Black college students' perceptions of occupational self-efficacy and barriers for racially/ethnically traditional and nontraditional majors

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BLACK COLLEGE STUDENTS’ PERCEPTIONS OF OCCUPATIONAL SELF-EFFICACY AND BARRIERS FOR RACIALLY/ETHNICALLY TRADITIONAL AND NONTRADITIONAL MAJORS

by

Justin T. Gibson

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Abstract

The purpose of this study was to explore the degree to which contextual factors, campus environment and the racial/ethnic traditionality of the academic major, were related to perceptions of self-efficacy for entering racially/ethnically traditional and nontraditional occupations and perceptions of career and educational barriers in Black and African American college students. An experimental study was conducted in which Black college students were randomly assigned to read one of four vignettes in which the target was either a Mathematics or Psychology major, and was either a student at a historically Black college or university or a predominantly White institution. The final sample consisted of 235 Black and African-American full-time students from different regions and locations within the U.S. Contrary to the hypothesis, there was no significant interaction between academic major and campus environment on the self-efficacy or barrier variables. There was a significant main effect for academic major on self-efficacy, such that participants rated the target as having greater self-efficacy for entering nontraditional fields when he was described as majoring in Mathematics compared to when he was described as majoring in Psychology. The results imply that the racial/ethnic traditionality of the academic major is an important factor to consider in Black college students’ self-efficacy for entering nontraditional fields.
CHAPTER I

Introduction

The estimated population of Blacks in the United States, including those of more than one race, is about 40.2 million, which is approximately 13.4% of the U.S. population (US Census Bureau, 2007). As of 2010, African Americans comprised 10.8% of the labor force in the United States (Bureau of Labor Statistics, 2010). Over the past few years, African Americans have made substantial gains in both educational and occupational achievement. For example, an estimated 1.3 million African Americans, aged 25 years and older, have attained advanced degrees such as a master’s, doctoral, medical or law degree (US Census Bureau, 2007). Despite these encouraging statistics, Whites are not only better represented among higher-prestige, higher-salaried professions, they are by far more diversified across the Holland typologies (Beasley, 2004). Moreover, the numbers of African Americans in fields related to math, science and engineering remain persistently low (US Census Bureau, 2007).

The discrepancy between the occupational achievement of college-educated African Americans and that of college-educated Whites has been attributed to the effects of racism, which continue to bar African Americans from achieving more educational and career gains. Historically, there has been an under-representation of minority students with STEM (Science, Technology, Engineering, and Mathematics) undergraduate degrees (US Census Bureau, 2007). Despite the increases mentioned above, Black students continue to be less likely to complete degrees in the STEM fields (US Census Bureau, 2007). Some argue that the reason for this gap is that minority students are not interested in STEM fields; however, Fouad and Byars-Winston (2005), using a meta-
analysis of 19,000 individuals, found that there were no statistical differences across racial groups in career interests or aspirations. In contrast, differences across racial groups did exist in that minorities anticipated more career-related barriers than White students (Fouad & Byars-Winston, 2005). Some of these barriers include, but are not limited to, greater barriers in degree attainment (Seymour & Hewitt, 1997), a generally negative classroom environment (Cabrera, Colbeck, & Terenzini, 2001), poor peer and faculty relations (Beasley, 2004), and experiences of prejudice and discrimination on campus (Brown, Morning, & Watkins, 2005). Thus, in order to decrease or close the occupational gap between racial groups, namely between Whites and Blacks, the factors that play a role in this discrepancy need to be discovered and explored. Additionally, identity statuses such as gender, race, and disability status have received attention by clinicians in addressing vocational concerns. Better understanding these identity statuses factors, particularly the degree to which they play a role in career pursuits, is necessary in order to provide individuals the opportunity to pursue the career options that fit with their interests best, taking into account to the larger socio-cultural environment of which they are a part.

Allen (1992) sought to explore the influence of contextual variables on Black college students. He claimed that any attempt to address the problems faced by Black college students without considering the broader contextual issues confronting Blacks, as a discriminated minority in America, is doomed to fail. Systemic barriers exist that may bar Blacks from educational and occupational achievement. Allen (1992) noted multiple barriers such as:
admission requirements that rely heavily on culturally and economically biased standardized tests; faculties dominated by middle-class, White males; soaring costs accompanied by inadequate financial aid programs; destructive pedagogical styles that emphasize ‘dog eat dog’ competition; the embrace of exclusionary ethics that undercut attempts to achieve cultural pluralism and diversity; and norms that elevate ‘sorting-out’ procedures over approaches that emphasize student learning, such as value-added, remedial strategies (p. 42).

Thus, research exploring occupational segregation must incorporate the contextual factors that occur at crucial times during the career choice process.

Some exploration of occupational segregation exists in sociological and business realms of study. The majority has focused on occupational segregation at national or regional levels, or on the effectiveness of Equal Employment Opportunity (EEO) Law on integration in the workplace (e.g., Tomaskovic-Devey, Zimmer, Stainback, Robinson, Taylor, & McTeague, 2006; Queneau, 2005). Using an aggregate of information about different regions and work environments, their findings support occupational segregation existence as a real problem for minorities, specifically demonstrating variability regionally and in different work environments based on race (e.g., Tomaskovic-Devey, Zimmer, Stainback, Robinson, Taylor, & McTeague, 2006; Queneau, 2005). More research is needed to determine what unique factors are contributing to the phenomena of occupational segregation by race on an individual level.

In examining racial group differences in occupational choice, some researchers have focused on the subjective experiences and contextual factors that hinder the success of Blacks and African Americans in educational settings (e.g., Rollins & Valdez, 2006;
Constantine, Wallace, & Kindaichi, 2005). Other researchers have explored factors that may prevent African American students from entering STEM fields and choosing STEM majors in college, such as cultural variables and occupational self-efficacy (e.g., Beasley, 2004; Umbach & Milem, 2004; Hackett, Betz, Casas, Rocha-Singh, 1992). Social Cognitive Career Theory (SCCT; Lent, Brown, & Hackett, 1994) provides a useful conceptual framework for understanding crucial determinants that may influence Black college students’ decisions to enter STEM fields or avoid them. SCCT accounts for several career-related variables (e.g., interests, self-efficacy expectations, person variables, contextual factors, anticipated barriers, etc.), which may influence the career choice process for African American college students.

An area that has been examined in conjunction with STEM college majors in research is the level and types of career interest across different racial and cultural groups. These studies consistently find that occupational interest is a good predictor of occupational self-efficacy across different racial/ethnic groups (e.g., Byars-Winston & Fouad, 2008; Hackett, Betz, Casas, Rocha-Singh, 1992), i.e., students who are more interested in certain fields or occupations are more likely to have greater efficacy for entering those fields or occupations. Interestingly, Witherspoon and Speight (2007) found that racial/ethnic minority students report having lower self-efficacy for entering nontraditional fields for their racial/ethnic group (i.e., STEM Fields); however, other studies have found no differences across racial/ethnic groups in occupational interests (e.g., Hackett, Betz, Casas, Rocha-Singh, 1992) as well as no significant differences in abilities or ability level across racial/ethnic groups (e.g., Allen, 1992; Davis, 1995). Taken together, these findings raise interesting questions about why, if there are no
differences between racial/ethnic groups of college students in career interests of ability level, Blacks are underrepresented in STEM fields, yet overrepresented in social and service-oriented occupations. The current study explores this question empirically, and examines some career-related and contextual variables that are hypothesized to play a role in the career choices and perceptions of Black college students, particularly for entering STEM fields.

In exploring Black students’ career perceptions and choices, one contextual factor that may be important is the environment in which the career choice is taking place, and specifically the racial composition of the environment. Beasley (2004) suggested that academic majors that are considered racially/ethnically nontraditional, i.e., those that remain predominantly White, may present a formidable socio-psychological barrier to Black students, who view settings with this type of racial composition as a potentially conducive environment for the occurrence of racist events. Beasley further stated that African American students’ perceptions of barriers in the STEM fields may lead to withdrawing from these majors, resulting in lower levels of African Americans in these fields and in a loss of racial diversification in these fields. This is a compelling notion, and very little empirical research has examined the potential influence of the racial composition of the campus environment on Black college students’ career perceptions and choices.

A number of scholars have suggested that the underlying cultural and social values and philosophies associated with Predominantly White Institutions (PWIs) are very different from those of Historically Black Colleges and Universities (HBCUs) (e.g., Chavous, Rivas, Green, & Helaire, 2002; Allen, 1982). Beasley (2004) argued that
institutional racism inherent within PWIs could present some unique barriers for students of color at those institutions, which are not present at HBCUs (Beasley, 2004). In addition, statistics from the National Science Foundation (NSF, 2000; 2002; 2007) on the educational experiences and graduate rates of Black students in PWIs and HBCUs lend credence to the notion that the racial composition of the educational environment might be important in Black college students’ career perceptions. HBCUs make up only 4% of all the universities in the United States; however, from 1996 – 2006, out of the 6% of Blacks awarded doctoral degrees, 82% came from HBCUs (NSF, 2007). HBCUs were responsible for more than 40% of all Black students in America who received degrees in mathematics and physical sciences such as physics, chemistry, astronomy, and environmental sciences (NSF, 2002). In addition, NSF (2000) reported that Blacks who graduated from HBCU undergraduate sciences programs are more likely to go to graduate school and complete their doctoral degrees than Blacks graduating from similar programs at other institutions.

One implication of this information is that the environmental setting and specifically the experience of being surrounded by Black students and professors and not having to cope with as much institutional racism, might play a role in the success and confidence level of Black college students in completing tasks related to a chosen major. It seems plausible to suggest that the over-representation of Blacks in racially/ethically traditional fields and lack of representation in STEM fields may partly be a function of perceived barriers or racism that inhibits success in these fields. Very little research has empirically explored these issues so more research is needed to examine the specific factors that may influence Black college students’ perceptions about and intentions to
enter either racially/ethnically traditional (i.e., social or service-oriented) or racially/ethnically nontraditional (i.e., STEM careers) career choices.

The purpose of the proposed study is to explore Black college students' perceptions of self-efficacy and barriers for racially/ethnically traditional (i.e., Psychology) and nontraditional (i.e., Mathematics) college majors. It is expected that self-efficacy perceptions will be a function of the college racial composition and the type of major. Hypothesized predictions are that Black college students will report greater self-efficacy for either academic major in the HBCU condition and greater barriers for either academic major in the PWI condition. The results from this study could provide important information about how to lessen the severity of occupational segregation in the STEM fields and aid in how to provide adequate support and preparation for Black college students in entering and mastering the job requirements of racially/ethnically nontraditional occupations.
CHAPTER II

Review of Literature

Racial/ethnic occupational segregation continues to be a problem, as college-educated Blacks continue to be overrepresented in traditional, social and service-related occupations, and underrepresented in nontraditional, or science, technical, engineering, and mathematics (i.e., STEM) fields. Several studies have examined the factors that play a role in maintaining the overrepresentation of Blacks in racially/ethnically traditional occupations, as well as those that have prevented them from entering into more racially/ethnically nontraditional occupations. In this study, two factors that seem to be important in understanding the lack of Black college students in STEM fields - campus environmental factors and career choice variables - are hypothesized to have an effect on both the occupational self-efficacy and the perception of barriers of Black college students for entering STEM and non-STEM occupations. Before going on to discuss the relevant literature, it is important to first define and clarify some of the relevant terminology.

Terminology

Blacks vs. African-Americans. There are no universally accepted terms in place for describing the racial and ethnic groups that exist in the United States, which may in part explain the extensive variation in how the terms are used in the literature. In an attempt to avoid confusion, the intent of this section is primarily to clarify how the terminology will be used in the current study. In the literature, the term African-Americans is used to describe individuals born in the U.S.; the term Black is used to describe individuals with ancestry originating from Africa (Hecht & Ribeau, 1991). The
APA manual (2001) suggests using the term most sensitive to the population of study, (i.e. refer to African-Americans as African-Americans if they self-identify as such).

*Black* is an inclusive term that refers to individuals who identify as African-American and the various subgroups that distinguish themselves from one another that possess the common experience in this country as being Black (e.g., Caribbean Blacks, South American Blacks, Hispanic Blacks and Africans) (Hecht & Ribeau, 1991). For the purpose of the current study, the term *Black* will be used because it is more inclusive. The term *African-American* will only be used when describing prior studies that have used this particular sample in their research.

