Within-group Ethnic Differences of Black Male STEM Majors and Factors Affecting Their Persistence in College

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Abstract

The present study examined how familial and institutional factors interact with the academic experiences of a diverse group of Black males enrolled as science, technology, engineering, and mathematics (STEM) majors at one university. Ogbu's (1998) Cultural-Ecological Theory of Minority School Performance, a theoretical framework, posits that the manner by which a group achieves minority status, coupled with community and family educational values, impacts academic achievement. Immigrants, voluntary minorities, perform better academically than involuntary minorities (nonimmigrants) because they are more accepting of and more likely to adapt to the White middle-class norms upon which schools in the United States are based (Ogbu, 1994, 2004). While the data overall are positive for the sample, when viewed by ethnic group, it was evident the African and Caribbean students are more academically integrated to campus than African American students. The African students, more so than any other ethnic group, are connecting, interacting, and forming relationships with faculty outside of the classroom; conversely, African American students in this study reported having the least amount of effective connections with faculty. This research study found that for the Black male STEM students in this project (a) their families are a pivotal force, (b) academic experiences vary across ethnicities, (c) faculty mediate student success, and (d) there is a lack of interactions between ethnic groups (Black Distance) on campus.

Introduction

In the United States, the economic, social, and educational status of Black males is in serious jeopardy. Research has shown that Black males have high mortality and substance abuse rates, low educational attainment, and low potential to succeed economically (Blake & Darling, 1994). Despite the frightening conditions of Black males, some do attend college and even graduate, but at a much lower rate than other racial and ethnic populations. The few students that are able to navigate the system of higher education and earn a bachelor's degree tend not to major in fields such as science, technology, engineering, or mathematics (STEM). As a result, national organizations such as the American Association for the Advancement of Science, National Science Foundation, and the National Academies have targeted efforts and funds towards increasing minorities earning STEM degrees. However, to date, there is very limited research available that can inform the ways in which the use of such funds for African Americans should be targeted. Moreover, the limited research conducted on Black STEM majors has not accounted for within-group ethnic differences and whether higher education support mechanisms should be targeted in particular ways for specific groups within the Black population. Utilizing Ogbu's (1998) Cultural-Ecological Theory of Minority School Performance, this qualitative and quantitative study sought to understand the academic experiences of Black males who are STEM majors and whether these experiences varied across ethnic groups.

Overview of the Literature

Despite a great deal of attention from researchers, politicians, and community organizations, the educational attainment gap between Whites and under-represented groups, specifically African Americans, continues to widen. This trend is even more disconcerting when examined through the lens of gender. While the demand for enrollment of minorities in colleges and universities is increasing, the proportion of Black males attending college remains small in comparison to other populations. The findings from studies on Black college students assume that Black males and females have the same college experiences. However, recent statistics provide evidence that there is a gender gap between Black males and females earning a bachelor's degree (Snyder & Hoffman, 2004). Since there are twice as many Black female students than male students, current research tends to be more reflective of female Black college students' experiences than that of Black male students.

Moreover, examination of the disciplines and academic majors from which Black males graduate illuminates that these students are less likely to major in the fields of science, technology, engineering, or mathematics (STEM). This trend is most evident in the fields of physical science and mathematics (Hrabowski, 2003). The disparities in degree attainment between Whites and racial minorities can be attributed to the differences in educational and social opportunities. Individuals from a low socioeconomic status are more likely to attend an urban school that has poor quality teachers and fewer upper level math courses (i.e. Advanced Placement courses) than middle class schools. The students who attend urban schools are not afforded an equal opportunity to build a foundation for success in college, especially the type required for the kinds of learning that will lead to majoring in a STEM field.

Black College Students in Math and Science Courses

Snipes and Waters (2005) note that only within the past few years have studies focused exclusively on African American mathematics students. Even fewer in number are studies (Treisman, 1992, Maton and Hrabowski, 2004, and Moore, 2006) that examine the experiences of African American college students in math and science classes.

A pinnacle study (Maton and Hrabowski, 2004) examined the exemplary Meyerhoff Scholars Program, which was developed in 1988 in response to the low levels of performance of well-qualified African American STEM majors. Maton and Hrabowski (2004) studied this program to determine which factors contributed to retaining and graduating African American STEM majors. To recruit and retain students, the Meyerhoff Scholars Program incorporates specific financial, academic, and social support mechanisms for this population. Maton and Hrabowski (2004) identified four sets of factors–academic and social integration, strong skill base, ongoing support and motivation, and excellent advising–necessary to enhance minority students' persistence and graduation rates in STEM majors.

Similarly, Treisman (1992), in his ethnographic study of 20 Black and 20 Chinese students in a college calculus class, found that both academic and social supports are necessary. Treisman (1992) observed that Black students were studying alone for calculus for about six to eight hours per week, while Chinese students were studying eight to ten hours alone and four to six hours with a group and that they would check each other's homework.

Treisman (1992) concluded that different strategies need to be used for Black and Latino students to successfully complete calculus and to remain math or science majors. These strategies, which parallel the Meyerhoff Scholars Program's factors for retaining and graduating African American STEM majors, were inculcated through the anti-remedial program Treisman created. The strategies used were to emphasize using study groups, utilize university support services, provide a supportive emotional and academic environment, and to create connections with the faculty (Treisman, 1992).

Treisman's (1992) and Maton and Hrabowski's (2004) findings have also been supported by Moore's (2006) study, which used grounded theory to identify African American males' decisions to pursue engineering as a major and career. Individual interviews, focus groups, and biographical questionnaires were completed by 42 African American male college students who attended a predominantly White university. Moore (2006) found five themes:

> (a) strong interests in science, technology, engineering, and mathematics; (b) strong familial influence and encouragement; (c) strong aptitude in science and mathematics; (d) meaningful academic experiences and relationships with school personnel; and (e) meaningful enrichment programs, opportunities, and academic experiences. (p. 250)

Studies that focus more specifically on Black students majoring in science and engineering suggest that one reason these students drop out is because of their mathematical performance in middle and high school. Algebra is a "gatekeeper subject" to the STEM disciplines (Moses & Cobb, 2001) but because "too many poor children of color are denied access to upper-level math classes" (Checkley, 2001, p. 6), they do not have the necessary educational foundations to succeed in college-level classes.

Together, the findings of this small body of research suggest that in order to retain and graduate Black STEM majors, several core factors must be incorporated into the students' college experience (Maton & Hrabowski, 2004; Moore, 2006; Treisman, 1992). The first factor is financial support because reducing financial stress allows the students to focus on their studies. Second, a strong academic skill base to comprehend the material is imperative. Third, a decreased feeling of isolation is essential; because there are so few Black students on campus, it is critical that the students are academically and socially integrated to campus and feel a part of a community. Fourth, ongoing support from and relationships with faculty members, advisors, and peers solidify students' feeling a part of the community. Next, family involvement in the students' collegiate experiences is crucial. Last, an understanding of how to navigate the system of higher education bears directly on a student's academic success. However, without further research about the experiences of Black male students majoring in these areas and the factors contributing to their remaining and graduating as STEM majors, there appears to be little likelihood that the numbers of Black male students entering these degree programs will increase.

