationships entails teachers interacting with students in responsive and respectful manner, offering students help when not understanding mathematics concepts, and requiring students to use critical thinking skills. Culturally relevant pedagogy posits positive student-teacher relationships are also prevalent when teachers knowledge and demonstrate knowledge about students' individual backgrounds, interests, and academic levels. These positive interactions all consist of students asking questions to understand, and teachers taking time to ensure student success. The more interaction students have with their teachers and professors, the more likely they are to learn effectively and to persist toward successful achievement. Seven of the participants reported having a good rapport with their college professor. This allowed them to focus on and understand the mathematics concepts being taught; this was found not to be the case for the student-teacher relationships in the high school setting.

#### **“We focused on FCAT material only”**

Underlying the findings of this study is the broader role of standardized testing and its far-reaching impact on the experiences and academic achievement of students of color. Six students described negative experiences in class. They noted that their teacher's pedagogy was influenced by standardized tests, which drove the curriculum and

instruction in a manner detrimental to meaningful learning. The findings need to be placed in this broader context of standardized testing to understand further the manner in which these students' experiences are part of a much larger pattern of educational experiences occurring at a statewide and national level.

For instance, all study participants reported that teachers were more preoccupied with “covering” material on standardized tests rather than ensuring students understood the material to be taught in the mathematics course. As found in the current study, the two participants who were enrolled in a college-level mathematics course also enrolled in higher level high school mathematics courses. These students went beyond taking the basic required high school mathematics classes, which consisted of Algebra I and II and geometry. For these participants, those higher level high school mathematics courses focused on covering the syllabus as opposed to the lower level mathematics courses, which these students reported focused on FCAT preparation. The six students who were required to take remedial mathematics courses once entering college reported the focus of their high school mathematics courses was strictly on FCAT prep and therefore they perceived themselves to not be ready for college level mathematics. It was clear whether students who had access to higher level mathematics classes in high school were in a better position to be placed in college level mathematics classes. The findings revealed that the standardized tests themselves did not prepare students for college level mathematics, drawing into question the purpose of these tests and their detrimental effects on college preparation. Although students assumed that passing the standardized tests meant they were “ready” for the “next level,” this was not the case. Despite the

many hours that teachers and students had put into FCAT testing, it ultimately had limited impact on students' mathematical futures.

## **Implications**

### **Implications for College Mathematics Professors**

As students become frustrated and concerned paying for developmental mathematics courses, there are several contexts in which educational change can be implemented with the cooperation and participation of high school administrators and teachers as well as of college administrators and faculty. In reaction to this concern, college administrators and faculty can respond to the transitional difficulties by developing new math programs and courses, providing new informational materials, and providing data on student performance.

As seen in chapter 2, Conley (2005) credits these transitional difficulties in mathematics to the differing priorities of the developers of the high school and college curriculum. While high school curriculum developers focus on mathematics standardized testing and assessments, college curriculum developers focus on career preparation. Educators have invested in and incorporated several program to aid in preparing students for college level mathematics courses, especially those students who are enrolled in remedial mathematics classes.

There also are several computer technologies that have the potential to provide students with efficient and effective methods of reviewing the prerequisite algebraic knowledge. One such program, Assessment and Learning in Knowledge Spaces (ALEKS), provides an interactive learning environment that assesses students' skills and understanding as they progress through pre-selected algebra material. Timothy explained

the structure of his mathematics course, which he referred to as “redesign,” that uses technology in the classroom setting. Timothy stated:

Well we walk in class and the teacher lectures, kind of. Since I’m in a redesign class, we watch math videos in class. So the teacher will play one of the math videos for us to watch, then he’ll pause a video and ask if we understand what was taught. If everybody is good, we keep going with the videos. If people have questions about the video, then he’ll re-teach it his way with the same examples and then do another example that is similar to it. At the end of the class, we have class work worksheets that we can work on together that he collects. Then we have homework on ALEKS that you can do as long as you have Internet access.