**Theoretical Underpinnings**

The purpose of the study is to explore the degree to which contextual factors, such as the racial composition of the environment and the racial/ethnic (R/E) traditionality of academic majors, are related to Black college students’ perceptions of self-efficacy for entering racial/ethnic nontraditional (R/E NT) occupations and barriers to entering R/E NT occupations. The Social Cognitive Career Theory (SCCT; Lent, Brown, & Hackett, 1994) offers a useful framework for exploring the career choices of racial/ethnic minority groups, as it was developed with the intention of integrating a variety of theories and constructs in career research. The SCCT framework is not only used to explain the central, dynamic processes and mechanisms through which career interests develop, it is used to explain how relevant career choices are enacted, and how performance outcomes are achieved. The SCCT framework is further used to account for the effects of person variables and contextual factors on career development, such as the effects of gender, race/ethnicity, and barriers on career development (Brown & Lent, 2005).
SCCT (Lent, Brown, & Hackett, 1994) has received a great deal of attention in the vocational literature and has demonstrated some success in describing the career choices and development of Blacks and African Americans. SCCT was created as a framework to explain the career development of individuals through the interplay of self-efficacy beliefs, outcome expectations, and personal goals (Brown & Lent, 2005). Additionally, the model accounts for the effects of barriers, as well as those of other contextual factors, on career choice.

SCCT posits that a few major constructs are central to understanding career behavior. Brown and Lent (2005) define outcome expectations as “the beliefs about the consequences or outcomes of performing particular behaviors” (p. 104). An outcome expectation refers specifically to considering what would happen if an individual performed a particular action. Brown and Lent conceive of self-efficacy “as a dynamic set of self-beliefs that are linked to particular performance domains and activities” (p. 104). Self-efficacy relates specifically to how an individual perceives his or her own capabilities. The interplay here is that self-efficacy revolves around one’s self-perceptions of whether they can or cannot do some task, while outcome expectations involve the perceived consequences of a particular course of action taken. These central concepts of the model are believed to influence a person’s career interests and performance outcomes, which in turn influence self-efficacy and outcome expectations. However, optimal conditions must exist for this interplay to proceed smoothly. Brown and Lent (2005) further explain that:

career interests are more likely to blossom into goals (and goals are more likely to be implemented) when people experience strong environmental supports and
weak barriers in relation to their preferred career paths. By contrast, 
nonsuppoportive or hostile conditions can impede the process of transforming 
interest into goals and goals into actions (p. 110).

That is to say that the central constructs of SCCT (e.g., self-efficacy) develops in a larger 
socio-cultural environment. In the event that the individual is exposed to an unsupportive 
environment, a misperception of one’s self-efficacy could not only lead an individual to 
abandon interests, but it could also affect career development in such a way that the 
individual may elect to pursue options that they perceive to have less barriers. The 
individual may achieve this by choosing fields that reflect a larger representation of his or 
her own culture, which may lead to more positive outcomes.

Lindley (2006) explored the cultural implications of self-efficacy and described 
self-efficacy as agent-specific, individualistic, and overly cognitive. She noted that 
despite the concept being Western in origin, there has been evidence of self-efficacy 
beliefs existing across cultural groups. In addition, she suggested three aspects of self-
efficacy that were important to examine for people of color including differential levels 
of self-efficacy levels, the impact of contextual variables on self-efficacy levels, and the 
predictive effects of self-efficacy on career development (Lindley, 2006). Brown and 
Lent (2005) stated “gender and ethnicity are seen as linked to career development in 
several key ways –through the sorts of reactions they evoke from the social/cultural 
environment and from their relation to the opportunity structure to which individuals are 
exposed” (p. 107). The context becomes increasingly important in understanding how 
ethnic/racial background influences the development of self-efficacy and interest (Brown 
& Lent, 2005). Thus, social/cultural factors as well as other contextual variables may
prove to be important to examine in the Black college student’s decision to pursue a racially/ethnically traditional or nontraditional occupation.

Various studies have found that SCCT is a useful framework for explaining career choices among those who express interest in science, math, and engineering-related fields (Schaefers, Epperson, & Nauta, 1997; Nauta & Epperson, 2003). For instance, Lent and colleagues (2005) found SCCT constructs to be predictive of engineering major choice for both men and women at a PWI and two HBCUs. Furthermore, social cognitive variables, such as self-efficacy (e.g., Byars-Winston & Fouad, 2008; Byars-Winston, 2006) and perception of barriers (e.g., Constantine, Wallace, & Kindaichi, 2005; Evan & Herr, 1994), have been used to explain the career choice behaviors of Black college students. Lindley (2006) postulated that lower self-efficacy for certain occupational fields may lead minorities to restrict career options when perceiving barriers to career pursuits. Patton, Creed, and Watson (2003) supported the finding that Lindley postulated by finding a negative relationship between perceived career barriers and career decision self-efficacy in a sample of South African adolescents.

Thus, SCCT provides a helpful framework for understanding what factors might enhance or limit Black college students in the development of their career interests and choices. In particular, the two social cognitive constructs of self-efficacy and perception of barriers have been examined within the context of the career development of racial/ethnic minority students, and the current study adds to the extant research in this area. Taken together, the research findings noted above suggest that when examining the career choices of college students of color, self-efficacy beliefs may be more important than outcome expectations, the socio-cultural environment in which the career choice
takes place is important and that educational and occupational choices may be influenced by the environmental context, and perceiving barriers for a particular field may affect students’ career development. Based on SCCT theory and research findings, it is plausible to suggest that the environment in which Black college students are being educated might play a role in the development of their career interests and choices, and it may influence their level of efficacy for and perception of barriers for entering STEM or nontraditional occupations. The purpose of the proposed study is to examine the degree to which contextual factors, namely racial composition and R/E traditionality of major choice, are related to Black college students’ perceptions of self-efficacy and perceptions of the barriers to entering and mastering the job requirements for R/E NT occupations.

**Research on Black College Students and Career-Related Variables**

SCCT provides a theoretical foundation for exploring the career behaviors of people of color, and there is a need to further understand career development and career choices of Black college students. Due to the long, pervasive history of oppressive forces acting on Blacks in America, Black college students face unique and distinct barriers that set them apart from other racial/ethnic groups. Therefore, it is important to exploring the factors that influence the career behaviors of this population. A number of studies have explored specific factors that may influence the career development and career choices of Black college students and high school students. Most research on Black college students has focused on academic performance; however, a few studies have focused on contextual variables that influence career choices of Black college students.

For example, Beasley (2004) explored the discrepancies between well-educated Blacks and Whites in career aspirations, focusing primarily on psychological responses to
perceived racism as a mechanism to explain the career aspiration differences. The findings of her study that are most relevant to the current study were that African American students in her sample tended to select fields that had the highest representation of African Americans, and did so as a means of avoiding racial or ethnic discrimination. In addition, she found that African American students were more likely to change their majors compared to their White counterparts. Beasley’s findings suggest the importance of including contextual and environmental factors, such as racism, when examining the career choices of Black college students.

Rollins and Valdez (2006) examined the career development of African American adolescents, and investigated the relationships among socioeconomic status (SES), racial/ethnic identity, and self-efficacy for various types of careers. They investigated the various relationships between perceived racism, gender, SES, ethnic identity development, career task self-efficacy and career decision-making self-efficacy in African American adolescents. They found that higher levels of career decision-making self-efficacy were associated with increased perceptions of racism that is experienced by one’s ethnic group; however, the group racism variable did not account for a significant portion of the variance in career task self-efficacy beyond the control variables (SES, gender, racial identity). Further, ethnic identity achievement was found to be associated with greater musical, literary, and social service career self-efficacy, while higher SES was found to be related to greater literary and career task self-efficacy.

Rollins and Valdez (2006) claimed that a perception of a higher degree of racism in this sample lead to higher levels of career self-efficacy. Such perceptions appeared to depend on the target of the racism and the kind of career self-efficacy belief. Racism that
was personally experienced was not significantly associated with career decision-making self-efficacy; however, racism perceived against an individual’s group resulted in significant effects. Additionally, Rollins and Valdez (2006) elaborated that Blacks possess an attitude created by years of oppression and institutional racism that inhibits goal acquisition. This attitude may be partially responsible for Blacks college students choosing racially-traditional majors, where successful goal attainment is more likely. Rollins and Valdez’s findings support the notion that it is important to examine within-group differences of Blacks, in order to better understand the career choice behavior this unique subset of college students.

The research on the career choices of Black college students supports the notion that there are unique aspects of the career development and choice process for Black college students. In addition, these studies highlight the importance of examining the environment in which the career choice is taking place, as well as the role that cognitive percepts such as self-efficacy and barriers for entering certain occupations may play in the career behavior of Black college students.

**Self-Efficacy and Occupational Barriers for Entering R/E N T Occupations**

As mentioned above, self-efficacy, as a concept and as a theoretical perspective, has been linked to the vocational behavior of Blacks and African Americans. Self-efficacy has been described as beliefs about one’s own ability that play a key role as the individual develops and executes the cognitive and behavioral skills required to undertake tasks (Brown & Lent, 2005). According to SCCT, higher self-efficacy leads to success in the career decision-making process (Brown & Lent, 2005). Self-efficacy is modified through performance accomplishments, vicarious experiences, verbal
persuasion, and physiological arousal (Bandura, 1977). Understanding Black college
students’ occupational self-efficacy expectations for racially/ethnically traditional and
nontraditional fields may provide some insight into the problem of the over-
representation of Blacks in traditional fields and the under-representation of Blacks in the
nontraditional STEM fields. The following studies provide support for examining the role
of self-efficacy for entering and mastering the job requirements of R/E N T occupations
in the career behavior of college students, and particularly for racial/ethnic minority
students.

Hackett, Betz, Casas, and Rocha-Singh (1992) examined the degree to which self-
efficacy for entering science and engineering related fields, vocational interests, and
outcome expectations in men and women across diverse racial backgrounds was related
to academic achievement in science and engineering programs. The sample consisted
mainly of European-American and Mexican-American college students. Hackett et al.
(1992) found that ethnicity, faculty encouragement, and personal support all had an
influence on academic self-efficacy and occupational self-efficacy for science and
engineering fields. Ethnicity was a significant predictor for both self-efficacy variables.
In comparison with the Mexican-American students, students from a Euro-American
background displayed wider interests, fewer stressors, and more faculty encouragement,
which predicted higher levels of occupational self-efficacy. Additionally, greater
academic self-efficacy was related to fewer negative outcome expectations, wider
interests, lower levels of faculty discouragement, and fewer stressors in European-
Americans, but not in Mexican-American college students. Hackett et al. also examined
trends in the small number of African-American college students in their sample and
found no differences in interest level between the ethnic groups in the sample. Hackett et al. (1992) reported that greater stress and stressors for college students of all racial/ethnic groups was related to lower grades and lower perceptions of academic and occupational self-efficacy. African-American and Mexican-American students possessed significantly higher levels of faculty discouragement and higher negative outcome expectations than Euro-Americans. The authors found higher levels of stress, strain, and stressors were also found in the Mexican-American and African-American students than in their Euro-American peers. Hackett and colleagues suggested that despite the lack of differences in interest levels, students of color in their sample had lower academic and occupational self-efficacy for R/E N T occupations that was directly related to both a lack of faculty support and to experiencing greater stress and stressors. This suggests a need to determine what factors are leading students of color to experience greater stress and stressors and less faculty support.

The study conducted by Hackett and colleagues (1992) demonstrated the importance of contextual factors in the campus environment and their impact on occupational self-efficacy for a nontraditional field of study. Specifically, perceived support from faculty and peers, as well as stressors in the environment had an effect on students of color’s perceptions of their confidence to successfully enter and master the educational and job requirements for a R/E N T occupation. However, because the study had a limited sample of African-American college students, further study is needed to see if similar results would be obtained with a larger sample of Black college students. Continued exploration into these factors (such as social/family support, faculty encouragement/mentoring, and academic/institutional climate) may be useful in
explaining their influence on Black college students’ major and occupational choices. Given that the other studies looked at either largely White samples, or compared racial groups, Byars-Winston (2006) – similar to the proposed study – sought to examine the vocational behavior of Black college students only. Using a sample of Black undergraduates at HBCU institutions, Byars-Winston (2006) conducted an exploratory study to expand SCCT by incorporating the racial/ethnic background variable (i.e. racial ideology) to academic self-efficacy, coping self-efficacy, career self-efficacy, perceived career barriers, and other career-related variables. Racial ideology consisted of four categories: 1) a Nationalist ideology defined as the importance and uniqueness of being Black, 2) a Humanist ideology defined by commonalities between all people, 3) an Assimilationist ideology defined by similarities between Blacks and other Americans, and 4) an Oppressed Minority ideology defined as the shared experiences between Blacks and other oppressed groups.