Ogbu's Cultural-Ecological Theory of Minority School Performance

Complicating this issue further is the limited information available about within-group differences of Black male students in the STEM disciplines. Studies to date homogenize Black males into one category and do not attempt to account for the variation in ethnicity and cultural background of African American students. Ogbu's (1998) Cultural-Ecological Theory of Minority School Performance postulates that a minority's educational views and experiences are directly related to the way in which they became a minority.

According to Ogbu, there are three types of minorities: autonomous, voluntary, and involuntary. In the United States, autonomous minorities are small in number and they may have a distinct religion, ethnic, or cultural identity. While they do experience some discrimination, they are not socially, economically, or politically disadvantaged. Examples of autonomous minorities are Jews and Mormons. Since there are not any non-White autonomous minorities in the United States, and Ogbu was concerned with people of color, he did not expand on this minority type (Ogbu, 1987, 1994; Ogbu & Simons, 1998).

Voluntary (immigrant) minorities are those who have chosen to come to the United States in order to obtain a better future, and as such, they may not internalize the cultural dynamics of America or feel particularly a part of the relationship between American Whites and non-Whites (Griffin, 2002; Ogbu & Simons, 1998). Immigrants from Africa, the Caribbean, and China are examples of voluntary minorities. The voluntary minorities "acculturate in an additive process (accommodation without assimilation) by overcoming language differences and differences between their cultural systems and that of the dominant host society" (Luciak, 2004, p. 360).

Involuntary (nonimmigrant) minorities are those that "(1) did not choose but were forced against their will to become a part of the United States, and (2) they themselves usually interpret their presence in the United States as forced by white people" (Ogbu & Simons, 1998, p.159). Involuntary minorities, people who have been conquered (American Indians), colonized (Mexican Americans in the Southwest), or enslaved (African Americans), often do not share the same level of positive expectations for their future as voluntary minorities (Ogbu, 1987). On the contrary, "involuntary minorities' perspectives of underserved and institutionalized oppression or discrimination have influenced the ways that they respond to White Americans and to the

societal institutions which Whites control" (Ogbu, 1990, p. 47). This population tends to experience the most challenges with academic performance and adjusting to school.

According to Ogbu (1998), children of immigrant minorities, regardless of their generational status, are considered voluntary minorities because he has found that the "education of descendents of immigrants continues to be influenced by the community forces of their forebears" (p. 159). The exception is when descendants of the immigrant group resemble the nonimmigrant group and society forces both groups to live and work together. As a result, the voluntary and involuntary minorities intermarry, and the descendents grow up with nonimmigrant peers and begin to assume the philosophies of their community. This situation has been experienced within the Black community because the descendents of Black immigrants from Africa and the Caribbean have become "Black Americans" (Ogbu & Simons, 1998).

Significant differences have been found in the educational attainment of Blacks who have chosen to immigrate to the U.S. and those who have been forced here due to the nation's history of slavery (Ogbu, 1987; Ogbu & Simons, 1998). Ogbu further argues that in order to understand this educational gap, it is necessary to examine both systemic and community forces. The system refers to "the way minorities are treated or mistreated in education in terms of educational policies, pedagogy, and returns for their investment or school credentials" (Ogbu & Simons, 1998, p. 156). How and why a group became a minority, coupled with their community's and families' educational returns and values are the community forces. According to Ogbu's theory therefore, it may be that not all Black STEM majors will require the same amount of support due to the differences in how they became a minority and their community and family forces.

There is a need to distinguish race from ethnicity. In 1948, Cox (as cited in Atkinson, Morten, & Sue, 1993) defined race as "any people who are distinguished or consider themselves distinguished, in social relations with other peoples, by their physical characteristics" (p. 7). This definition was one of the earliest that incorporated the social aspects of race. Krogman (1984, as cited in Helms, 1993) defines race as "a sub-group of peoples possessing a definite combination of physical characteristics, or genetic origin, the combination of which to varying degrees distinguishes the sub-group from other sub-groups of mankind" (p. 3). In differentiating between race and ethnicity, Casa (1984, as cited in Helms, 1993) has defined ethnicity as, "a cultural group classification of individuals who share a unique social and cultural heritage passed on from generation to generation" (p. 4). According to Atkinson and colleagues (1993), "ethnic differences involve differences in nationality, customs, language, religion, and other cultural factors; physical differences are not necessarily germane to ethnic differences" (p. 8). Thus, the terms race and ethnicity are not synonymous because ethnicity does not consider physical differences. To this end, it is possible for people to belong to one race and also belong to various ethnic groups. For example, the racial category of Black includes ethnic groups such as African Americans and Jamaicans.

The concept of who is Black has a legal history in the United States because laws such as the "one drop rule" and the "traceable amount rule," were created to categorize as Black any person who has as little as one thirty-second African/black blood (Rosenblum & Travis, 2000; Waters, 1999). Helms (1993) notes that a person "needs only to have one-sixteenth black African ancestry or some physical features deemed typical of such ancestry in order to be classified as black" (p. 3). Blacks are the only ethnic population in the United States that is defined and counted according to a "one drop rule" (Rosenblum & Travis, 2000). Once a person is classified

as Black, they are subject to being treated as second class citizens. In contrast to the one drop rule, defining blackness across ethnic groups is different. Additionally, just because people may be of the same race does not mean they all share the same culture, identify with each other, or even get along.

In the United States, West Indians' interactions and views of African Americans is rather complex. In *Black Identities: West Indian American Dreams and Realities*, Waters (1999) explains how West Indians do not want to be categorized as African Americans because they do not consider themselves African American, and they want to maintain their own West Indian culture and identity. A level of tension has been found to exist between African Americans and West Indians, but their relationship is impacted by the generational status of the West Indian.

Waters (1991) addressed this issue in a qualitative study by conducting in-depth interviews with a diverse sample of African Americans and West Indians from different socioeconomic backgrounds and generations. Both the immigrant and American born participants all felt that "American blacks were hypersensitive to race…[and] saw race and racism in every situation, even when [such sensitivity] was not unwarranted" (Waters, 1991, 69). West Indians also had very clear views of African Americans, especially regarding work ethic and achievement. West Indian immigrants tended to view African Americans as "lazy, unambitious, uneducated, unfriendly, welfare-dependent and lacking in family values" (Waters, 1991, p. 69).