Anthony also expressed how the use of technology helps in understanding mathematics by stating, “We have this online program called ALEKS that we can work on at home that’s really helpful, so I do a lot of practice on that too to understand.” The ALEKS program assesses students on what they already know based on their prior mathematical knowledge. Once students are assessed, the ALEKS program bases student’s homework problems, as well as the level of difficulty for each student. Redesign classes and the ALEKS program contribute to incorporating culturally responsive pedagogy by allowing students and teachers to work cooperatively on the classwork worksheets. Students are able to ask teachers questions based on the lessons that were taught that day and are able to received feedback during class.

Along with computer technologies, the implementation of college freshman seminar classes or learning communities that are designed specifically for Black male students can be used to increase achievement in mathematics. These learning

communities supports Cooper and Datnow's (2000) study, which asserted, "Many Black students find the most comfort and can relax, not fearing condescension or disrespect, in the company of other Black students" (p. 187). The study cite offers a "Brother 2 Brother" learning community which offers students a chance to link several disciplines at once, which also applies concepts to everyday experiences. Learning communities also aid in the transitional difficulties from high school to college for Black male students.

Black male students also should be exposed to the career opportunities that are available to them if they pursue mathematics as a major. Students' inability to see the relevance of mathematics underscores the fact that Black male students should be exposed to mathematics careers. Mathematics educators must propose mathematics as a viable college major for all students, especially Black male students. Implementation of high school recruitment fairs will help to inform students of career opportunities in mathematics as well as to inform students of transitional strategies to prepare them for college-level mathematics. College faculty knowledge in a variety of college information seminars involving high school personnel are extremely important in ensuring accurate information about college mathematics programs is provided to prospective students (Kirst, Antonio, & Bueshela, 2004). With faculty involvement in recruitment, Borba (2001) insisted colleges can decrease remedial math program enrollment. It is helpful to provide high schools with information such as how students performed in their college mathematics course, results of college admission and mathematics placement tests, the number of students taking remedial mathematics courses, student performance in mathematical entry-level college courses, the number of students awarded degrees, and grade point information (Dougherty, Mellor, & Jian, 2006). This information can assist

high school personnel in making decisions about the success of their college preparatory programs (Kirst & Reeves Bracco, 2004).

### **Implications for High School Mathematics Teachers**

The failure of most teachers to engage in culturally relevant pedagogy was reflected in student interviews. Although it is unclear whether the teachers of the students in the current study received any meaningful education in culturally relevant pedagogy, critical race theory scholars and multicultural educators point to areas for such professional development. Such professional development would include but not be limited to teachers conveying positive messages and high expectations as well as recognizing the mathematics potential of Black male students. In the culturally relevant mathematics classroom, the teacher should build from the students' ethno or informal mathematics and orient the lesson toward their culture and experiences, while developing the students' critical thinking skills (Gutstein, Lipman, Hernandez, & de los Reyes, 1997).

Another implication is for mathematics educators to research the mathematical contributions of people of color and use that as a foundation for mathematics teaching and learning for all students (Kenschaft, 2005). Mathematics educators should seek out mathematics lessons, activities, and projects that require students to think critically and to use mathematics to analyze various community, national, and international issues. Examples of this practice would include teaching mathematics for social justice and relating mathematics to students' local community experiences. An example of incorporating social justice into the mathematics curriculum is linking Black male student tracking rates to slope intercept form and the rate of change.

To address a lack of participation in mathematics among minority students, Chang (2002) challenged educators to strengthen the educational pipeline prior to college. As evidenced by many of the participants in the current study, students developed an interest, or lack of interest, for mathematics prior to college. This points to the need for teachers to be intentional in their efforts to support Black male students to persevere in mathematics at an early age. This would also include encouraging students to participate in advanced mathematics courses, providing a stimulating curriculum that encourages critical thinking, and offering greater access to the opportunities that exist within mathematics-related fields. Teachers should encourage students to pursue career opportunities that involve mathematics. The importance of culturally relevant pedagogy as revealed in this study stands in stark contrast to the current state policy towards advanced education for teachers. The current study revealed a need for teachers to be competent in culturally relevant pedagogies, pointing to the fact that mathematical knowledge alone in the education of traditionally marginalized groups is not sufficient.