Byars-Winston (2006) found that the Nationalist and Assimilationist ideologies in predicting career-self-efficacy and perceived career barriers. Furthermore, she found that perceived barriers are influential in Black college students’ career choices and may partially explain Black students’ entrance into more traditional fields, due to an awareness of obstacles for Blacks in nontraditional fields. Racial ideology was not, however, related to academic and coping self-efficacy, but was significantly related to perceptions of barriers. Byars-Winston attributed this lack of effect to the campus environment. More specifically, due to the likelihood of an HBCU being a culturally affirming environment, limited differences in values and beliefs associated with Black culture may reduce their influence on self-efficacy beliefs. Future research
recommendations support comparing and contrasting different campus environments (as opposed to cultural groups), such as studying whether cultural values-beliefs influence self-efficacy beliefs of Black college students in an environment that is not culturally affirming.

Thus, research findings suggest that students of color, including Black college students, may have lower self-efficacy for entering R/E N T majors or careers than White students and that multiple contextual factors, including perceived barriers, play an influential role in their academic and occupational choices. The research to date on perception of barriers has largely been studied in conjunction with self-efficacy literature in Black college students; however, there has been great variability in and confusion about how the concept of perception of barriers has been defined in the career literature. Perception of barriers has been described as the interaction between the objective event and subjective individual responses to the objective event (Constantine, Wallace, & Kindaichi, 2005; Lent et al., 2000); that is, perception of barriers reflects not only the actual exposure to a barrier but also the perception of how the barrier affects the individual. For the current study, Byars-Winston and Fouad’s (2008) definition of barriers will be used; perception of barriers occurs when one’s “[anticipation of] a personal hindrance is a function of one’s perceived capability to negotiate the challenges associated with the barrier” (Byars-Winston & Fouad, 2008, p. 427).

The research linking career-related barriers and occupational and educational attainment for college students of color has yielded mixed results. Most studies have looked at perception of barriers as a predictor of particular outcome, such as its effect on career aspirations (e.g., Constantine et al., 2005; Evan & Herr, 1994). Some research has
suggested that awareness of discriminatory job ceilings is negatively associated with both the career development and career choices of Black students at various developmental levels (Rollins & Valdez, 2006; Taylor, Casten, Flickinger, Roberts, & Fulmore, 1994). Research examining what influences these perceptions of barriers in Black college students, however, remains relatively unexplored.

In one of the few studies conducted with Black college students, Byars-Winston and Fouad (2008) outlined the importance of the interrelationships between perception of barriers, contextual variables, and career-related variables. The authors examined the effects of both distal environmental influences (i.e., family influences, family involvement, and cultural socialization) and proximal environmental influences (i.e., perceived and actual social support systems, racism, sexism and other social barriers) on math and science-related efficacy beliefs and perceived career barriers to math/science interests and goals in a sample of undergraduates. They found that parental involvement directly predicted math/science self-efficacy, and they found an indirect relationship from math/science self-efficacy to goals mediated through interests. In addition, they found that math/science self-efficacy directly predicted outcome expectations, that coping efficacy significantly predicted math/science self-efficacy, and that goal intentions and coping efficacy act as mediators between perceived career barriers and goals.

Findings from this study suggest that both perceived career barriers and self-efficacy beliefs for entering nontraditional fields were influential in understanding the career development of Black college students. Findings of this study also suggest that contextual factors, such as aspects of the environment, are important in understanding career behavior of Black college students. Furthermore, barriers may be related to other
variables such as ethnic identity, racial ideology, perceptions of racism, or other ethnic/racial background variables. More study is needed to see if the contextual variables studied are applicable to Black college students. Moreover, experimental study on contextual variables may be an important way to examine how Black students perceive their effects on perception of barriers and self-efficacy beliefs for R/E N T occupations.

In the current study, perception of barriers is an outcome variable, or criterion variable of study. Based on the research reviewed, contextual variables may be playing a role in the perception of barriers that Black college students have towards R/E N T occupations. Due to these contextual variables, Black college students may be selecting career goals they perceive to have less barriers for Blacks (i.e. R/E T occupations). Based on the research on perceptions of barriers, it may be important to examine the contextual factors that influence Black college students’ perceptions of barriers in order to help Black college students to develop ways to cope with and combat these barriers, if possible.

**Campus Environment (HBCUs and PWIs)**

There is a need to explore which contextual factors have the most salient effect on the career choice of Black college students, particularly to identify the best way to understand the lack of representation of Blacks in R/E N T occupations. As evidenced by Beasley’s (2004) findings, environmental factors may be playing a role in the degree to which Black college students pursue R/E N T occupations versus R/E T occupations. The campus environment, and specifically both the type and racial composition of the university, may be an especially important factor to consider and explore in an effort to
determine its influence on the perception of barriers and self-efficacy for both R/E N T and R/E T occupations.

There has been some research that has examined the environmental/contextual effects found in campus environments with different racial compositions on Black college students. Brown, Morning, and Watkins (2005) conducted a study that examined the link between the racial composition of the campus environment, racial perceptions, and STEM major involvement. Brown et al. found that African American computer science and engineering students enrolled in HBCU institutions reported more favorable perceptions of their college experiences than African American students in the same majors at PWIs. In addition, HBCU students had substantially higher grade point averages and reported more positive perceptions of the campus environment than students in the other institutions. This link between the campus environment and STEM major environment seems an important variable to include in studying R/E N T occupations.

Allen (1992) aimed to identify differences in the experience of Black undergraduates at HBCUs and PWIs and was primarily interested in examining how Black students’ college success is influenced by campus context and students’ backgrounds. Using survey data from a larger study, a sample comprised of 2500 Black students was analyzed using multivariate analysis. Allen (1992) reported that academic achievement was highest for Black college students who had higher educational aspirations, positive relationships with faculty, and positive peer relationships. Compared to Black students who attended HBCUs, Black students attending PWIs reported lower academic achievement. Notably, Allen found that characteristics of the individual and
those of the institution combined to influence the academic performance, the extent of social involvement and the occupational goals in Black college students. In reference to this finding with Black college students, Allen further explains that “what he or she does when confronted with difficult subject matter, how he or she handles the uncertainty of new situations, and how adept he or she is in help-seeking behavior will ultimately determine whether a college experience is positive or negative” (Allen, 1992, p. 38).

Davis (1994) explored the differential experiences at campus environments with different racial compositions. Specifically, Davis examined environmental factors, academic achievement, and other career-related variables of Black college students attending PWIs and HBCUs. Davis analyzed a sub-sample of a larger survey study conducted with college students across the United States. Of the seven hundred and forty-two Black males used in the analysis, 55% attended HBCUs while 45% attended PWIs. Davis (1994) found that Black males attending HBCUs were more integrated into the academic life of the campus, achieved better grades, and perceived more institutional support from their college than Black males at PWIs. Black students attending PWIs who had more positive perceptions about institutional support, studied harder, and had stronger peer relations did not have better grades. Davis also reported that the closer the match of the racial composition of the students’ home community to that of their campus environment, the more positive their academic environment. It has been reported that HBCUs produce more Black students entering R/E N T occupations than at PWIs. Davis’s study uncovers some of the reasons behind HBCUs producing more Black students in R/E N T occupations and, more importantly, it provides evidence that
differential experiences posed by the differing campus environments plays an influential role in Black college students’ career decisions.

Based on the research reviewed, the presence of a positive, culturally-affirming campus environment where social support and faculty encouragement is present appears to have an effect on the positive experiences associated with the college environment, and also career choice (e.g., Brown, Morning, & Watkins, 2005; Davis, 1994). Differential experiences posed by different campus environments (i.e., a culturally-affirming campus environment versus a culturally-disaffirming campus environment) appear to be important to examine the under-representation of Blacks in STEM fields. In doing so, clinician may be able to find the best way to intervene with respect to the very real barriers posed by campus environmental factors.

Racial/Ethnic Traditionality of Academic Major

Discussed above, the campus environment is predicted to have an effect on Black college students’ perceptions of barriers and self-efficacy for entering and mastering the job requirements for racially/ethnically nontraditional occupations or racially/ethnically traditional occupations. Another important variable to examine, likely related to Black college students’ perceptions of self-efficacy and barriers, is the particular academic major or concentration of study that the Black student has chosen. Similarly to a lack of gender diversity among the STEM fields, an under-representation of Blacks with STEM undergraduate degrees has also been observed.

Despite comprising 11% of the labor force, the numbers of Blacks in fields related to math, science and engineering remain persistently low (US Census Bureau, 2007). This occupational segregation has drawn a line separating fields with heavy
representation of Blacks (i.e., traditional fields) and fields with low if any representation of Blacks (i.e., nontraditional fields). Racially/ethnically traditional fields have typically been associated with social and service related careers with heavy representation of Blacks in those fields, while racially/ethnically nontraditional fields have been associated with STEM careers with under-representation of Blacks in those fields (Witherspoon & Speight, 2007).

Notwithstanding an increase in Blacks pursuing higher education, according to the NSF (2004), the number of undergraduate degrees awarded in mathematics awarded to Blacks steadily decreased from 1995 to 2004, while undergraduate degrees awarded to Blacks in education and psychology have shown a marked increase in that time period. Additionally, a survey conducted by the Higher Education Research Institution (2006) reported that Black freshmen students had very low intentions of majoring in mathematics, and comparatively very high intention of majoring in social and behavioral sciences. Further study is needed to determine what is contributing to this lack of representation of Black college students in mathematics majors, and what occurs during the crucial period in career choice where Black college students choose to pursue psychology degrees over mathematics degrees.

Traditional working environments for African Americans originated through the work done by Littig (1968) who found that the professional aspirations of African American college students were limited to education, social work, and government work. Opportunities for Blacks in career fields have become more open than in the 1960s; however, the concepts of open and closed occupations that Littig introduced in her seminal work appears to still have some bearing today as evidenced by the under-
representation of Blacks in STEM fields. The author also provided initial evidence that contextual factors apart from lack of interest or ability may be playing a role in limiting career opportunities to Blacks.

Littig (1968) explored the possibility that personality has differential effects upon the occupational aspirations of Black college students as a consequence of the social class. The participants were 140 Black male college students from three colleges, two of which were designated as working class, and one deemed middle class. College social class was based upon the predominance of students from middle or working class backgrounds. The author found that Black students in the middle class college tended to aspire to traditionally open occupations for Blacks; whereas, students from the working class colleges aspired to traditionally closed occupations. Littig provided the first evidence of other factors related to closed occupations versus open occupations as a function of the environment and social class. Littig also postulated that there was more than just ability barring Black students from closed occupations. Despite societal changes in the years since her study was published, Littig’s work still seems to bear relevance to the current climate of workplace segregation.

In one of the few studies that has specifically examined the R/E traditionality of majors for African American college students, Witherspoon and Speight (2007) explored the relationship among Afrocentric values, discrimination, and career interests and self-efficacy beliefs of African American college students. Additionally, the authors sought to identify the best predictors for explaining African Americans’ interest levels in racially/ethnically traditional and nontraditional occupations. The authors recruited a sample of 129 African American students from a HBCU for inclusion in their study.
Their sample consisted of 99 females, 77%, and 30 males, 23%. 32% of the sample identified majors in education while 13% of the sample identified majors in the social sciences. Adapting a method from Hackett and Betz (1981) on gender traditionality, the authors created a measure of strength of self-efficacy and interest for 10 traditional and nontraditional occupations for African Americans.

Witherspoon and Speight (2007) used the term *racially/ethnically traditional fields* (R/E T) to refer to areas of the work force that have an over-representation of a particular race or ethnic group (i.e., Blacks in social and service-oriented fields), while R/E NT occupations were defined as areas of the work force that have a lack or an under-representation of a particular race or ethnic group (i.e. STEM Fields). To classify the difference in occupations, the authors used 208 occupations from the 1983 Bureau of Labor Statistics, only including occupations that fell one standard deviation below the mean to be classified as a R/E NT occupation and one standard deviation above the mean to be classified as a R/E T occupation. Witherspoon and Speight required participants to respond to questions about their capabilities with regard to educational requirements and job duties of 10 racially/ethnically traditional and nontraditional occupations.

Witherspoon and Speight (2007) found that gender was predictive of interest in R/E T occupations. In their study, African-American women expressed higher levels of interest in racially/ethnically traditional occupations than African-American men. Additionally, the authors found support for stronger self-efficacy beliefs for racially/ethnically traditional occupations being predictive of higher interest in these occupations; whereas, weaker self-efficacy beliefs for R/E NT occupations predicted higher interest in racially/ethnically traditional occupations. Witherspoon and Speight
emphasize this finding as particularly important in explaining the continued over-representation of African Americans in racially/ethnically traditional occupations.