African Americans also have very clear views of West Indians. The African American participants interviewed by Waters (1991) described the West Indians as "selfish, lacking in race awareness, being lackeys of whites, and had [having] a sense of inflated superiority" (p. 70). American Blacks prefer to use the term African American to racially describe themselves, and they believe all Black ethnic groups should also use this term in the United States. When Black ethnic groups reject being categorized as African American, African Americans perceive this response as the African American ethnic group being considered inferior to West Indians or Africans.

Traore (2003) researched the negative relationships between African and African American students in an inner city high school in the US. "African students wondered why their fellow African American brothers and sisters treated them as second-class citizens, while the African Americans wondered why the African students [seemed] to feel or act so superior to them" (Traore, 2003, p. 244). The concept of Afrocentricity, placing African values as the foundational principle, was used as a tool to bring these two groups of students together because they had to partake in small group discussions and attend cultural events. As the students learned about their own and each other's cultures, they began to form positive relationships by getting to know each other personally and dispelling the myths and stereotypes that previously existed.

The same stereotypes and myths that negatively impacted the high school students' views of Africans and African Americans, also negatively affects adults. In "Tensions between Africans and African Americans Surface Again," an article in the *New York Amsterdam News* (Cunningham, 2005), it was reported how African immigrants are frequently harassed by African Americans in New York. While not everyone shares experiences or views, there is a level of separation between Africans, African Americans, and West Indians in the U.S. despite what might be considered their apparently common race.

Issues Effecting Black Male College Student Retention and Graduation

There is a wealth of literature on African American college students ranging from Black students on predominantly White campuses (Sedlack, 1987), the effect of stereotypes on standardized test taking by Black college students (Steele & Aronson, 1995), and African American students and racial identity (Helms, 1993); however, few studies have focused solely on African American male college students (Harper, 2004). The few studies that have been conducted on undergraduate Black males identify general factors that lead to such students earning a degree. Unfortunately, as mentioned previously, there are few studies on the academic experiences of Black male STEM majors. Unlike Black females, who may leave school because they drop out, the Black male attrition rate is significantly higher due to academic dismissal (Hood, 1992; University System of Georgia, 2002). The literature pertaining to undergraduate African American males identifies several general factors that encourage their persistence in college. These factors tend to be grouped under the headings of individual, institutional, and family factors.

Individual factors

Individual factors are specific to the person and include GPA, academic skills, and motivation to succeed, among other noncognitive factors. In their survey of 229 African American freshmen at a Historically Black College and University, Schwartz & Washington (2002) found that high school GPA and class rank, combined with noncognitive factors–intrinsic motivation (being motivated internally to succeed in college), students' academic and social integration on campus, students feeling a part of the academic and social environments, the value students placed on education, and students believing that education is the conduit to achieving career and financial goals–are more likely to predict African American males' persistence in college than ACT scores.

Hood's (1992) research on the academic and noncognitive factors affecting the retention of African American males at a predominantly White institution is often cited when discussing this population. The sample included 409 (60% Black and approximately 13% each of White, Latino, and Asian) students who were admitted to the Educational Services Program, a special program to recruit and retain minorities and underprepared students. For Black males, high school class rank was the only variable that was significant in predicting GPA in college. To gain a deeper understanding of the college successes and failures of Black males, Hood interviewed two seniors and three freshmen. The interview participants attributed the high attrition rate of Black males to three factors: "(1) allowing situations to 'get to them' (e.g. being the only Black person in a class), (2) not taking college seriously until too late, and (3) not getting help such as counseling and/or tutoring when needed" (Hood, 1992, p. 21).

Davis (1994) surveyed 742 Black males who attended Historically Black Colleges and Universities (55%) and Predominantly White Institutions (45%) on their demographic information, college-level factors, and academic performance. His conclusion, which supports Hood's (1992) findings, is that "college-going Black males who are achievers in high school and who become more fully integrated into the academic life of their college campuses are more likely to be the most academically successful in college" (Davis, 1994, p. 630). Together, these studies suggest that African American males succeed because of their intrinsic motivation, determination to succeed, and ability to establish relationships with peers and faculty.

Institutional factors

Institutional factors pertain to the culture and climate of the university and whether minority students are able to integrate academically within the university. A healthy campus climate includes the entire operations of a campus from the recruitment of students, faculty, and staff to student organizations to curriculum and faculty interactions.

The significance of academic integration for Black males was found in Patitu's (2000) study on the satisfaction of 185 Black males who attended a predominantly White research university. Overall, the students felt academically integrated to campus because they were receiving a good education, formed relationships with faculty and peers, had positive experiences, created an enjoyable social life, accessed student services, and received financial support.

Studies have proven that students have experienced college differently on all levels depending on their race (Cabrera, Nora, Terenzini, Pascarella, & Hagedorn, 1999; Johnson, 2003; Reid & Radhakrishnan, 2003). The demographic changes within the student body have forced colleges and universities to proactively attempt to create and maintain a healthy campus climate and community. Campus climate involves more than just treating everyone equally. It involves ensuring that there are policies and procedures that overtly support and encourage a multicultural environment both in and out of the classroom so that every student feels as if he or she is a part of the community. "The challenge is to create campus environments that reflect the cultural heterogeneity within [the population] and create a learning community where all students are treated with respect and helped to succeed" (Valverde & Castenell, 1998, p.109).

While there is literature on the role of campus climate on the persistence of African Americans, the literature on African American males and campus climate, specifically, is limited. Also, studies have not reported or focused on the role of campus climate on the persistence of African Americans based on their academic majors. Studies have indirectly shown the affect of the racial climate and academic climate on Black males. For instance, African American males who performed better academically reported that they felt as though their institution supported them as Black men and directly met their needs (Cuyjet, 1997; Davis, 1999; Hall & Rowan, 2001).

Family factors

Research has identified patterns in African American families; however, it is important to remember that not all families are the same. Slavery has negatively and positively impacted the African American family structure. Negatively, it has stripped the family as a unit and separated mothers and fathers (Fordham, 2000). Positively, it has allowed the family to become a more unified unit, and to extend it beyond the traditional definition of a family (Henke, 2001; McEachern & Kenny, 2002).

There is a significant amount of literature regarding the relationship between family and educational success, but it is primarily focused on K-12 and not higher education (Walker & Satterwhite, 2002). The literature that does exist on college students is inconsistent, and there are few studies on African American college students (Rodriguez et al., 2003). The research that is available demonstrates that families play a critical role in the academic success of Black undergraduate students (Kiah, 1992; Walker & Satterwhite, 2002; and Herndon & Hirt, 2004).

To date, there are not any studies that specifically address the relationship between family support and Black male college students.

Moore's (2006) study demonstrated that individual, institutional, and family factors all affect Black male students' retention and graduation. Individually, Black male engineering majors must be academically strong in math and science, as well as seriously interested in the STEM areas. Institutionally, they must interact with faculty and have meaningful academic experiences. Familial influences and receiving encouragement from their family are also equally important.