### **Implications for Policymakers**

Educators and policymakers have the responsibility to ensure that Black male students are not disproportionately represented among those students who succeed in mathematics. In an effort to improve Black male students' achievement in mathematics, policymakers must move away from a deficit theory as it relates to the mathematics achievement of students of color, especially Black male students. The deficit theory when pertaining to Black male students defines students by their weaknesses rather than their strengths. This theory also claims that Black males are poor performers of mathematics because of their own intellectual deficiencies. Policymakers must consider the

perspective of research that situates Black male students as successful mathematics students (Thompson & Lewis, 2005). When policymakers develop policies that affect the mathematics education of Black male students, they need to give considerable attention to research in the field. Furthermore, policymakers must account for race in their established educational policies. A number of factors that shape this issue include instructional and curricular practices; policy implementation and monitoring; and cultural incongruences among educators, students, and their families.

Since many of the participants perceived mathematical success to be attributable to the relevance of mathematics as a discipline, instructional programs should be created in the earlier grades that demonstrate and promote the relevance and utility of mathematics. Policymakers can create a curriculum or an instructional program that includes cultural literature in each subject, especially mathematics, which would ensure that each culture is seen as an important culture in education.

While teachers may be the experts of their respective content areas, there is a need for training teachers to deal with students who come to school with a multitude of economic, health, and social issues outside of school, and which are manifested in the classroom. The inclusion of a Teaching Diverse Populations in Mathematics course would introduce teachers to the challenges of teaching students with diverse backgrounds as well as of implementing strategies for teaching students of different backgrounds.

It also is the responsibility of policymakers to aid schools that have fallen below average in student mathematical achievement, rather than simply rewarding high schools and teachers extra incentives when achieving above level in mathematics achievement. It would be beneficial for policymakers when noticing schools that fall below average in

mathematical achievement to invest in those schools in an effort to increase achievement by providing those schools with supplemental learning materials such as manipulatives, with professional development for mathematics teachers, and with mathematical technology.

To reduce the number of students enrolled in remedial mathematics courses at the college level, policymakers have made remedial classes at the state college level optional. However, rather than promoting academic preparation, administrators at the state college level have found themselves addressing increasing criticism from minority groups. Not requiring students to take remedial courses ultimately has led to students taking mathematics courses they are not prepared to take, and also to students being required to repeat courses. Michael explained, “College to me is like a business. It seems like it’s all about the money. We don’t even get real credit for these prep classes.” Therefore, the realization of the students is that policymakers have implemented this policy to make more money and students feel they are set up to fail. Such a strategy has created problems by inadvertently increasing the number of unsuccessful students. As Samuel stated after graduating from high school, he felt he should have been prepared for college level mathematics. The state of Florida policymakers also believe that high school graduates should be adequately prepared for college level mathematics, therefore, changing the policy towards remedial mathematics education places more responsibility on the school system to better prepare students for college.

### **Implications for Students and Families**

This study highlighted several insights on how students and their families engaged in educational practices that enhanced (or diminished) their achievement in

mathematics. Students should actively pursue more experiences with teachers, peers, and family who promote and encourage belief in their mathematics abilities. The responsibility to become successful in mathematics also lies in the hands of Black male students. Black male students should be more receptive of the experiences provided by teachers, peers, and family who promote and encourage belief in their mathematics abilities. Selective peer relationships enhance a student's self-efficacy in mathematics; therefore, Black male students would benefit from establishing a relationship with a set of peers whose mathematics performance is equal to or better than theirs (Bullock & Merrill, 1980). It is essential for Black male students to have a core group in which each participant motivates and encourages academic success in mathematics. Therefore, Black male students can benefit mathematically from organized peer study groups. These groups also can provide environments and opportunities for students to construct knowledge individually as well as concurrently with their peers through social and cultural interactions.