Witherspoon and Speight’s (2007) study identified predictors of African Americans’ interest levels in both R/E T and R/E N T occupations, namely occupational self-efficacy and occupational interest; however, the authors failed to address the environmental influences posed by the racial composition of the college setting. Additionally, Witherspoon and Speight (2007) stated that the inclusion of the schedule of racist events may not be adequately tapping how prejudicial behavior has shaped an individual’s attitudes about discrimination; that is, larger contextual/environmental factors may be influencing the perception of barriers and real barriers experienced that affect career choice and occupational self-efficacy.

In reviewing the research on R/E traditionality, some conclusions can be drawn from the studies conducted. Primarily, there is not a great deal of research on R/E traditionality of majors on record for Blacks. There is simply not enough information to explain the work-force division by race/ethnicity. Findings of both Littig’s (1968) and Witherspoon and Speight’s (2007) work demonstrate that 1) environment plays a role in shaping Black college students major selection in a R/E T or R/E N T occupation, 2) real barriers exist that actively bar Blacks from R/E N T occupations, 3) the perception of barriers may be enough to influence Blacks to select majors that are associated with more R/E T work environments for Blacks, and 4) Blacks may have lower occupational self-efficacy for R/E N T occupations than R/E T occupations. Littig’s and Witherspoon and Speight’s work support a need for further study to determine if barriers and self-efficacy
influence Black college students to enter R/E N T occupations or select R/E T occupations.

**The Current Study**

Very few studies have actually examined Black college students’ perceptions of occupational self-efficacy for racially/ethnically traditional and nontraditional majors. Furthermore, even fewer studies have used an experimental design in research on Black students and self-efficacy. The present study was designed to address these issues by comparing the responses of Black college students under four conditions that varied as a function of college setting and major, the independent variables of study.

For the proposed study, the independent variables of study are the campus environment (HBCU and PWI) and the academic major (Mathematics and Psychology). For Black college students, the environmental context may be facilitating or hindering exploration of interests in traditional or nontraditional fields of study. Some researchers have even claimed an underlying conflict between values of Black college students and the values and philosophies of the institution at PWIs (e.g., Chavous, Rivas, Green & Helaire, 2002; Allen, 1992). Howard University was chosen as a representation of an HBCU in the vignette, due to it being one of the top five degree granting institutions to Black students in the STEM fields. Georgetown University was chosen as the PWI in the vignettes because historically it has a similar reputation to Howard of graduating students with STEM majors. Georgetown University is reported to have 6.7% Black students, a 91% matriculation rate for Black students in 2008, and it ranked 53 of 572 institutions that reported having any full-time graduate students in science, engineering, and health in the fall 2006 survey (NSF, 2008). Campus environment was included as a moderator
variable because it was expected that it would moderate the relationship between the other independent variable of study and all dependent variables.

The second variable of study is the academic major of study. Both the NSF (2004) and Higher Education Research Institute (2006) issued summary reports detailing the decline of intention to major in mathematics and degrees awarded in mathematics to Black college students, while reporting the opposite for social behavior sciences such as psychology and sociology. For the proposed study, mathematics will serves as the R/E N T major and psychology will serves as the R/E T major. Inclusion of this variable is to determine if students perceive the R/E traditionality of the major to have an effect on the dependent variables of study.

Occupational self-efficacy and perceptions of barriers for racially/ethnically traditional and nontraditional fields are the dependent variables of study. Occupational self-efficacy and perceptions of occupational barriers may vary as a function of the environmental context (Brown & Lent, 2005) and the academic major the Black college student has selected (Witherspoon & Speight, 2007). Perceptions of occupational barriers will be assessed using two barrier scales. The methodology used by Witherspoon and Speight was incorporated in the selection of nontraditional and traditional occupations to assess for occupational self-efficacy. It is hypothesized that Black college students will have different perceptions of self-efficacy for entering and mastering the educational and job requirements for R/E N T occupations and perceptions of occupational barriers anticipated for R/E N T occupations will vary as a function of the racial composition of the campus environment and the R/E traditionality of the academic major.
Additionally, three covariates are being included due to parcel out any potential effects that they may have on the observed effect between academic major and the campus environment (the independent variables) and occupational self-efficacy and perceptions of occupational barriers (the dependent variables). The three covariates are interest in R/E N T, interest in R/E T occupations, and gender. For the current study, contextual variables are of more interest than these variables that have previously been studied; however, it is important to include them due to their documented effects in order to increase the sensitivity of the test for the main effect of the campus environment on occupational self-efficacy and perceptions of occupational barriers and the main effect of the academic major on occupational self-efficacy and perceptions of occupational barriers, and to increase the sensitivity of the interaction between campus environment, academic major, and occupational self-efficacy and the interaction between campus environment, academic major and perceptions of occupational barriers. All of these covariates will be tested in preliminary analysis to determine if they need to be controlled for in the major analysis.

The first covariate, the participants’ level of interest in R/ET and R/NET occupations, is included due to its potential effect on the variables of study. Witherspoon and Speight (2007) found significant relationships between interest and self-efficacy for traditional and nontraditional occupations. Interest level may also produce effects in the perceived barriers that are not accounted for by the independent variables alone. Including interest in both R/E T occupations as well as R/E N T occupations will be done in order to remove any differences in participants as a function of interest level.
Gender will also be included as a covariate because of differences in perceived career options for male and females (Lent, Brown, & Larkin, 1986; Hackett & Betz, 1981). The aim of the study is to examine the perceptions that Black college students have about how the academic major and campus environment influences occupational self-efficacy and perceptions of occupational barriers. Gender will be included as a covariate to parcel out any potential gender effects observed between occupational self-efficacy and perceptions of occupational barriers for R/E N T or R/E T occupations.

**Hypotheses**

The present study proposed two hypotheses. First, it is expected that campus environment (PWI vs. HBCU) will moderate the relationship between the R/E traditionality of the academic major (Mathematics vs. Psychology) and the perception of occupational self-efficacy. And second, campus environment (PWI vs. HBCU) is hypothesized to moderate the relationship between R/E traditionality of the academic major (Mathematics vs. Psychology) and the perception of occupational barriers. Participants are expected to rate the black college student in the HCBU campus environment condition with the racial/ethnic traditional major having higher OSE and lower perceived barriers. Participants are expected to rate the student in the PWI campus environment condition with the racial/ethnic nontraditional major as having lower OSE and higher perceived barriers. In the event of an insignificant interaction effect, main effects will be examined for the two independent variables of the study.
CHAPTER III

Methodology

This chapter provides a detailed description of the research design, characteristics of the sample selection, procedures for data collection, instrumentation, power, and statistical analysis used for the proposed study.

Design

The study used an experimental design in which participants were randomly assigned to one of four conditions. Two sets of analyses were conducted, a randomized 2 x 2 multivariate analysis of covariance (MANCOVA) and a randomized 2x2 multivariate analysis of variance, in order to determine the effect of racial/ethnic traditionality of academic major (Mathematics versus Psychology) and campus environment (HBCU versus PWI) on the perception of occupational barriers and occupational self-efficacy, controlling for gender, interest in racial/ethnic traditional fields, and interest in racial/ethnic nontraditional fields. For the current study, mathematics was used as the nontraditional major and psychology as the traditional major. This was based on the overrepresentation of Black college students with majors in psychology (a racially-traditional major) versus lack of representation of Black college students in racially nontraditional majors that lead to higher prestige (i.e. mathematics).

Additionally, Howard University was selected as the HBCU and Georgetown University as the PWI. These institutions were selected based on both universities having
a reputation for high matriculation, retention, and degree granting of Black college
students. In addition, three covariates were included: participants’ occupational interest in
nontraditional occupations for Blacks (PIS-NON), participants’ occupational interest in
racially/ethically traditional occupations (PIS-TRAD), and participant gender. These
covariates were included to increase the sensitivity of the test statistic by controlling for
any variability in the dependent variables.

Power

Following the methods described by Murphy and Myors (2004) and Cohen (1977), an a-priori power analysis was conducted to determine the number of participants
needed to ensure statistical conclusion validity for two randomized, 2 X 2 MANCOVAs.
Power was set at .80 to avoid Type II error (Cohen, 1977). Effect sizes for the power
analysis were determined based on the relevant literature presented below.

There are no known studies that examined the effects R/E traditionality of the
major and campus environment on self-efficacy and perception of barriers. Witherspoon
and Speight (2007), however, examined African Americans’ interest and self-efficacy in
traditional versus nontraditional occupations at HBCUs and public schools Midwestern
large metropolitan area. Additionally, Allen (1992) examined several of the variables that
are used in the proposed study with a sample of Black undergraduates at a HBCUs and
PWIs. For the proposed study, the estimated effect size will be derived based on Cohen’s
methods, Allen’s (1992) and Witherspoon and Speight’s (2007) findings.

Witherspoon and Speight (2007) reported intercorrelations as follows: \( r = .46 \) for
interest in traditional occupations and self-efficacy for traditional occupations and \( r = .47 \)
for interest in nontraditional occupations and self-efficacy in nontraditional occupations.
Additionally, they examined the relationship between racist events and self-efficacy in traditional or nontraditional occupations. They used racist events as a contextual variable that could have an influence on self-efficacy beliefs, due to African Americans seeking out work environments with limited discrimination in the work place (Witherspoon & Speight, 2007). The authors reported an interaction effect of SE-NON, SE-TRAD, and gender as significant predictors of interest INT-TRAD, $F(3, 109) = 17.50, R^2 = .33, p < .000$.

For the interaction of racial/ethnic major traditionality and campus environment on perception of barriers and occupational self-efficacy, there has not been a study that looked at the effects of campus environment and major on perception of barriers and occupational self-efficacy. Allen (1992) did look at the interaction of student background factors, campus environment, aspirations, and student outcomes on achievement. He reported an effect size of .205 for the interaction. However, the dependent variable he used was more of an outcome variable. Lindley (2006) reported that self-efficacy may influence career development of Black college students more than the outcome variables. Given Lindley’s claim, and the usage of self-efficacy as a dependent variable, a more conservative effect size for the interaction will be used will be used for the proposed study.

Additionally, Witherspoon and Speight (2007) reported intercorrelations of $r = .10$ for racist events and OSE-NON and $r = .09$ for OSE-TRAD. This supports the two dependent variables of study showing an insignificant correlation with each other. The limited research that examines the link between campus environment and perception of barriers has only found indirect links (Byars-Winston & Fouad, 2008). However, for the
proposed study, the dependent variable of study is perception of barriers, which has been predicted to have a more salient effect on Black college students (Beasley, 2004; Rollins & Valdez, 2006) than the actual experience of racist events.

Using the above effect sizes and inter-correlations among the variables, a multivariate power analysis was used to calculate the power of the proposed study for different samples sizes (Cohen, 1977; Haase, 1993). MANCOVA is a MANOVA in which the dependent variables (DVs) are initially adjusted for differences in one or more covariates (Field, 2009). In estimating effect sizes for MANOVA, GPower can be used by adjusting the denominator df (Faul, Erdfelder, Lang, & Buchner, 2007). If the k is the number of groups in the design and g is the number of covariates, then groups = k + g. For the proposed study, there are 3 covariates (g) and 4 experimental conditions (k) then the groups entered in GPower would be 7 (Faul, Erdfelder, Lang, & Buchner, 2007).

For the interaction of occupational self-efficacy, campus environment and major traditionality, $f^2 = .0625$, power is at least 80%, at least 147 participants are needed. For the interaction of perception of barriers, campus environment and major traditionality, using a small effect size, $f^2 = .01$, power is at least 80%, at least 875 participants are needed. However, the small effect size was derived from Witherspoon and Speight (2007) who used schedule of racist events instead of perception of barriers, which may not be adequately tapping the effect of barriers on the student experience.

The current study was designed to be more explanatory of black college students. For the current study, using a non-restrictive sample, more balanced across gender composition, and an experimental design with carefully designed stimulus materials to be more explanatory of participants’ perceptions of the variables of study. Thus, based on
the methods described by Cohen (1977), a medium effect size will be used for power analysis to obtain the appropriate sample size. A total sample size of 160 participants, at least 40 participants per condition, are needed to obtain the desired power level of .80 at $\alpha = .05$ and improve the ability to detect a difference with the F-test. The final sample size for each condition was as follows: HBCU/Psychology ($n=49$), HBCU/Mathematics ($n=65$), PWI/Psychology ($n=67$), and PWI/Mathematics ($n=54$). The final total sample size of 235 participants was deemed adequate for the analyses. More information is provided about the sample characteristics below.