In addition to the interaction of individual, institutional, and family factors, Black males wishing to undertake a STEM major are also susceptible to other issues. The few studies that have been conducted on Black male students persistence show that their persistence is effected by their intrinsic motivation, value placed on obtaining an education, integration to campus (Hall & Rowan, 2001; Moore, 2006; Patitu, 2000; Schwartz & Washington, 2002, Summer), and familial support (Herndon & Hirt, 2004; Rodriguez et al., 2003; Walker & Satterwhite, 2002).

In summary, there is a wealth of research on African American college students' experiences, but since there are twice as many Black female students than male students, current research is more reflective of female Black college students' experiences than Black male students. Additionally, while research has been conducted on Black male college students, there is very little research on Black males who are majoring in a STEM discipline. Overall, the literature on Black males persisting in college suggests that the factors needed for them to persist and earn a degree are (1) academic integration, (2) institutional support, and (3) their personal qualities and academic skills (Cuyjet, 1997; Hall & Rowan, 2001; Hood, 1992; Maton & Hrabowski, 2004; Patitu, 2000; Schwartz & Washington, 2002, Summer; Wellbrock, 1998). In addition, the values instilled by their family, as well as continued family support, positively affect Black students' academic success (Herndon & Hirt, 2004; Walker & Satterwhite, 2002). When students are academically integrated, this positively influences their grade point average, commitment to their college, and to earning a degree.

This study fills existing gaps in the literature on the academic integration of Black males who are STEM majors, the role of their family on their academic collegiate experiences, and within-group ethnic differences. Understanding Black male STEM majors' academic integration and the role of their family will provide information that will allow institutions of higher education to enhance these students' educational experiences, thus increasing their persistence and graduation rates.

Purpose and Research Questions

Drawing on Ogbu's theoretical concepts, the purpose of this study is to examine how familial and institutional factors interact with the academic experiences of a diverse group of Black males enrolled as STEM majors at one university. Utilizing both quantitative and qualitative techniques, this study analyzed the academic integration of Black male undergraduate STEM majors, the role of their families in their collegiate career, and whether there were any within-group differences. The study was guided by the following research questions:

1. What have been the participants' academic experiences in higher education as a STEM major?

a. What are some of the within-group variations of the academic experience of Black male STEM majors at a predominantly White, public research university?
2. What role does family play in the participants' academic experiences?
a. What are some of the within-group variations of the participants' family values and expectations about higher education?

Method

This study examined the familial influences and academic integration of Black male STEM majors attending a predominantly White research university in the northeast. The researcher used both quantitative and qualitative research methods. The survey, Academic and Social Integration Scale (Pascarella & Terenzini, 1980), enabled the researcher to learn about the participants' academic integration, specifically their interaction with faculty, intellectual development, and institutional and goal commitments, and within-group differences. A demographic questionnaire was used to collect background information on each participant and information about each participant's family. The qualitative method of interviews was used to gain more in-depth perspectives on the role of family on the academic experiences of six Black male STEM majors.

Setting and Sample

The setting for this study was a science and technology public, predominantly White research university with a total population of approximately 8,800 students. Participants in this study were all students who met the criteria for inclusion in the study. They were (a) Black, (b) male, (c) currently enrolled as a full-time undergraduate student, (d) science, technology, mathematics, or engineering major, and (e) had sophomore (27 credits) standing or higher. Freshmen were excluded due to their limited amount of college experience and because the instrument to be administered–the Academic and Social Integration Scale (Pascarella & Terenzini, 1980)–requires students to have completed at least one year of college.

Based on the database the researcher received from the University, there were 258 students who met the criteria for the study. All 258 students were asked to complete the survey. Ninety-nine students (27 African, 24 African American, 25 Caribbean, and 23 Biracial) completed the survey. In the demographic portion of the survey, participants were allowed to identify themselves ethnically by checking a maximum of two ethnic categories. Based on the responses, the four ethnic categories were African, African American, Caribbean, and Biracial. The Biracial category identifies participants who identified themselves as belonging to two ethnic groups.

As can be seen in Table 1, most of the students who participated in the survey were engineering majors (78%), 19% were technology (i.e. computer science and information technology) majors, 2% were majoring in mathematics, and 1% was majoring in science. The largest percentage of participants (28%) family income was between $20,000 – 39,999 per year. An additional 20% was $40,000 – 59,999, 13 % was $60,000 – 79,999, and 20% was over $80,000.

The participants were not only more likely to have come from a middle or upper class socioeconomic level, but it was also more likely that they were not the first in their families to attend college. In fact, less than 30 percent (27.3%) of the participants were the first person in

their family to attend college. Overall, the fathers of all the participants were well educated, as more than half (53.5%) had earned a doctorate degree. The mothers were also educated, but not to the extent to which the fathers were because 32.7 percent of the mothers never attended college, and none of the mothers of the participants had earned a doctorate. Nearly 35 percent of the mothers had not earned at least a bachelors degree.

There were significant differences when the parents' educational background was scrutinized by ethnicity. Overall, the African parents were the most educated with 36.4 percent having earned at least a bachelors degree. The Caribbean fathers were more educated because 64 percent earned at least a bachelors degree; however African fathers were the most educated, with 74.1 percent having earned at least a bachelors degree.

Table 1.

Participant Demographics (N=99)

Characteristic	Frequency	Percent
Ethnicity		
African	27	27.3
African American	24	24.2
Caribbean	25	25.3
Biracial	23	23.2
Major		
Science	1	1.0
Technology	19	19.2
Engineering	77	77.8
Mathematics	2	2.0
Family Income (N = 93)		
$0 – 19,000	12	12.9
$20,000 – 39,999	28	30.1
$40,000 – 59,999	20	21.5
$60,000 – 79,999	13	14
$80,000+	20	21.5
Missing	6	
First To Attend College		
Yes	27	27.3

From the population of 99 students who completed the survey, 28 students volunteered to be interviewed. To obtain a diverse interview pool, the researcher used the following criteria – ethnicity, income, and major. Only six students responded and participated in the interview. The sample included one African American, two Africans, and three Caribbean students (see Table 2). There were two sophomores, three juniors, and one senior. One of the students was majoring in mathematics, one majored in instructional technology, and four were engineers (biomedical,

chemical, civil, and industrial). To protect the identity of the participants, pseudonyms are used in reference to all of the participants as well as specific programs, individuals, and settings.

Table 2.