Community members also can serve as role models by demonstrating examples of academic and mathematics success in the real world while encouraging students to gain additional mathematical knowledge. Black male students must be provided with positive Black male role models within their homes and community in an effort to increase Black male achievement. Community members and organizations can work together with institutions to provide opportunities for students to work collaboratively in academic situations inside and outside of the classroom. Community leaders and organizations also can work collaboratively with institutions to provide opportunities for Black male students to discover the utility of mathematics in their everyday lives. These leaders and

organizations also can provide education and parenting skills for parents so that those without social and cultural capital can learn the necessary skills to better assist their children in their mathematical success.

As seen in the current study, involved parents encouraged students to succeed in academia. Parental involvement may help to aid in decision making and parents can be advocates with the institution in an effort to aid in the mathematical success of Black male students. Parents must become actively involved in their children's education if the underrepresentation of Black male students' success in mathematics is going to be addressed in mathematics education. As Brown (2006) found, parental involvement in the form of open communication and focusing on academics were predictors of academic achievement in Black males.

### **Limitations**

#### **Critique on the Sample**

One of the limitations of this investigation involved participants used for the study. Participants were chosen by their demographics, their current college mathematics course in which they were enrolled at the time of the study, and the socioeconomic status of the high school they attended. The college mathematics courses included in this study consisted of MAT 0018 Pre-Algebra, MAT 0028 Elementary Algebra, MAT 1033 Intermediate Algebra, and MAC 1105 College Algebra, with college algebra being the only college-level mathematics course. The other mathematics courses were remedial mathematics courses. While each mathematics course served to teach different levels of mathematics, students enrolled in the remedial courses were found to experience similar high school instruction. As a result, this study did not conclude that their high school

teaching experiences were significantly different. Participants in each remedial mathematics course reported having similar attitudes toward and experiences in their high school mathematics, despite the different levels of mathematics courses in which they were enrolled. A future study would consider the high schools that the participants attended, making sure that two participants did not attend the same high school and if so, choose students who did not have the same teachers. The two participants who were eligible to enroll in college algebra also reported having similar experiences in their high school mathematics courses, but they portrayed a more positive attitude toward mathematics.

Previous research has reported poorly funded institutions as not having high quality teachers, which has become a crucial issue in the educational system. Another limitation found in this study was selecting students based on the socioeconomic status of the high school that each participant attended. The researcher believed that student mathematical success would be higher in students who attended a school whose socioeconomic status was below 25% due to the fact that research has shown that those schools most likely would have better qualified teachers as opposed to schools whose socioeconomic status was above 75%. The current study found that the socioeconomic status of the schools had no effect on mathematical success; however, the study did find that one student who tested into a remedial mathematics course and who also attended a Christian academy felt more successful in mathematics.

Although the focus of the current study was to examine the attitudes toward and experiences in mathematics of Black male students, examining the attitudes toward and experiences in mathematics of males of other ethnic groups may be used to contribute to

the field of critical race theory. This comparison may be used to contribute to the field of critical race theory by examining the perceptions of Black male students regarding learning as opposed to the learning experiences of males of other ethnic groups. This could provide insight to the idea that teachers may teach to a certain culture and that the curriculum is culturally specific.

### **Critique of College Placement Testing**

Another limitation of this investigation involved the validity of the college placement test that students are required to take in an effort to place students in the correct mathematics course. While the current study found that two participants were placed into college level mathematics courses because they were enrolled in higher level mathematics courses in high school, there was one outlier student who also took higher level mathematics courses in high school but was placed into a remedial course.