**Participants**

A total of 236 college students completed the study measures; however, in examining the manipulation check items, one participant failed to identify the correct condition to which she or he was assigned and was removed from the sample. The final samples sizes for the four conditions were: HBCU/Psychology ($n = 49$), HBCU/Mathematics ($n=65$), PWI/Psychology ($n=67$), and PWI/Mathematics ($n=54$). However, several of the measures were incomplete. The total of number of participants who filled out the surveys for the occupational self-efficacy measures ($n=139$), perceived career barriers ($n=118$), and perceived educational barriers ($n=118$).

Table 4 describes the demographic characteristics of the sample. The majority of the sample self-identified as African-American, while less than 3% of the sample identified as Biracial or other/international. The sample was fairly equally split across educational levels with the majority of participants identifying as either seniors (33%) or juniors (25%). Seventy-five percent of the sample identified as female, with only twenty-five percent identifying as male. These findings appear to be consistent with national
statistics that report gender demographics of Black college students (NSF 2000). The majority of the sample had declared a major (95%), and participants reported a variety of majors.

The sample as a whole was fairly spread out in terms of location, though large percentages came from Tennessee (20%), California (8%), Alabama (5%), and New York (4.5%). Information was not obtained about specific universities each student attended; however, based on location and recruitment procedures, the information seems to indicate that slightly more students in the sample attended HBCUs rather than PWIs (i.e. the majority of students recruited from the southern regions were from HBCUs). These numbers seem to be consistent with national statistics on numbers of Black and African Americans attending HBCUs versus PWIs (NCES 2004; NSF 2007).

Over half of the sample identified as Christian (60%) with all of the other religious/spiritual categories having at least some representation within the sample (ranging from .5% to 6%). The salary ranges were fairly diversified across the different income ranges, though the largest percentages were reflected in the ranges $50,000 – $74,999 (24%), $20,000 - $29,999 (18%) and $30,000 - $39,999 (13%). According to recent population statistics, these percentages were somewhat high in comparison with the average college students, especially when population statistics for college graduates was reported around $40,000 in 2009 (NCES 2011). Most students in this sample declared a major (95%) with varying degrees of uncertainty around the choice in major. The sample was fairly equally spread across the highest level of education; the largest percentages of the sample being juniors and seniors (20% and 25% of the sample respectively). See Table 2 for more information about the sample.
There were two items included in the demographic questionnaire that assessed the similarity between the racial composition of the participant’s home environment and campus environment, as well as their high school environment and campus environment. Davis (1994) postulated dissimilarity between these environments contributed to challenges faced in the college campus environment. These items were included to determine if these differences contributed to the participant’s response patterns. Twenty-two percent of the sample indicated similarity and twenty-eight percent indicated dissimilarity between the racial composition of their home and campus environment. Twenty-six percent indicated similarity and twenty-eight percent indicated dissimilarity between high school and college racial composition. These findings suggest that this was a variable in which participants clearly differed; however, random assignment of participants to conditions helped to distribute this variable across the four groups.

**Conditions and Stimulus Materials**

The four conditions in this study were operationalized using written vignettes, each introducing the main character of “Alex” who was a Black college student. The conditions were identical except for changing two characteristics: (a) the educational environment (i.e., PWI vs. HBCU), and (b) Alex’s major (i.e., Psychology vs. Mathematics). The four vignettes are included below:

**Condition 1 – HBCU/Psychology:** Alex Johnson is a 20-year old, African American male. His parents are very supportive of his educational pursuits, so are his siblings. Alex has two older brothers and a younger sister, who he feels very close to. He is currently starting his junior year at Howard University, a Historically Black University in Washington D.C.

Alex’s campus/social life is very similar to other college students that attend Howard University. The faculty and student body is primarily Black. In his psychology classes, most of his teachers are Black and African American, as well as most of the students. Simply, most students are of the same race as Alex. He generally feels comfortable with his fellow students and teachers. Alex has a
fairly active social life. He is involved in intramural sports and is considering rushing for a fraternity on-campus. Also, he has several peers of a similar racial/ethnic background pursuing similar career goals as him.

Alex has generally done well in his educational pursuits. Teachers typically have described Alex as being ambitious and a good student possessing the ability to pursue graduate education. Alex is majoring in psychology. He has always enjoyed helping others. His friends frequently report that he’s easy to talk to and a good listener. He has taken a large number of the classes required to graduate with a bachelor’s degree in psychology. He enjoys his psychology classes, especially Theories of Psychology and Abnormal Psychology.

Alex has developed a mentor/mentee relationship with a Black faculty member who graduated from one of the Historically Black Colleges and Universities. Alex goes to his mentor for career and academic-related concerns. Topics covered with his mentor have included career planning, realistic goal setting, and potential barriers to his career pursuits. Alex has career goals of entering an education-related field or pursuing his master’s degree in psychology following the completion of his bachelor’s degree.

Condition 2 – PWI/Psychology: Alex Johnson is a 20-year old, African American male. His parents are very supportive of his educational pursuits, so are his siblings. Alex has two older brothers and a younger sister, who he feels very close to. He is currently starting his junior year at Georgetown University, a predominantly White institution in Washington D.C.

Alex’s campus/social life is very similar to other college students that attend Georgetown University. The faculty and student body is primarily White. In his psychology classes, most of his teachers are White, as well as most of the students. Simply, most students are of a different race than Alex. He generally feels comfortable with his fellow students and teachers. Alex has a fairly active social life. He is involved in intramural sports and is considering rushing for a fraternity on-campus. However, he does not have several peers of a similar racial/ethnic background pursuing similar career goals as him.

Alex has generally done well in his educational pursuits. Teachers typically have described Alex as being ambitious and a good student possessing the ability to pursue graduate education. Alex is majoring in psychology. He has always enjoyed helping others. His friends frequently report that he’s easy to talk to and a good listener. He has taken a large number of the classes required to graduate with a bachelor’s degree in psychology. He enjoys his psychology classes, especially Theories of Psychology and Abnormal Psychology.

Alex has developed a mentor/mentee relationship with a White faculty member who graduated from one of the Predominantly White Institutions. Alex goes to his mentor for career and academic-related concerns. Topics covered with his mentor have included career planning, realistic goal setting, and potential barriers to his career pursuits. Alex has career goals of entering an education-related field or pursuing his master’s degree in psychology following the completion of his bachelor’s degree.
Condition 3 – HBCU/Mathematics: Alex Johnson is a 20-year old, African American male. His parents are very supportive of his educational pursuits, so are his siblings. Alex has two older brothers and a younger sister, who he feels very close to. He is currently starting his junior year at Howard University, a historically Black university in Washington D.C.

Alex’s campus/social life is very similar to other college students that attend Howard University. The faculty and student body is primarily Black. In his Mathematics classes, most of his teachers are Black, as well as most of the students. Simply, most students are of the same race as Alex. He generally feels comfortable with his fellow students and teachers. Alex has a fairly active social life. He is involved in intramural sports and is considering rushing for a fraternity on-campus. Also, he has several peers of a similar racial/ethnic background pursuing similar career goals as him.

Alex has generally done well in his educational pursuits. Teachers typically have described Alex as being ambitious and a good student possessing the ability to pursue graduate education. Alex is majoring in mathematics. He has always enjoyed solving mathematical equations and working with numbers. He has taken a large number of the classes required to graduate with a bachelor’s degree in mathematics. He enjoys his math classes, especially Linear Algebra and Calculus.

Alex has developed a mentor/mentee relationship with a Black faculty member who graduated from one of the Historically Black Colleges and Universities. Alex goes to his mentor for career and academic-related concerns. Topics covered with his mentor have included career planning, realistic goal setting, and potential barriers to his career pursuits. Alex has career goals of entering a math-related field or pursuing his master’s degree in math following the completion of his bachelor’s degree.

Condition 4 – PWI/Mathematics: Alex Johnson is a 20-year old, African American male. His parents are very supportive of his educational pursuits, so are his siblings. Alex has two older brothers and a younger sister, who he feels very close to. He is currently starting his junior year at Georgetown University, a predominantly White institution in Washington D.C.

Alex’s campus/social life is very similar to other college students that attend Georgetown University. The faculty and student body are majority White. In his Mathematics classes, most of his teachers are White, as well as most of the students. Simply, most students are of a different race than Alex. He generally feels comfortable with his fellow students and teachers. Alex has a fairly active social life. He is involved in intramural sports and is considering rushing for a fraternity on-campus. However, he does not have several peers of a similar racial/ethnic background pursuing similar career goals as him.

Alex has generally done well in his educational pursuits. Teachers typically have described Alex as being ambitious and a good student possessing the ability to pursue graduate education. Alex is majoring in mathematics. He has always enjoyed solving mathematical equations and working with numbers. He has taken a large number of the classes required to graduate with a bachelor's
degree in mathematics. He enjoys his math classes, especially Linear Algebra and Calculus.

Alex has developed a mentor/mentee relationship with a White faculty member who graduated from one of the Predominantly White Institutions. Alex goes to his mentor for career and academic-related concerns. Topics covered with his mentor have included career planning, realistic goal setting, and potential barriers to his career pursuits. Alex has career goals of entering a mathematics-related field or pursuing his master’s degree in math following the completion of his bachelor’s degree.

**Instrumentation**

**Demographics.** A demographic questionnaire was developed for the current study. It consisted of questions regarding participants’ age, gender, race/ethnicity, place and nation of birth, class status (i.e., freshmen, sophomore, etc.), religious/spiritual affiliation, household income, major if declared, certainty about intended major, highest level of education (i.e., undergraduate, some graduate, Master’s, Ph.D., etc.). Additionally, several Likert-type scales were used to assess the similarity of the participants' racial composition of community reared in and college environment, similarity between racial composition of high school and college environment, perception of prestige of Georgetown University and Howard University, perception of ability to prepare students for STEM fields at Georgetown and Howard University, and general quality of education of Georgetown University and Howard University. Refer to Appendix F to see the Demographic Questionnaire as it was presented to the participants.

**Occupational Self-Efficacy and Occupational Interest Measures.** In order to investigate perceptions of occupational self-efficacy (OSE) and perceptions of occupational interest (OIS) for racial/ethnic nontraditional and traditional fields, a list of 22 occupations was selected for examination in the current study. Using the same
methodology as Witherspoon and Speight (2007), 208 occupations were gathered from the Current Population Survey, the 2008 Annual Social and Economic (ASEC) Supplement conducted by the Bureau of the Census for the Bureau of Labor Statistics, with African-American representation ranging from 1% (racial/ethnic nontraditional fields) to 24% (racial/ethnic traditional fields). These occupations were selected to: 1) represent current trends in the labor market, and 2) represent occupations applicable to college students.

Based on the procedure originally developed by Bandura (1977a), several studies (Betz & Hackett, 1981; Lent, et al., 1986; Hackett, Betz, Casas, & Rocha-Singh, 1992; Byars, 1997) used this methodology to create measures of career self-efficacy for gender traditional and gender nontraditional fields and most recently the methodology was used to develop a self-efficacy scale measuring African Americans’ efficacy for entering racial/ethnic traditional and racial/ethnic nontraditional fields (Witherspoon & Speight, 2007). Witherspoon and Speight used the 1981 census data; 2008 census data was used for the current measure in order to get a more current racial/ethnic breakdown by occupations.

The Occupational Self-Efficacy Scale (OSE) was designed to assess the participants’ self-efficacy for entering and mastering the educational and job requirements for 11 traditional (OSE-TRAD) and 11 nontraditional occupations (OSE-NON) for Blacks. Occupations were rated on a 7-point Likert-type ranging from 1 (not at all confidant) to 7 (totally confidant). Two scores are yielded for traditional and nontraditional occupations. Refer to Appendix D for a list of the occupations.
The Occupational Interest Scale (OIS) was designed to assess participants’ interest level for 11 traditional (OIS-TRAD) and 11 nontraditional occupations (OIS-NON) for Blacks in the labor market. A 7-point Likert-type scale was used to rate the participants’ interest in each occupation from 1 (not at all interested) to 7 (totally interested). Two scores are yielded for traditional and nontraditional occupations.

Previous scales developed using this methodology have shown adequate reliability. Witherspoon and Speight (2007) reported internal consistency coefficients of .88 for their measure of self-efficacy for traditional occupations, .87 for their measure of self-efficacy for nontraditional occupations, .78 for their interest measure in traditional occupations, and .71 for their interest measure of nontraditional occupations with a sample of African American college students. For the current sample, internal consistency coefficients were .87 for the measure of self-efficacy for traditional occupations and .85 for the measure of self-efficacy for nontraditional occupations. Additionally, internal consistency coefficients were .80 for the measure of participant’s interest in traditional occupations and .83 for the measure of participant’s interest in nontraditional occupations for the current sample.