Interview Participants Demographics

Participant	Ethnicity	Major	Year	Family Income
Allen	African	Math	Sophomore	$20,000 – 39,999
Darren	African	Chemical Engineering	Junior	$80,000+
Jacob	Haitian	Industrial Engineering	Junior	$20,000 – 39,999
George	Haitian	Instructional Technology	Sophomore	$20,000 – 39,999
Charles	Jamaican	Biomedical Engineering	Junior	$20,000 – 39,999
Peter	African American	Civil Engineering	Senior	$80,000+

Overall, the participants in this study were students from educated parents whose family income tended to be at least middle-class. In addition, most of the students were not first generation college students, and their parents were born outside of the United States.

Data Collection

There were two phases of data collection because of the mixed methods design being utilized. First, a survey was used to elicit information regarding participants' academic integration, specifically their interaction with faculty, intellectual development, and institutional and goal commitments. Participants were contacted via email to participate and complete the web-based survey. Next, interviews were conducted with a smaller portion of students to explore the role of their family on their collegiate academic experiences. Each of these methods is described next.

The Academic and Social Integration Scale/Survey

The Academic & Social Integration Scale (Pascarella & Terenzini, 1980) is based on Tinto's (1988) academic and social integration model. According to Tinto's model (1988, 1998), students depart from college because they are not academically and socially integrated with the college. Persistence is influenced by students being involved on campus socially and academically; however, being academically integrated tends to influence persistence more (Tinto, 1998). The academic and social integration model assumes that a student's academic performance and intellectual level impacts their academic integration. The Academic and Social Integration Scale has been found to be internally reliable and valid with "alpha coefficients for

these scales ranging from .71 to .84" (Fox, 1984, p. 1052). Overall, Fox (1984) concluded the scales "have discriminate validity" for studying under-represented students attending urban institutions.

The Academic and Social Integration Scale consist of five sub-scales of institutional integration, of which four were utilized for this study. The student perception of peer group interactions was not used for this study because the focus of the study is on students' academic integration. The interactions with faculty scale measures students' out of classroom experiences with faculty and assesses whether the students developed a close relationship with at least one faculty member. Interactions with faculty inside and outside the classroom also directly impacts a student's academic integration (Tinto, 1998). The quality and interest in teaching, as well as faculty's interest in helping students develop academically and personally, are the focus of the faculty concern for student development and teaching scale. The third scale, academic and intellectual development, focuses on students' satisfaction with their GPA and overall academic experience and with the students being intellectually stimulated. The more students are integrated to their campus academically and socially, the more committed they are to the institution and to graduating, commitments Tinto refers to as "institutional and goal commitments" (Pascarella & Terenzini, 1980). Institutional and goal commitments, the final scale, seek to understand students' commitment to graduating from their current institution or another institution, enrolling the following semester at their current institution, and overall satisfaction with current institution. Ultimately, the student should experience institutional integration.

Interviews

At the end of the demographic survey, students were asked to volunteer for an optional interview. A total of six students were interviewed for approximately 45-minutes. A semi-structured interview guide (Seidman, 1998) was created based on two sources. The first source was a revised set of questions that the researcher had previously used in a pilot study conducted in 2004. The second source was a set of questions that has been used in previous research by Herndon & Hirt (2004). The interview protocol focused on the participants' role within his family, his family's effect on his collegiate academic experience, family values, family expectations, characteristics males should embody, and familial support. In addition, a few questions inquired about campus culture, classroom climate, and participants' interactions with their academic advisors because these experiences are related to their academic integration. With the permission of the participants, the interviews were tape recorded. All interviews took place on campus in a conference room.

Data Analysis

Data analysis followed a 3-phase plan: phase one, analysis of the survey data; phase two, interviews; and phase three, amalgamating survey and interview data sets. For phase one (The Academic and Social Integration Scale), the scales were analyzed separately using descriptive statistics to search for general trends. Inferential statistics (ANOVA and cross tabulations) were used across the scales to determine patterns of significance as well as relationships between the demographic variables and scale items. The demographic variables were analyzed using

descriptive statistics to provide a portrait of sample characteristics. ATLAS/ti was used to analyze the interview data, which was coded inductively and deductively in a two step process. Categorical aggregation (Stake, 1995) was used to search for "patterns of experiences" (Aronson, 1994). Coded segments of data that appeared to be similar or related were chunked into groups. To further reduce the data, common patterns were merged into several overarching themes. "Themes are defined as units derived from patterns such as 'conversation topics, vocabulary, meanings, feelings, or folk sayings, and proverbs" (Taylor & Bogdan, 1989, p. 131 as cited in Aronson, 1994). By grouping codes with similar meanings together and searching across the data, the researcher was able to identify six themes. The final process included amalgamating both data sets.

Findings

Despite theories (Ogbu, 1987) that posit that immigration status and cultural background interplay with Black males' student success, most of the available research on academic integration has not looked at the variation across different Black ethnic groups. One purpose of this study was to examine how institutional factors interact with the academic experiences of a diverse group of Black males enrolled as STEM majors at one university and to see if there were any within-group ethnic differences. This section presents the results of the Academic and Social Integration Scale to address the first research question: what have been the participants' academic experiences in higher education as STEM majors and are there within-group ethnic differences? The second section will provide key findings based on the qualitative and quantitative data.

Academic integration is an interplay of factors linked to academic performance, campus climate, interactions with faculty, intellectual stimulation, and a range of other formal and informal academic experiences. In general, the students' responses in this study are positive regarding their academic experiences at this institution, as measured by the Academic and Social Integration Scale (Pascarella & Terenzini, 1980). Their overall satisfaction relating to academic integration was evidenced in two ways – their assessments of campus climate and interactions with faculty.

Quantitative Findings

Campus Climate

Campus climate involves more than just treating everyone equally. It involves ensuring that there are policies and procedures that overtly support and encourage a multicultural environment both in and out of the classroom so that every student feels a part of the community. "The challenge is to create campus environments that reflect the cultural heterogeneity within [the university population] and create a learning community where all students are treated with respect and helped to succeed" (Valverde & Castenell, 1998, p. 109). One aspect of the campus climate is the academic climate, which is "composed of students' observations about their academic experience, such as treatment by instructors, being perceived as serious students by peers, and receiving academic mentoring" (p. 265). Reid and Radhakrishnan (2003) found that the academic climate was a better predictor of general campus climate than racial climate for undergraduate African Americans.

The academic climate as a STEM major is important to these students because their academic experiences have a direct impact on their retention and graduation. Overall, the participants were fairly pleased with their academic experiences. Sixty-two percent reported feeling satisfied or very satisfied. With the exception of one biracial student who strongly disagreed, all (99%) of the students indicated that it was imperative for them to graduate from college. Over 80 percent (82%) of the students felt that earning good grades is important. All of the students were highly motivated, as evidenced by their reported commitment to the institution, graduating from college, and earning good grades. Therefore, the data suggest that this institution's campus climate provided an environment conducive to meaningful academic experiences.