Therefore, an analysis of high school exams and pacing guides is needed to examine the validity of students' mathematical achievement for entering college. Researchers are critical of most college placement programs because they are not analyzed routinely for accuracy and effectiveness in placement (Daley, 2008; Hoyt and Sorensen, 2001). An analysis of placement tests could include a routine investigation to determine whether existing cut-off scores are effective in mathematics placement.

### **Conclusion**

A significant amount of research has been conducted on Black male students in the K-12 public school setting and the mathematical achievement gap among Black males (DeCuir-Gunby, 2007; Ottley, 2007). According to the National Center for Educational Statistics (2011) report, Black male students are achieving at lower rates than their male

peers in the K-12 education system. Not only do Black male students achieve at lower rates than other males at their level, Black males also are entering into the college setting being required to enroll in remedial mathematics courses once admitted into college.

This study examined the attitudes toward and experiences in mathematics of Black male college students using the theoretical framework of critical race theory and culturally relevant pedagogy. For the purpose of this study, two tenets of critical race theory were discussed: (1) racism is normal in education and (2) a need exists to account for the unique voices of color. Critical race theory and culturally relevant pedagogy can be applied to the curriculum, instruction, and assessment in education. Critical race theorists refer to this as master scripting. The participants reported that being required to learn upper level mathematics was irrelevant to their culture and everyday lives. The master scripting of the mathematics curriculum also led to some participants reporting their dislike for mathematics, which impacted their mathematical success. The experiences and lived reality of the participants resulted in findings that teacher-student relationships also impacted student attitudes toward mathematics. The way teachers teach profoundly affects the way that students perceive the content of the mathematics curriculum and their attitudes toward mathematics. Finally, critical race theory questions the use of assessment-based testing in education. This study found that being required to take standardized tests and assessments also impacted student attitudes toward and experiences in mathematics.

## APPENDICES

## Appendix A

### FAU Institutional Review Board Approval



**Institutional Review Board**

*Mailing Address:*  
Division of Research  
777 Glades Rd., Bldg. 80, Rm. 106  
Boca Raton, FL 33431

Tel: 561.297.0777 Fax: 561.297.2573

<http://www.fau.edu/research/researchint>

Michael Whitehurst, Ed.D., Chair

DATE: August 1, 2013

TO: Dilys Schoorman, Kyla Williams  
FROM: Florida Atlantic University IRB

IRBNET ID #: 467982-2  
PROTOCOL TITLE: [467982-2] Perceptions of Black Male Students' Attitudes and Experiences in Mathematics Preparedness: A Critical Race Theory Analysis

PROJECT TYPE: *New Project*  
ACTION: APPROVED

APPROVAL DATE: August 1, 2013  
EXPIRATION DATE: July 31, 2014

REVIEW TYPE: Expedited Review  
REVIEW CATEGORY: Expedited review category # B7

Thank you for your submission of Response/Follow-Up materials for this research study. The Florida Atlantic University IRB has APPROVED your *New Project*. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

- This study is approved for a maximum of **16** subjects.
- It is important that you use the approved, stamped consent documents or procedures included with this letter.
- **\*\*Please note that any revision to previously approved materials or procedures, including modifications to numbers of subjects, must be approved by the IRB before it is initiated.** Please use the amendment form to request IRB approval of a proposed revision.
- All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All regulatory and sponsor reporting requirements should also be followed, if applicable.
- Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.
- Please note that all research records must be retained for a minimum of three years.
- **This approval is valid for one year.** A Continuing Review form will be required prior to the expiration date if this project will continue beyond one year.

If you have any questions or comments about this correspondence, please contact Angela Clear at:

Institutional Review Board

Research Integrity/Division of Research  
Florida Atlantic University  
Bldg. 80, Rm. 106  
Boca Raton, FL 33431  
Phone: 561-297-0777

\* Please include your protocol number and title in all correspondence with this office.