Hackett, Betz, Casas, and Rocha-Singh (1992) provided construct validity evidence for their measure of occupational self-efficacy by showing that it was positively correlated with coping, positive outcome expectations, and faculty encouragement and negatively correlated with stressors, strain, negative outcome expectations, and faculty discouragement. Additionally, Hackett et al. (1992) provided construct validity evidence for their measure of interest by showing that it was positively correlated with faculty encouragement and positive outcome expectations.
Despite the methodology being used frequently in the gender traditionality literature, this methodology has been more recently applied to the study of racial/ethnic occupational traditionality. Witherspoon and Speight (2007) used this methodology to create a measure of occupational self-efficacy for traditional and nontraditional fields with an African American population. However, the authors used census data from 1981, which may no longer be reflective of the current trends in society. Further, the careers listed in the measure showed wider variability of education required. The population for the current study is Black college students, which warranted careers chosen based on jobs reflective of careers Black college students would be applying to following the completion of their studies.

Perceived Educational Barriers. The 24-item Perceptions of Barriers Scale (POBS; McWhirter, 1997) was developed to measure the perceptions of potential ethnic and gender-related educational barriers. A modified version of the POBS was created for use with college students (Luzzo & McWhirter, 2001). For the modified version of the scale, 9 items were deleted, 19 items were added, and the Educational Barriers items were presented in a different format to be presented to be more reflective of the experiences of college students (Luzzo & McWhirter, 2001). This 31-item scale uses a 5-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The subscales consisted of: (a) Career-Related Barriers (e.g., “In my future career, I will probably experience negative comments about one’s sex, such as insults or rude jokes”), and (b) Educational Barriers (e.g., “In my future career, I will probably lack support from teachers”). A total scale score will be calculated and used in analyses. A higher score is reflective of higher anticipated gender or ethnic discrimination.
Luzzo and McWhirter (2001) used the modified POBS with a sample of 168 female and 118 male college students at a small southern university. In the sample, 89% of the sample identified as European American, 7% as African American, 2% as Native American, 1% as Asian American, and less than 1% Hispanic American. Cronbach’s alpha of .90 was reported for the total scale, .86 for Career-Related, and .88 for Educational Barrier subscales. Test-retest reliability was obtained over a 2-month time period yielding .78 for the total POB scale score, and .72 and .68 stable coefficients for Career-Related and Educational Barrier subscales respectively. For the current study, Cronbach’s alpha was calculated to be .94 for the total scale for the sample.

**Perceived Career Barriers.** Byars and Hackett (1996) modified the original 112-item Career Barriers Inventory (Swanson & Tokar, 1991b) and developed a 28-item version. The modified CBI was designed to assess the perceptions of barriers that are anticipated to interfere with entering or succeeding at chosen career. Byars and Hackett (1996) only selected the items within the barrier scales that were considered most relevant to pre-entry career behavior of Black college students. Respondents made two responses to each item: the perceived likelihood of encountering each barrier and the degree to which each might hinder their career progress. The respondents are asked to first rate the perceived likelihood of encountering the barrier, using a 7-point, Likert-type scales ranging from 0 (very unlikely or not at all) to 6 (very likely or completely). Additionally, the respondents are asked to rate degree to which the barrier is anticipated to hinder career progress using a 7 point, Likert-type scales ranging from 0 (not at all) to 6 (completely). Like the proposed study, Byars and Hackett (1996) were interested in
examining the perception of career barriers of the participants, therefore, only the mean scores for the first part of the two responses given per each of the three subscales were computed. A higher score is reflective of higher anticipated gender or ethnic discrimination.

Byars-Winston (2006) conducted a study with a similar population of the current study, with 141 undergraduates (67% female) enrolled in a private HBCU who self-identified as Black, African American, or Biracial. Using the same method as Byars-Winston, three subscales of career barriers from the original CBI were selected based on the relevance to the college student population. The subscales used were: (a) Choice of Career (e.g., “being undecided about what job/career he would like”), (b) Finding a Job (e.g., “unsure of how to actually finding a job”), and (c) Performing your Job (e.g., “not receiving support from his coworkers/supervisors”). Byars and Hackett (1996) and Byars (1997) reported Cronbach’s alpha coefficients for the four subscales ranging between .77 and .92. Additionally, Byars and Hackett (1996) reported internal consistency reliability of .95 for the modified version of the CBI. Swanson et al. (1996) provided evidence of construct validity by reporting that the scales of the CBI were relatively unrelated to variables such as vocational identity and career indecision making; Byars-Winston and Fouad (2008) additionally reported construct validity by reporting a negative correlation between the CBI and coping efficacy (a theoretically dissimilar construct). For the current study, the internal consistency reliability coefficient was .91 for the total scale. Similarly to Byars-Winston and Fouad (2008), the modified version of the CBI using the total scale score will be used in analyses.

**Procedure**
Participants for the current study were recruited through various different channels, including on-campus postings at the University at Albany, national listservs for fraternities and sororities for Black college students, national listservs of programs specifically aimed at recruitment and retention of Black College Students (i.e. McNair Scholars Program, Miller’s Scholars Program), and postings on clubs for Black college students on social networking sites (e.g., Facebook, Yahoo Groups, etc.) for inclusion in a web-based study on perceptions of self-efficacy and barriers. These postings included a brief statement about the purpose of the study and a link to where the survey was hosted on PsychData.com. This was an anonymous survey that had an incentive offered, a raffle for one of 8, $25 Amazon.com gift cards. If students were interested in participating in a raffle, upon completion of the survey, they were directed to a separate page to provide their contact information, that was kept separate from their survey information. IRB approval was obtained for all materials used for recruitment, consent, appropriateness of the survey, and all efforts to maintain confidentiality before the current study was conducted on any participants. The instructions for the study will be as follows:

Thank you for your participation in the study. The purpose of this study is to learn more about students’ perceptions of occupational barriers and occupational self-efficacy. Following these instructions you will be asked to read a vignette depicting a Black student, like yourself, named Alex who is in college. There will be some questions about your perceptions of Alex for you to answer after you have finished reading the vignette.

Psychdata has an option that allows for random assignment of stimulus materials to each participant who signs on to the link provided in the solicitation materials. Each
participant was randomly assigned to one of four conditions: a) HBCU/Psychology, b) PWI/Psychology, c) HBCU/Mathematics, and d) PWI/Mathematics. Participants read one of the four vignettes and completed a demographic questionnaire, the Perception of Barriers Scale (POBS; McWhirter, 1997), the Occupational Self-Efficacy Scale for traditional fields (OSE-TRAD), the Occupational Self-Efficacy Scale for nontraditional fields (OSE-NON), a modified version of the Career Barriers Inventory (CBI; Swanson & Tokar, 1991), the Occupational Interest Scale for traditional fields (OIS-TRAD), the Occupational Interest Scale for nontraditional fields (OIS-NON).

**Pilot Study**

A pilot study was conducted in order to ensure that the manipulation of the two independent variables, campus environment and major, were successful. Prior to data collection, twenty participants who were unaware of the nature of the study were randomly assigned to one of the four conditions, presented with the stimulus materials and asked to complete all questionnaires and demographic questionnaires. The pilot student participants \((N = 20)\) were randomly assigned into each of the four conditions: HBCU/Psychology \((n = 4)\), HBCU/Mathematics \((n = 7)\), PWI/Psychology \((n = 5)\) and PWI/Mathematics \((n = 4)\). The pilot sample was divided fairly equally across conditions (4 participants for each condition). See Table 1 for the demographic characteristics of the pilot sample. Of the pilot sample, forty percent identified as having senior class standing, and eighty percent of the entire pilot sample had declared a major. Almost ninety percent of the pilot sample identified as Black (other participants identifying as Biracial/Multi-racial or African), and almost seventy-five percent of the pilot sample identified as female. The gender diversity is more balanced in the overall sample used for the main
analyses than the pilot sample. Additionally, the overall sample is more spread evenly between freshmen, sophomore, junior and senior status than in the pilot sample. With the exception of these two domains, both the pilot and overall sample responded similar on the other demographic variables and appear to be an appropriate group to pilot test the vignettes.

The pilot test questionnaire (See Appendix A for the full items) had items that were designed to illicit the participants to: (a) recall the racial/ethnic background of the student in the vignette, (b) select the major that best fits the student in the vignette (i.e., Psychology, Mathematics, Chemistry, Sociology, Physics, or other), and (c) select the campus environment that best depicts the student in the vignette (i.e., HBCU, PWI). Additionally, participants were asked to provide perceptions of the target student’s peer relationships (i.e. Likert scale ranging from 1 – Generally Negative to 5 – Generally Positive), faculty encouragement (i.e. Likert scale ranging from 1 – Not At All Encouraged to 5 – Extremely Encouraged), and the racial composition of the campus environment (i.e. Likert scale ranging from 1 – Mostly Black to 5 – Mostly White) for the vignette they were randomly assigned to.

All pilot sample participants correctly identified the student depicted in the vignette as Black/African American, correctly identified the participant’s major, and correctly selected the student’s campus environment. Based on the sample, seventy five percent of the sample in the HBCU/Psychology condition rated the student as extremely encouraged by faculty in comparison to forty percent of the PWI/Psychology condition. In the HBCU/Mathematics condition, eighty percent of the pilot sample reported the target student was extremely encouraged while zero percent rated the target student as
extremely encouraged in the PWI/Mathematics condition; seventy five percent rated the student as encouraged in this condition however). In the HBCU/Psychology condition, one hundred percent of the sample rated the peer relationships of the target as generally positive, while eighty percent rated the sample as generally positive in the PWI/Psychology condition. In the Mathematics condition, both of the samples rated peer relationships fairly equally. Finally, one hundred percent of the pilot sample rated their randomly assigned condition correctly as Mostly Black or Mostly White. Thus, the vignettes were deemed acceptable because the manipulation seemed to be successful (i.e., participants correctly identified the campus environment and major of the target in the vignettes).

Data Analyses

Preliminary analyses. Preliminary analyses of the participants’ responses on the demographic questionnaire were conducted to describe the sample characteristics. Means and standard deviations were assessed for participants’ age and level of education. Frequencies were provided for participants’ gender, racial or ethnic background, and type of major. Descriptive statistics, consisting of the means, standard deviations, and inter-correlations, were reported for the major demographic and study variables.

All participants were given the manipulation check items that were included in the pilot test (e.g., “what is Alex’s major,” “which best describes Alex’s campus environment,” etc.). Please refer to Appendix A to see a list of all of these items. If a participant incorrectly identified Alex’s major or campus environment, the data was not included in the analyses. Furthermore, preliminary analyses was also conducted to ensure that all observations are independent through randomization, that all dependent variables
are normally distributed for each group, that the covariance matrices for dependent variables are equal, a linear relationship between the dependent variables and the three covariates, and the slope of the regression for the covariates is the same in each group in order to make sure assumptions of MANCOVA were not violated (Tabachnick & Fidell, 2007).

**Test of Covariates.** A series of 2x2 analyses of covariance (ANCOVAs) were conducted to determine if the theoretically supported covariates had statistically significant effects on the dependent variables of study. The independent variable was Academic Major, the moderator variable was Campus Environment, and the three hypothesized covariates were Gender, Participants’ Interest in racial/ethnic nontraditional fields (PIS-NON) and Participants’ Interest in racial/ethnic traditional fields (PIS-TRAD).

**Major Analyses.** A randomized 2x2 Multiple Analyses of Covariance was conducted to test the hypotheses for the first set of dependent variables: 1) Occupational Self-Efficacy for Racial/Ethnic Nontraditional Major (OSE-NON) and Occupational Self-Efficacy for Racial/Ethnic Traditional Major (OSE-TRAD). A randomized 2x2 Multiple Analysis of Variance was conducted to test for the second set of dependent variables: 2) Educational Barriers (EB) and Career Barriers (CB). The two sets of dependent variables were examined together due to the theoretically and empirically supported correlation between the constructs. The independent variables were Racial/Ethnic Traditionality of Major and Campus Environment. These variables were used to create four conditions: (a) HBCU/Mathematics, (b) HBCU/Psychology, (c) PWI/Mathematics, and (d) PWI/Psychology.
Adjustment was made for two covariates for the first set of dependent variables: Participants’ Interest in Racial/Ethnic Traditional Occupations (PIS-TRAD) and Gender. PIS-TRAD was included as covariate in order to remove the influence it may have on how participants rank the target in the vignette on the measures of OSE-NON and OSE-TRAD as seen in their study. Gender was selected as the third covariate because of differences found in perceived career options for male and females (Lent, Brown, & Larkin, 1986; Hackett & Betz, 1981). Correlations between all covariates and the dependent variables were calculated to ensure that the assumptions for MANCOVA were not violated. F tests were used to test for statistical significance for each of the hypotheses, evaluated using α = .05. Multiple Analysis of Covariance and Multiple Analysis of Variance were performed by SPSS GLM. Additionally, in the MANCOVA and MANOVA, the Pillai-Bartlett trace F test approximation was used to calculate canonical roots in order to test for significant between-group differences (Field, 2009; Tabachnick & Fidell, 2007; Cohen, Cohen, West, & Aiken, 2003).