Based on the data and the literature, it is apparent that these students, regardless of whether they had already declared their intended majors, had decided that they would pursue a career in a STEM field. The campus climate, coupled with the students' interests and career goals may explain their level of intrinsic motivation as well as commitment to this institution. More specifically, seventy-four percent were confident they made the right choice in choosing to attend this university. These results would suggest that the participants were having a positive academic experience.

Interactions with Faculty

The frequency and quality of student-faculty interactions, both inside and outside of the classroom, are considered a key component of academic integration for Black students (Hood, 1992; Patitu, 2000). The literature has overwhelmingly concluded that the more meaningful contacts students have with faculty, the more likely the students' satisfaction, adjustment to college, and academic success are positively influenced (Chang, 2005; Garrett & Zabriskie, 2003; Kuh & Hu, 2001; Pascarella & Terenzini, 1978). In other words, when students become connected to the campus community, they are more likely to become integrated to the institution.

The general trends across all ethnic groups in this study regarding their professors' quality in teaching and helping students develop academically and personally were not positive. Overall, the students felt their professors were committed to teaching (67%), but were not outstanding teachers (57%). Less than half (46%) believed the professors were committed to spending time with students outside of the classroom. Since the student to faculty ratio (13 to 1) at this university is very good, it is possible that faculty members are able to converse with students more during class time, which minimizes the need for outside of class contact. The participants' responses resonate with the general university responses from the National Survey of Student Engagement that was conducted at this institution in 2004. Students at this institution are less satisfied with their educational experiences and relations with faculty as compared to other United States doctoral-intensive institutions.

While over seventy percent of the students indicated they felt as though they were intellectually stimulated, only forty percent believed their interactions with faculty outside of the classroom had a positive impact on their intellectual development. At the same time, sixty percent of the participants reported that their career goals had been positively influenced by outside classroom interactions they have had with faculty. This finding is in agreement with Moore (2006), who found that African American male engineering students' educational

interests and career goals were affected by the quality of their interactions with school professionals.

One potential reason for the reported limited intellectual development from interacting with faculty outside of the classroom may be the lack of Black male faculty members on campus. The limited numbers of Black males earning a degree in a STEM discipline means there is also being an absence or lack of Black male STEM professionals. Therefore, there is a lack of role models and mentors for young Black males to encourage them to pursue these fields. African Americans, according to Hall and Post-Krammer (1987, as cited in Hall, 1998), are more likely to choose occupations in which they have interacted with successful professionals. In other words, "early exposure to, and interaction with, professional role models in the natural and technical sciences have been found to be critical for recruiting and retaining students' interests and participation in mathematics and science" (Hall, 1998, p. 31). More specifically, Lundberg and Schreiner (2004) found that African American students preferred to disclose more information to faculty members of their own race or ethnicity. In addition, "African American students find it difficult to approach faculty, particularly when the faculty are different from themselves in terms of race because they fear that faculty have negative perceptions of their racial group" (Lundberg & Schreiner, 2004, p. 549).

Academic Integration and Differences across Ethnicities

According to Ogbu (1987, 1998), the capacity in which a people arrived in the United States, (i.e. whether voluntarily or involuntarily) provides insight into their values, beliefs, and educational experiences. His Cultural-Ecological theory postulates that immigrants perform better academically than involuntary minorities (nonimmigrants) because they are more accepting of and likely to adapt to the White middle-class norms of U.S. schools (Ogbu, 1994, 2004). To see if Ogbu's theoretical concepts were applicable to this population, the survey data were analyzed by ethnicity to search for within-group differences. While the data overall were positive for the sample, when viewed by ethnic groups, some variations were apparent. There were two main areas in which significant differences were found: academic experience and faculty connections.

Academic Experience and Intellectual Development

The African and West Indian students in this study (both voluntary minorities), were more satisfied with their academic experiences and appeared to be benefiting from these experiences more than the African American and Biracial students (see Table 3). Africans (78%) were clearly the most satisfied with their academic experience, followed by West Indian (68%), African Americans (50%), and Biracial (48%) students.

In addition to African students being significantly more satisfied with their academic and intellectual development, they also reported being pleased with their grade performance. Over 60% of African (63%) and West Indian (64%) students were earning the grades they expected themselves to earn, whereas less than forty-five percent of African American (42%) and Biracial (43%) students were similarly satisfied. The African American students (involuntary minorities) are the least satisfied with their academic experiences, grade performance, and intellectual growth.

Table 3.

Academic Experiences Across Ethnic Groups

Experience	African	West Indian	Biracial	African American
Satisfaction with academic experiences	78%	68%	48%	50%
Satisfied with academic performance	63%	64%	43%	42%
Academic experiences have positively influenced intellectual growth	78%	96%	78%	58%
Satisfied with intellectual development	70%	80%	70%	63%

To assess the statistical significance of the differences between ethnicities, multiple comparison methods were used (see Table 4). Due to the number of tests used, a Bonferroni correction was applied to control for the possibility of a Type 1 experimentwise error rate. An alpha level of .05 was used for all statistical analyses. On this scale, Academic and Intellectual Development, the African students scored significantly higher compared to African American (M=3.05, S.D. = 1.16), West Indian (M=1.06, S.D.=1.15), and Biracial (M=2.26, S.D.=1.17). The results also showed a significant difference between African and African American students, *p*=.060.

Table 4.

Academic and Intellectual Development Scale Multiple Comparisons by Ethnicity (N=99)

Ethnicity (I)	Ethnicity (J)	Mean Difference (I-J)	Standard Error	Significance
African	African American	3.0463	1.15980	.060*
	West Indian	1.0563	1.14745	1.000
	Biracial	2.2528	1.17307	.347

* Significant difference between African and African Americans. *p* ≥.05

These findings suggest that the African students are more satisfied with their academic experiences and intellectual development at a significantly higher level than African American students.

Faculty connections

The African students, more so than any other ethnic group, regularly connected, interacted, and formed relationships with faculty members outside of the classroom (see Table 5). Conversely, African American students in this study reported having the least amount of effective connections with faculty. Sixty percent of the African students reported developing a close relationship with at least one faculty member, whereas less than forty percent of the African American (38%) and West Indian (33%) students reported having developed a relationship with at least one faculty member. More than half (56%) of the African students participated in informal conversations with faculty, which may possibly contribute to the students' intellectual growth and academic integration. The African American students (33%) were not engaged in these conversations with faculty at the same level as African students, which may decrease the African American students' level of academic integration. This lack of engagement was evidenced by the fact that only twenty six percent of African American students reported that their intellectual growth was being positively affected by their connections with faculty outside of the classroom, while over half (54%) of the African students reported such a benefit. The African American students' career goals and inspirations were the least impacted (35%) by interacting with faculty outside of the classroom, whereas nearly sixty percent (58%) of the African students had benefited.

Table 5.