**This letter has been electronically signed in accordance with all applicable regulations,  
and a copy is retained within our records.**

## Appendix B

### Email Letter to Professors

Hello Professor,

My name is Professor Kyla Williams, a mathematics professor here at [REDACTED] and I am currently enrolled as a Ph.D. student in the Curriculum and Instruction Program at Florida Atlantic University. I was hoping you would allow me to visit your class and speak to your students for 5 – 10 minutes about my dissertation topic pertaining to students' attitudes and experiences toward mathematics. During this visit, I would ask that you administer and collect the recruiting tool, just as you would the teacher evaluations that are administered to students at the end of the semester. This recruiting tool will be used to identify students who would be eligible to participate in this research study. If possible, I would love to visit your class on:

Please let me know if this would be ok! I really appreciate your time!

Thank you,

Kyla Williams

[REDACTED]



Approved on:	8/12/2013
Expires on:	7/31/2014

  
Institutional Review Board

**Appendix C**

**Recruiting Tool**

Personal Data Information (circle the most appropriate response)

Are you a first generation college student?            Yes            No

Race: \_\_\_\_\_

Which state did you attend high school?

High School:            Public            Private

    If Private, was school religious based?            Yes            No

Name of High School Attended: \_\_\_\_\_

Year of high school graduation: \_\_\_\_\_

Circle all mathematics courses that you took in high school:

Algebra I    Algebra II    Geometry    Trigonometry    Calculus    Other

What grade average did you earn:    A    B    C    D    F

Describe your attitudes and/or experiences of mathematics: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Student ID: \_\_\_\_\_

## Appendix D

### Student Informed Consent Form

#### Student Informed Consent Form

- 1) **Title of Research Study:** Perceptions of Black Male Students' Attitudes and Experiences in Mathematics Preparedness: A Critical Race Theory Analysis
- 2) **Investigators:** Dr. Dilys Schoorman and Ms. Kyla Williams
- 3) **Purpose:** The purpose of this proposed qualitative multiple case study doctoral dissertation is to investigate the perceptions of Black male students' attitudes and experiences toward mathematics.
- 4) **Procedures:** As a participant, you will be required to participate in two interviews during the Fall 2013 semester. The interviews will be held in the researcher's office or in the public library, depending on the location with which you are most comfortable with. The first interview will be conducted at the beginning of the semester, which will focus on your high school experiences in mathematics. The second interview will be conducted toward the end of the semester, which will focus on your college experiences in mathematics. This interview will focus on your own preparedness for college level mathematics. Each interview will take no longer than 30 – 40 minutes. With your consent, the interviews will be audio – recorded. In the event that you would not like the interviews to be audio-recorded, I will take field notes to document your interview responses.
- 5) **Risks:** The risks involved with participation in this study are no more than one would experience in regular daily activities. All documents will be kept confidential and will not be shared with anyone except the researcher and yourself, if you are interested. Participation or nonparticipation will not affect your academics, and the information contained will not be used for anything other than this research.
- 6) **Benefits:** Potential benefits that you may attain from participation in this research study include the satisfaction of knowing that you have contributed to an investigation of Black male students' attitudes and experiences toward mathematics. You will also have the satisfaction of knowing that you may potentially help educators and policymakers understand the challenges that Black male students face in trying to succeed in mathematics.
- 7) **Data Collection and Storage:** Any information collected will be kept confidential and secure and only the people working with the study will see this data, unless required by law. In an effort to ensure confidentiality, pseudonyms will be used to protect your name. The data will be kept for 3 years in a password protected computer as well as a locked file cabinet in the investigator's office. After 1 year, paper copies will be destroyed by shredding and electronic data will be deleted. We may publish what we learn from this study. If we do, we will not let anyone know your name/identity.