Hypothesis 1. To test the first hypothesis, a randomized 2 x 2 MANCOVA was conducted with Campus Environment (HBCU/PWI) and Academic Major (Mathematics/Psychology) as the independent variables and the first set of dependent variables of OSE-NON and OSE-TRAD, adjusted for the two covariates (Gender and PIS-TRAD). Pillai's trace (V) was used to as the test statistic and the measure of strength of association to test if the conditions are significantly different. The larger the Pillai's trace, the sum of explained variances, then the more the given effect could be explained by the proposed model. Significance was tested with the F test approximation to Pillai-Bartlett’s Trace with appropriate degrees of freedom (Tabachnik & Fidell, 2007). It was
expected that there would be a significant $F$ value for OSE ratings for the interaction of Academic major and Campus Environment.

In the event of a significant interaction between Campus Environment and Major, post-hoc univariate $F$ tests of group differences would be used to determine which group means differed significantly from others, in order to specify the exact nature of the overall effect determined by the $F$ test. In addition to examining means and standard deviations, pairwise multiple comparison tests would be used to test each pair of groups to identify similarities and differences (Haase & Ellis, 1987; Tabachnick & Fidell, 2007).

Hypothesis 2. To test hypothesis two, a randomized 2 x 2 MANOVA was conducted with Campus Environment (HBCU/PWI) and Academic Major (Mathematics/Psychology) as the independent variables and Educational Barriers (EB) and Career Barriers (CB) as the dependent variables. Pillai-Bartlett trace ($V$) was used as the test statistic and the measure of strength of association to test if the conditions are significantly different. The larger the Pillai’s trace, the sum of explained variances, the more the given effect could be explained by the proposed model. Significance was tested with the $F$ test approximation to Pillai-Bartlett’s Trace with appropriate degrees of freedom (Tabachnik & Fidell, 2007). It was expected that there will be a significant $F$ value for Perceived Barriers ratings for the interaction of Academic Major and Campus Environment.

In the event of a significant interaction, post-hoc univariate $F$ tests of group differences would be used to determine which group means differ significantly from others, in order to specify the exact nature of the overall effect determined by the $F$ test. In addition to the means and standard deviations, pairwise multiple comparison tests...
would be conducted to test each pair of groups to identify similarities and differences (Haase & Ellis, 1987; Tabachnick & Fidell, 2007).

CHAPTER IV

Results

This chapter provides a detailed summary of the results of the study, including preliminary data analyses and tests of the hypotheses.

Data Screening

A total of 417 participants logged into the Psychdata website where the survey was hosted. Of these 417 individuals, only 236 had fully completed the survey items; the remaining individuals were removed from the dataset. Additionally, one participant failed to identify the correct major for Alex in the randomly assigned condition and was also removed from the analyses. All other criteria for inclusion (i.e., correct identification of the manipulation conditions, age and racial/ethnic background of participants) were met. Of the 235 participants who completed the measures, a total of 102 cases contained at least one missing data point. In particular, some participants failed to complete portions of the stimulus materials (i.e., stopped the survey before completing the last scales). The final sample size ranged from 118 – 139 depending on the survey materials.

After examining the missing values, it seemed that the incomplete data was likely related to the length of the stimulus materials and survey, rather than due to the nature of the items or scales. The majority of the information needed for analyses was complete so the data was deemed appropriate to be screened to ensure all assumptions were not violated. In SPSS GLM and SPSS MANOVA, listwise deletion was performed to remove participants missing particular scales from the tests of hypotheses or main analysis. This
was deemed preferable to pairwise deletion or dummy variable coding in order reduce bias and given that the missing values appeared at random (Field, 2009).

**Preliminary Analyses**

The first step in the data analysis process involved examining the results of the manipulation check and screening the data for skewness and kurtosis, homogeneity of variance, normality and outliers. Following this process, the tests of the covariates were conducted.

*Manipulation Check.* As described in previous sections, all sample participants correctly identified the student depicted in the vignette as Black/African American, and identified the campus environment depicted in the vignette accurately. One participant incorrectly identified the participant’s major and was removed from the sample.

*Skewness/Kurtosis.* Prior to running the main analyses, the dependent variables were examined to ensure linearity and normality using several methods. First, the data was examined for normality by calculating the skewness and kurtosis of the dependent variables (OSE-NON, OSE-TRAD, EB, and CB) for the four conditions. See Tables 3 and 4 for Skewness and Kurtosis values respectively. These results revealed that none of the variables of study showed significant skewness or kurtosis at the p < .05 level.

*Homogeneity.* The Levene’s test was conducted in order to test the hypothesis that the variances in the groups are equal. If significant, it indicates that the variances are significantly different and therefore the assumption of the homogeneity of the variances has been violated (Field, 2009). The results of Levene’s test for EB was nonsignificant ($F(3, 111) = 1.121, p = .344$), as well as for CB ($F(3, 111) = .139, p = .936$).
Additionally, Levene’s test statistic was nonsignificant for OSE-NON ($F(3, 130) = .760, p = .518$) and OSE-TRAD ($F(3, 130) = .986, p = .402$).

Box’s Test of equality of covariance matrices was used to determine if the observed covariance matrices of the occupational self-efficacy variables and educational and career barriers were equal across conditions. The results were nonsignificant for OSE-NON and OSE-TRAD (Box’s $M = 12.125, F(9, 132613) = 1.308, p = .226$) and for EB and CB (Box’s $M = 3.134, F(9, 71513) = .336, p = .963$). This suggests that the covariance matrices of each of the dependent variables of study were equal across all four conditions.

**Normality.** To test for normality of the sample, the Kolmogorov-Smirnov (K-S) test and Shapiro-Wilk test statistics were calculated for each condition to determine if significant scores were more than .05 (Field, 2009). The K-S and Shapiro-Wilk tests determine whether the distributions of scores were significantly different from the normal distribution. See Tables 5 and 6 for the K-S and Shapiro-Wilk test results for all dependent variables of study. There were no significant differences to indicate that these distributions were not normal.

**Tests of Covariates**

A series of four, 2x2 analyses of covariance (ANCOVAs) were conducted to determine if the covariates had statistically significant effects on the occupational self-efficacy and barrier variables of study. The independent variable was Academic Major, the moderator variable was Campus Environment, and the three hypothesized covariates were Gender, Participants’ Interest in racial/ethnic nontraditional fields (PIS-NON) and Participants’ Interest in racial/ethnic traditional fields (PIS-TRAD). The results for each
of the covariates are presented in Tables 9-12.

**Gender.** The analysis of covariance indicated that Gender had no significant effects for any of the dependent variables of study (OSE-NON, OSE-TRAD, PEB or PCB). This seems consistent with the majority of the sample being largely female.

**PIS-NON.** The analysis of covariance indicated that Participants’ Interest in racial/ethnic nontraditional fields had no significant effects for any of the dependent variables of study (OSE-NON, OSE-TRAD, PEB or PCB).

**PIS-TRAD.** The analysis of covariance indicated that Participants’ Interest for racial/ethnic traditional fields had a significant effect on the degree of Occupational Self-Efficacy for racial/ethnic nontraditional fields, $F(1, 206) = 10.604, p = .002, \eta^2 = .115$ and Occupational Self-Efficacy for racial/ethnic traditional fields, $F(1, 193) = 7.083, p = .009, \eta^2 = .081$. There were no other significant effects found for Perceived Educational or Career Barriers.

Based on the above analyses, several conclusions can be made about the covariates. Participants’ Interest for racial/ethnic traditional fields had a significant effect on the degree of Occupational Self-Efficacy for racial/ethnic nontraditional and racial/ethnic traditional fields. Participants’ Interest in racial/ethnic nontraditional fields and Gender did not have a significant effect on any of the dependent variables of study. Also, none of the covariates had any significant effect on the barrier variables. Only Participants’ Interest in racial/ethnic traditional fields will be included as covariates for the occupational self-efficacy variables. Means and standard deviations for the present sample are presented in Table 7. Correlations between all continuous dependent variables of study are presented in Table 8. All Tests of Covariates are presented in Tables 9 -12.
Major Analyses

**Occupational Self-Efficacy.** To test the first hypothesis, that Campus Environment (PWI/HBCU) will moderate the relationship between Academic Major (Mathematics/ Psychology) and the set of occupational self-efficacy variables (OSE-NON and OSE-TRAD), a randomized 2x2 MANCOVA was conducted. The independent variables were Academic Major and Campus Environment. The dependent variables were Occupational Self-Efficacy (OSE-NON and OSE-TRAD). Adjustments were made for one covariate: Participants’ Interest in Racial/Ethnic Traditional Occupations (PIS-TRAD).

Contrary to hypothesis one, the interaction between Academic Major and Campus Environment was not significant (Pillai’s Trace = .022, F (2, 133) = 1.48, p = .231), suggesting that the campus environment did not act as a mediator of the relationship between academic major and occupational self-efficacy. Given that the interaction was not significant, a MANOVA was conducted on the two main effects (Campus Environment and Academic Major) after removing the interaction term from the analysis. This analysis revealed that there was a significant main effect for Academic Major (Pillai’s Trace = .280, F (2, 135) = 26.2, p = .000), but not for Campus Environment (Pillai’s Trace = .009, F (2, 135) = .533, p = .588), suggesting that participants rated the target’s occupational self-efficacy differently based on whether he was a psychology or mathematics major, but not based on whether the target was attending an HBCU or a PWI.

Post hoc univariate analyses of covariance (ANCOVAs) were conducted to further understand the significant findings. The results revealed the absence of a significant effect for Campus Environment on OSE-NON, (F (1, 134) = 286, p = .593) and on OSE-
TRAD (F (1, 134) = .007, p = .935). Univariate ANCOVAs revealed a significant effect for Academic Major on OSE-NON, (F (1, 134) = 7.956, p = .006) but no significant effect for OSE-TRAD (F (1, 134) = .010, p = .919).

Additionally, a discriminant analysis was conducted as a multivariate follow-up test to the significant main effects revealed from the ANOVA. The discriminant analysis was conducted with Occupational Self-Efficacy for Racial/Ethnic Nontraditional Fields (OSE-NON), Occupational Self-Efficacy for Racial/Ethnic Traditional Fields (OSE-TRAD), Gender, and Participants’ Interest for Racial/Ethnic Traditional fields (PIS-TRAD) as the discriminator variables and Racial/Ethnic Traditionality of the Academic Major as the categorical criterion to explore which variables contributed to the observed group differences. The discriminant analysis revealed a canonical correlation of .548 on Function 1, which accounted for 100% of the between group variability. The eigenvalue on D (the quantity maximized by the discriminant function coefficients obtained) was .429. The dimension reduction analysis was conducted to test the significance of the latent roots and revealed that Function 1 was statistically significant, Wilks Lambda = .700, $\chi^2 = 47.810, p = .000$. This supported the conclusion that one root accounted for the data so the second function was not included in subsequent analyses.

Standardized discriminant function coefficients and structure coefficients were examined to determine what variables contributed to the group differences (see Table 13). The standardized discriminant function coefficients suggested that the latent root was defined by OSE-NON, OSE-TRAD, PIS-TRAD, and PIS-NON in the positive direction and Gender in the negative direction. The structure coefficients suggested that OSE-NON ($r = .43$) and PIS-TRAD ($r = .22$), contributed most strongly to differentiating between
Psychology and Mathematics conditions. See Table 13 for all of the classification function coefficients. Compared to Psychology, participants in the Mathematics conditions rated the target as having greater occupational self-efficacy for entering nontraditional occupations.

**Career Barriers.** To test the second hypothesis, that Campus Environment (PWI/HBCU) moderated the relationship between Academic Major (Mathematics/Psychology) and perceived Educational Barriers (EB) and perceived Career Barriers (CB), a randomized 2x2 MANOVA was conducted. The independent variables were Academic Major and Campus Environment. The dependent variables were EB and CB.