Faculty Interactions Across Ethnic Groups

Interactions	African	West Indian	Biracial	African American
Close relationship with at least one faculty member	60%	33%	47%	38%
Satisfied with opportunity to interact with faculty	56%	44%	39%	33%
Outside classroom experiences with faculty have positively influenced intellectual growth	54%	41%	37%	26%
Outside classroom experiences with faculty have positively influenced career goals	58%	48%	50%	35%

The disparity between African and African American students interacting with faculty was not surprising because over seventy percent (73%) of African students felt as though faculty were interested in conversing with students on topics beyond academics. If students feel as though faculty members are committed to them academically, professionally, and personally, then the students will be more likely to engage in conversation and begin to build relationships with faculty. Conversely, if the students feel as though the faculty members are not interested in speaking with them regarding non-academic issues, then the students are less likely to form

relationships and benefit from these interactions, which is evident in the responses of the West Indian and Biracial (50%) and African American (48%) students in this study.

What is unknown in this study is whether faculty members reach out to all Black students, and only African and West Indian students take advantage of this opportunity or whether faculty members only reach out to African and West Indian students. Also, what is unknown is whether faculty members have different academic expectations of Black students based on their ethnicity, past experiences with various ethnic groups, and ethnic stereotypes.

Mixed Method Key Findings

Based on the survey and interview data, there are four key findings of this research. This research study found that for the Black male STEM students in this project, (a) their family is a pivotal force, (b) academic experiences varied across ethnicities, (c) faculty mediate student success, and (d) there is a lack of interactions between ethnic groups (Black Distance) on campus. Each of these findings is discussed next.

Family is a Pivotal Force

Ogbu's (1998) theory has two major parts. The first part is the system (how minorities are treated in educational settings), and the second part is the combination of community forces (the minorities' educational views and their responses to how they are treated in school) within a given community. Ogbu (1987, 1994, 1998) posits that the manner by which a group achieves minority status, coupled with their community and family educational values impacts academic achievement. Voluntary minorities are more likely to receive academic encouragement from their community and family than involuntary minorities (Ogbu, 1991). Voluntary and involuntary minorities differ in their philosophies of how to "make it" and succeed in the United States. For voluntary minorities, the "folk theory of making it involves the belief that hard work, following the rules, and most important, getting a good education will lead to a good employment and success in the U.S. society" (Ogbu & Simons, 1998, p. 163), whereas involuntary minorities also agree that hard work and education are necessary to succeed but not enough to overcome racism and discrimination.

In agreement with Ogbu, this study found that the participants' families play a pivotal role in their educational experiences and development. The Black males in this study have been shaped by their family's educational values, as evidenced by less than thirty percent of the sample being the first in their families to attend college. More specifically, all of the Black males interviewed reported that the value of education and obtaining a college degree was instilled at an early age and is still emphasized today.

For these participants, their families' role extended beyond instilling educational values to also helping with the college application process and providing ongoing support. With the exception of one interviewee, all of the students reported that their family played a role in them attending college. In addition, the students interviewed reported that they currently receive financial, emotional, and educational support from their families. Financial support, the most frequently recorded type of support, is critical to the persistence of Black students. Research indicates that students who worry about how to pay for college cannot focus on their academics (Maton & Hrabowski, 2004; Patitu, 2000; Rice & Alford, 1989). More importantly, the students

want to show and thank their family members for all their support by performing well academically and graduating.

This research contradicts Ogbu in that the African American student who was studied, an involuntary minority, received the same type of messages and encouragement from his family to succeed academically as often as the voluntary minority students in this study did. Regardless of how the African American male interviewee's ancestors arrived to the U.S., this study found that his educational views and values had been shaped and continue to be shaped by his family.

Ogbu's theory emphasizes that educational achievement is not based on race or ethnicity, but on (1) how a person became a minority and (2) a particular culture's ability to gain economic progress and rewards for educational gains. By explaining a person's educational attainment solely on their historical process of becoming a minority, Ogbu does not acknowledge any changes in their values, norms, and behaviors over time or by generational status (Foley, 2005; Gibson, 1997). Therefore, his theory is a "fixed notion of race/ethnicity as an inherited historical tradition" (Foley, 2005, p. 386) rather than one that views culture and ethnicity as ever changing because we are shaped by our experiences, family, and community. While there were no variations across ethnicities relating to the role of the participants' families, there were differences across participants in the remaining key findings.

Academic Experiences Across Ethnicities

Ogbu's Cultural-Ecological theory postulates that immigrants perform better academically than involuntary minorities (nonimmigrants) because they are more accepting of and likely to adapt to the White middle-class norms around which schools in the U.S. are based (Ogbu, 1994, 2004). The findings from this study support Ogbu's theory, as significant differences between the African and African American male students were found. The African students in this study were the most academically integrated ethnic group, while the African Americans were the least. In addition to the African males reporting being more satisfied with their academic experiences than African Americans, over sixty percent (63%) reported being pleased with their grade performance, whereas most (58%) of the African American students were not satisfied with their grade performance. The African American males in this study appeared to be the least satisfied with their academic experience, grade performance, and intellectual growth.

Also supportive of Ogbu's (1987) theory is the reported experiences of Caribbean students (voluntary minorities) in this study. Like the (voluntary minority) African students, the West Indian students reported being significantly more satisfied with their academic experiences and appeared to be benefiting from these experiences more than the African American and Biracial students. One of the reasons why these students may be more satisfied and motivated, according to Ogbu (1987, 1998), is because voluntary immigrants tend to trust the system and schools and typically conform to the rules of the new educational system because they believe it will allow them access to other opportunities (Ogbu, 1987). The findings from this study substantiate the need for research to investigate within-group ethnic differences because the pattern of African American students in this study suggests that they are integrating less than African and West Indian students.

The lack of acknowledgement of the diversity within Black ethnic groups, especially diversity among involuntary minority groups, is a frequently cited critique of Ogbu's theory (Foley, 2004; Foster, 2004; Gibson, 1997). "A manifestation of these criticized aspects of

Ogbu's work is that there is no room in his analysis for the existence of involuntary minority high-achievers whose motivations to strive and succeed are rooted in their experiences as community participants" (Foster, 2004, p. 377). Succinctly stated, Ogbu believes that African Americans intentionally perform poorly because they do not want to be considered to be "acting white." Based on the requirements to be accepted to this research university, the African American participants in this study are considered high-achievers. While they are not excelling at an equal level as the African participants, they are determined to succeed and are persisting towards earning a STEM degree.

Faculty Mediate Students Success

The literature has overwhelmingly concluded that the more meaningful contacts students have with faculty inside and outside the classroom, the more likely that the students' levels of satisfaction, adjustment to college, and academic success are positively influenced (Chang, 2005; Garrett & Zabriskie, 2003; Kuh & Hu, 2001; Pascarella & Terenzini, 1978). Specifically for STEM majors, research has shown that informal student-faculty interactions directly affect students' retention and their quality of effort in science and math courses (Thompson, 2001).