Approved on:	8/01/2013
Expires on:	7/31/2014

\_\_\_\_\_ Initials

- 8) **Contact Information:** For questions or problems regarding your rights as a research participant, you can contact the Florida Atlantic University Division of Research at (561) 297-0777. For other questions about the study, you should call the principal investigators, Dr. Dilys Schoorman at (561) 297-6598, or Ms. Kyla Williams at [REDACTED]
- 9) **Consent Statement:** I have read or had read to me the preceding information describing this study. All of my questions have been answered to my satisfaction. I am 18 years of age or older and freely consent to participate. I understand that I am free to withdraw from the study at any time without penalty. I have received a copy of this consent form.

I agree \_\_\_\_ I do not agree \_\_\_\_ to participate in this study.

I agree \_\_\_\_ I do not agree \_\_\_\_ to be audio-recorded.

Signature of Participant: \_\_\_\_\_ Date: \_\_\_\_\_

Printed name of Participant: First \_\_\_\_\_ Last \_\_\_\_\_

Signature of Investigator: \_\_\_\_\_ Date: \_\_\_\_\_

## **Appendix E**

### **First Student Interview Protocol**

Working Title of Study: Perceptions of Black Male Students' Attitudes and Experiences  
in Mathematics Preparedness: A Critical Race Theory Analysis

Name of Interviewee and Position:

Place:

Date:

Starting Time:

Ending Time:

Introduction: Thank you for agreeing to participate in this research study. Pseudonyms will be used and all information shared will be kept confidential and used only for a research assignment in Advanced Qualitative Inquiry course. The purpose of this study is to understand the perceptions of Black first time in college male students' toward their high school mathematical experiences and preparedness for college mathematics at a Southern State College. The interview will last approximately 30 – 40 minutes. Do I have your permission to audio record this interview?

Interview Questions:

- 1.) What are your feelings about mathematics?
- 2.) Do you feel you are successful in mathematics? Explain.

3.) Please describe your mathematics experiences during high school.

- a. Describe a typical mathematics class that you encountered during high school.
- b. What were the best ways for you to learn mathematical concepts?
- c. What were your relationships like with your mathematics teachers in high school?
- d. What was your favorite and least favorite mathematics class in high school and why?
- e. What racial group would your high school mathematics teachers be classified? Do you think that the Race of your high school mathematics teacher had an effect on the way you learned mathematics?
- f. What was the demographic makeup of your high school mathematics class?

Closing: Thank you very much again for taking the time to participate in this study. Your contribution is greatly valued and appreciated. We assure you that all information will be kept confidential and will only be used for this course.

## **Appendix F**

### **Second Student Interview Protocol**

Working Title of Study: Perceptions of Black Male Students' Attitudes and Experiences  
in Mathematics Preparedness: A Critical Race Theory Analysis

Name of Interviewee and Position:

Place:

Date:

Starting Time:

Ending Time:

Introduction: Thank you for agreeing to participate in this research study. Pseudonyms will be used and all information shared will be kept confidential and used only for a research assignment in Advanced Qualitative Inquiry course. The purpose of this study is to understand the perceptions of Black first time in college male students' toward their high school mathematical experiences and preparedness for college mathematics at a Southern State College. The interview will last approximately 30 – 40 minutes. Do I have your permission to audio record this interview?

Interview Questions:

1.) Do you think your high school mathematics classes and teachers prepared you for this college mathematics class?

2.) What could your high school teacher's have done differently in order to purpose you for college level mathematics?

3.) Please describe your mathematics experience in your current college mathematics course.

a. Describe a typical mathematics class session.

b. Describe your relationships with your college mathematics professor.

c. What does it take for you to get good grades in your mathematics class?

4.) Do you believe that Race has an influence on your mathematical success?

5.) Do you think that because you are a Black male, the impact of learning is different?

6.) If you had Black male teachers, do you think you would have learned math better?

Closing: Thank you very much again for taking the time to participate in this study. Your contribution is greatly valued and appreciated. We assure you that all information will be kept confidential and will only be used for this course.

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