The general trend across all ethnic groups in this study regarding the quality of teaching and the academic and personal mentoring is not positive. The students reported that although their professors appeared to be committed to teaching, the professors were not, in fact, outstanding teachers. In addition, the students indicated feeling that faculty members were not committed to investing time in students outside of class. Due to the excellent faculty to student ratio (1:13) and the nature of the university, all of the students had at least minimal required interaction with faculty members and academic advisors; however, interview findings showed that the depth of the relationship varied depending on the individual.

When the data was reviewed across the ethnicities, the African students in this study, more so than any other ethnic group, were connecting, interacting, and forming relationships with faculty outside of the classroom. On the other hand, the African American students had the fewest effective connections with faculty. The African students reported participating in informal conversations with faculty, which may possibly contribute to their intellectual growth and academic integration. In comparison to the African students in this study, the African American students were remotely engaged in these conversations with faculty. In addition, the African American students' career goals and inspirations were the least impacted by interacting with faculty outside of class, whereas most of the African students benefited from these discussions.

One reason for the disparity between African and African American students on this issue is that African students appear to have different perceptions of the faculty than their African American counterparts. African students were more likely to report that they found the faculty members were interested in conversing with students on topics beyond academics. If students feel as though faculty members are committed to them academically, professionally, and personally, the students will be more likely to engage in conversation and begin to build relationships with faculty, thus becoming academically integrated into the institution.

Based on existing literature, Black students are academically integrated when they form relationships with faculty. Therefore, if only certain groups of Black male STEM students in this study had these opportunities, it is quite possible that the retention and graduation of some students will be affected. These findings are similar to those of Lundberg and Schreiner (2004),

who found that African American students do have contact with faculty, but the interactions are not meaningful.

Black Distance

The racial category of Black includes several ethnicities (i.e. African American, West Indian, and African), and intra-racial dynamics exist among Black ethnic groups. More specifically, in society, a level of tension has been found to exist among all three ethnic groups (Cunningham, 2005; Traore, 2003; Waters, 1999). The current study found that the Black male participants are not interacting with other Black male students, even those who appear to share the same ethnicity, thus perpetuating Black Distance.

The Black males who were interviewed are not utilizing each other across ethnic lines as a resource, and their interactions are minimal for unknown reasons. The participants do not know why they continuously choose not to sit near or interact with people who look like them ethnically. Black Distance appears to negatively impact academic integration because it is preventing the students from forming relationships with other Blacks that could evolve into a support network or study group, which could provide another mechanism for the students to become integrated to campus.

Ogbu's theory has been critiqued for presenting a rigid dichotomy that does not consider power relations in society and underestimates the diversity within ethnic groups (Cummins, 1997; Foley, 2005; Gibson, 1997; Harpalani & Gunn, ; Tyson, Darity, & Castellino, 2005). While researchers have shown that schooling is impacted by political and societal issues (Cummins, 1997; Erickson, 1987; Noguera, 2003), Ogbu does not consider the impact of these forces on school failure. The views the participants hold of other ethnicities could be impacted by societal beliefs, thus causing them to unconsciously act on those stereotypes. Masculinity may also be a factor in Black Distance. Ogbu does not account for any role that gender may play in shaping a student's academic performance, identity, or school experiences (Gibson, 1997). Yet, as evidenced by the educational attainment gap between Black males and females, gender must be considered (Snyder & Hoffman, 2004). While this study did not address masculinity, the participants' reported emphasis on the need to succeed in order to give back to their families is supportive of existing literature (Harper, 2004). Harper (2004) found "the high-achievers' views of masculinity were clearly alternative and inconsistent with those of fellow African American male peers" (p. 102) and their desire to succeed was for "selfless reasons" to help their African American community.

The findings from the current study reveal that, overall, the Black males are academically integrated and determined to succeed despite the limited amount of Black males on campus, poor teaching quality of professors, and professors who do not spend quality time with students outside of class. When ethnicity is considered, however, the African and West Indian students had more positive experiences than African American and Biracial students in this study. Based on these findings, there are several policy implications and recommendations that can be made to improve the academic experiences of Black male STEM majors at this institution. These implications are discussed in the next section.

Policy Implications

Based on the findings of this study, there are four areas that higher education administrators might want to consider when developing responsive policies for Black male STEM majors. These areas are (1) improving communication on campus between Black males (reducing Black Distance), (2) providing academic advising training sessions, (3) cultivating relationships between Black male STEM majors and Black faculty and administrators, and (4) including the family in the academic institution.

Limitations and Areas for Future Research

This study is limited by the setting, sample size, and instruments used. The institution is focused predominantly on STEM disciplines; therefore, the findings may not translate as easily to other universities with a broader academic focus or Historically Black Colleges and Universities. Moreover, the sample size of the study was small; therefore, the findings cannot be generalized to explain the experiences of all Black male STEM majors. It is also important to note that Black male students who dropped out voluntarily or involuntarily were not studied. Therefore, the findings of this study are of those men who show a stronger commitment to completing their programs. It must also be noted that since race is a social construct, the participants' racial and ethnic identities are subjective. For example, a research participant might have checked African and African American because he has one parent who belongs to each ethnic category or because both parents are African, but he identifies himself ethnically as African American.

Despite these limitations, this study is one of few studies to have investigated the academic integration of Black male STEM majors and the role of their families on their collegiate careers. Rather than viewing Black males as one category, this study contributes new insights to the literature by examining whether academic integration and family support differ among Black ethnic groups. This research shows that there is significant difference not only between Black ethnic groups but also within each of these groups. Moreover, this study has identified a new theoretical construct of Black Distance to describe the phenomenon whereby Black students from different ethnic groups choose to not associate with one another although they may be one of only two Blacks in a classroom. Future research, in addition to an examination of the theoretical construct of Black Distance, is needed to build on the work of this study in several ways.

First, to specifically research the interplay between Black male STEM majors' academic, institutional, and familial experiences, across a large population and multiple sites, a new instrument should be created. The new instrument would expand upon the Academic and Integration Scale and delve more deeply into issues of academic integration. A second promising line of inquiry is the interplay of generational status and Black male's persistence in difficult majors such as STEM careers. Next, as a science and technology university, the students intentionally choose to attend this school because of their academic major, which is very different than those who attend a liberal arts university. More research is needed across all types of higher educational institutions to explore the effect of institutional climate on the academic and social integration of Black males (Chang, 2005; Flowers, 2006). A final area for future research is to study Black males who are no longer STEM majors to find out about their academic experiences and what caused them to change their majors. Understanding their

academic, social, and psychological experiences could provide insight into how to create retention programs to help Black males persist as STEM majors.

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