The results revealed that the interaction between Academic Major and Campus Environment was nonsignificant (Pillai’s Trace V = .013, $F(2, 111) = .713, p = .492$), indicating that hypothesis two was not supported. The analysis was repeated to examine main effects after omitting the interaction term. There were no significant main effects for Academic Major (Pillai’s Trace V = .003, $F(2, 113) = .179, p = .836$) or Campus Environment (Pillai’s Trace V = .013, $F(2, 113) = .738, p = .480$). These findings suggested that participants in the different conditions did not perceive different degrees of career and educational barriers for the target in the vignette based on the racial composition of the campus environment or based on his academic major.
CHAPTER V

Discussion

The present investigation aimed to investigate the degree to which contextual factors, such as the racial composition of the campus environment and the racial/ethnic (R/E) traditionality of the academic major, were both related to Black college students’ perceptions of a target’s occupational self-efficacy for entering racial/ethnic nontraditional and traditional fields, and perceptions of the target’s educational and career barriers. The first hypothesized prediction was that the campus environment (PWI vs. HBCU) would moderate the relationship between the R/E traditionality of the academic major (Mathematics vs. Psychology) and the perception of occupational self-efficacy. The second hypothesized prediction was that campus environment (PWI vs. HBCU) would moderate the relationship between R/E traditionality of the academic major (Mathematics vs. Psychology) and the perception of occupational barriers. Neither of these interaction hypotheses was supported in the context of this study. This appeared primarily related to lack of sufficient power and an inadequate sample size due to missing data.

Although there was no support for the interaction between academic major and campus environment, the current study did find a main effect for academic major on self-efficacy. That is, the study found that scores on occupational self-efficacy for entering and mastering the tasks of racial/ethnic nontraditional fields varied as a function of the racial traditionality of the academic major. Specifically, participants in the Mathematics conditions rated the target as having higher self-efficacy for entering nontraditional occupations compared to ratings for the target when he was majoring in Psychology.
In the review of literature, there were several conclusions that were drawn from the research on Black college students, including an alarming lack of research on R/E traditionality of majors for Black college students. This study aimed to correct that lack of research and found some significant results related to the racial/ethnic traditionality of the major. Littig’s (1968) and Witherspoon and Speight’s (2007) work was integral to the formation of the research questions explored in this study. Namely, this study aimed to explore the role that the environment plays in shaping Black college students’ occupational choices in selecting racially/ethnically traditional versus nontraditional fields, the role that the environment plays in shaping Black college students’ perceptions of their career barriers, and the degree to which the traditionality of the academic major play a role in Black college students’ perceptions of occupational self-efficacy and barriers. Some of these results provide some answers to those questions, while others remain still unanswered.

Previous studies that have examined perceptions of barriers or self-efficacy perceptions primarily used correlational designs (Hackett, Betz, Casas & Rocha-Singh, 1992; Byars-Winston, 2006; Witherspoon & Speight, 2007). Far fewer studies have used experimental designs, random assignment, or controlled for any confounding variables to the variables of interest. This study makes a significant contribution to the research in this area given the use of an experimental design with random assignment and methods to control for confounding variables.

Few studies have examined the issue of occupational segregation by race/ethnicity. The findings of the current study could be useful in ultimately lessening the severity of occupational segregation in the STEM fields and aid in providing adequate
support and preparation for Black college students in entering and mastering the job requirements of racially/ethnically nontraditional occupations. However, this study is only the first step towards exploring the phenomena of occupational segregation. The remainder of this chapter will explore the meaning of the major findings of this study, relate those findings to similar studies, describe the limitations of this study, explore the clinical relevance of these findings, and describe recommendations for future research.

**Interaction Between Campus Environment and Academic Major**

The percentages of Blacks and African-Americans who graduate with STEM degrees or entering higher education and entering STEM related careers from historically black colleges and universities far exceed their same race/ethnic peers from predominantly white institutions (NSF, 2007; NSF, 2004; NCES, 2004). HBCU students in STEM majors reported more favorable perceptions of their college experiences and had substantially higher grade point averages than same race/ethnic students in the same majors at PWIs (Brown, Morning, & Watkins, 2005). Brown and Lent (2005) stated that self-efficacy, barriers, and other variables associated with Social Cognitive Career Theory occur and develop within the context of a larger socio-cultural environment. These authors further suggested that in the event that the individual is exposed to an unsupportive environment, a misperception of one’s self-efficacy could lead an individual to abandon interests and pursue options that they perceive to have less barriers that reflect a larger representation of his or her own culture (Brown & Lent, 2005). Littig (1968) in her seminal work found that social class and environment played a role in whether Black college students elect to pursue *traditionally open occupations* for Blacks, as opposed to *traditionally closed occupations*. 
Brown and Lent (2005) and Littig (1986) provided support for this current study and the hypothesis that the campus environment would moderate the effect of the academic environment on both sets of occupational self-efficacy variables and both sets of barrier perceptions. More specifically, it was expected that participants would rate the student who majored in mathematics in the predominantly white institution (PWI) with lower self-efficacy for entering nontraditional fields and higher barriers than the student who majored in mathematics in the historically black college and/or university (HBCU). Additionally, it was also expected that participants would rate the Black college student who had a psychology major in the HCBU campus environment condition with higher occupational self-efficacy for entering a racial/ethnic traditional field and lower perceived barriers than the student in the psychology condition at the predominantly white institution. There was no evidence based on the results of the current study that the interaction of campus environment and racial/ethnic traditionality of the academic major had any significant effect on any of the dependent variables of study.

There are a couple of possible explanations that may have influenced the lack of empirical support of this moderating effect. Although interaction effects can be difficult to find, the insignificant results were surprising because they were are inconsistent with the theoretical and prior research support for the moderation effect. Discussed further in the section on campus environment, it became clear because of the level of missing data and some of the demographic information that was gathered, that the manipulation for campus environment was not successful. Examining the mean differences between the different conditions, PWI/Mathematics and HBCU/Mathematics had the highest means of occupational self-efficacy for nontraditional fields. This appears consistent with the
significant main effect found for academic major. However, mean scores for the PWI/Math condition were slightly higher than HBCU/Mathematics condition in occupational self-efficacy for nontraditional fields, while PWI/Psychology had slightly higher mean scores than HBCU/Psychology. Though not significant, it appears that the participants in this study may have perceived the opposite of what previous literature suggests: there is a slight possibility that predominantly white institutions better prepare Black college students for entering traditional and nontraditional occupations than historically Black colleges and universities. However, reflecting on the vignettes used in the study, the problem may be the way the vignettes were written suggesting that the manipulation was not strong enough to produce a significant moderation effect.

Howard University was chosen as the HBCU in the vignette and Georgetown University as the PWI. Demographic information gathered from both of these institutions supported that distinction. However, all vignettes used in the study depicted positive experiences in either university. Previous research suggested that PWIs are generally hostile environments for Black college students while HBCUs are positive environments, which may explain why Black college students at HBCUs tend to have higher grades and HBCUs produce more graduates in STEM fields (Allen, 1992). In this study, participants were lead to believe that the student in the vignette had positive experiences regardless of the major or campus environment. In hindsight, it might have been important to ask the participants if they believed that the conditions depicted in the vignettes were a realistic approximation of conditions, as they exist in the U.S. today.

Another explanation may be the nature of the dependent variables themselves, or at least how they were measured in this study. There were no significant effects found on
any of the barrier perceptions with any of the conditions. This may suggest that the barriers scales used in this study may not be adequately tapping the stress or negative outcomes that may be experienced at different campus environments. It could also suggest that college students may not be able to fully grasp the nature of the barriers they may face because they have not yet faced them.

There were two measures of perceptions of barriers used in this study: 1) Perceptions of Barriers Scale (POBS; McWhirter, 1997) and the Career Barriers Inventory (CBI; Swanson & Tokar, 1991b). Examining the means across the different conditions (i.e. HBCU/Math, HBCU/Psychology, PWI/Math, and PWI/Psychology) show relatively consistent scores in the POBS, which suggests that the participants did not change their perception of the target’s barriers based on either the environment or the target’s major. It could be that the items reflected on the POBS were not adequately tapping the perceived educational barriers construct. The POBS (McWhiter, 1997) measures perceptions of potential ethnic and gender-related educational barriers, but individually reviewing the items (e.g. “In his future job, Alex will probably experience discrimination because of his racial/ethnic background,” “In college, Alex will probably experience discrimination because of his racial/ethnic background,” etc.) are not specific to the contextual variables of the current study (i.e. major and campus environment) and may have been too general to produce any actual effect regardless of the manipulated conditions.

On the other hand, the CBI reflected items that were considered most relevant to pre-entry career behavior of Black college students. Participants reported slightly higher CBI scores in the PWI/Psychology condition and the HBCU/Mathematics condition and
lower means in the PWI/Mathematics and HBCU/Psychology condition. This suggested that the participants at least had slight differences in perceptions as a function of the campus environment/academic major interaction. However, these mean differences were not significant as shown in the lack of a significant interaction effect. Yet, perhaps the items related to pre-entry career behavior were more closely connected to the moderation effect predicted between academic major and campus environment than the items reflected by the POBS. Recommendations for future research are to examine context-specific barriers of the racial/ethnic traditionality of the major and the specific different campus environments to determine if there is more of an effect than found using more general barrier perception items.

**Academic Major: Psychology vs. Mathematics**

Population data from the recent Census report continues to show that representation of Black and African Americans in fields related to math, science and engineering (i.e. racial/ethnic nontraditional fields) remains consistently low, yet consistently high in fields that are social and service related (i.e. racial/ethnic traditional fields) (U.S. Census Bureau, 2011; Witherspoon & Speight, 2007). The variable of racial/ethnic traditionality of the academic major was chosen because the number of undergraduate degrees in mathematics awarded to Blacks has steadily declined over the last decade, while undergraduate degrees awarded to Blacks in education and psychology continue to increase (Higher Education Research Institution, 2006; NSF, 2004). Math and science confidence has been explored to determine if this may be playing a contributing factor to this decline of Blacks in STEM majors (Byars-Winston & Fouad, 2008); however,
perceptions of confidence as influenced by the academic major previously to this study was virtually unexplored in career research.

Racial/ethnic traditionality of the academic major did have a significant main effect on both sets of occupational self-efficacy variables and both sets of barrier variables. The results of this study supported half of that prediction. That is, this study found that participants rated the target as having greater self-efficacy for entering nontraditional fields in both Mathematics conditions, compared to both Psychology conditions. Thus, the factor that differentiated the psychology and mathematics group conditions was that the participants rated the math major as having higher self-efficacy for nontraditional fields.

The results found that perceptions of the target’s self-efficacy for nontraditional occupations, i.e., occupations with lower representation of Blacks such as the STEM occupations, played a key role in the differences between the academic major conditions. Interestingly, however, self-efficacy for traditional occupations, i.e., occupations with higher percentages of Blacks, was not highly influential in differentiating the mathematics and psychology major conditions. In addition, academic major was related to self-efficacy perceptions, but did not seem to be important in perceptions of barriers for the target. That is, participants did not perceive differences in the target’s career and educational barriers based on his major.

In speculating on the findings, it is important to note that participants’ level of interest in racially traditional fields was related to both occupational self-efficacy variables. Interest and major selection appear to be areas that require further study. Witherspoon and Speight (2007) found evidence that stronger self-efficacy beliefs in
traditional occupations were predictive of higher interest in traditional occupations and weaker self-efficacy beliefs in nontraditional occupations predicted higher interest in traditional occupations. The results of this study may provide additional clarification of Witherspoon and Speight (2007)’s findings about the relationship between interest and self-efficacy. That is, in this study participants’ interest in nontraditional occupations was not related to perceptions of the target’s self-efficacy for either traditional or nontraditional occupations. However, participants’ interest in traditional fields had a significant effect on both sets of occupational self-efficacy variables which means in this study that participants’ own interest in traditional fields played a role in their occupational self-efficacy ratings. Future research may want to further explore lack of STEM interest as a predictor of STEM self-efficacy, which has virtually been unexplored in self-efficacy research.

In relation to previous research on interest, the sample of the current study may not be representative of students who actually are interested in pursuing mathematics. This may be why participants’ interest in racial/ethnic nontraditional fields did not affect either occupational self-efficacy variable in this study. In this sample, there was representation of students wanting to pursue science-related fields. Occupational self-efficacy and interest in racial/ethnic nontraditional fields was measured in this study by including fields related to science and math. Also, occupational self-efficacy for racial/ethnic traditional fields included fields other than just those related to psychology. Therefore the lack of representation of students in mathematics major should have been accounted for but there is no way to be certain that it was not a confound to this study. Future
research considerations include exploring other methods to measure these concepts, in addition to the methodology used in this study.

Efforts to increase and nurture interests of Blacks and African-Americans at earlier stages of development may be crucial to lessening the work-force racial discrepancy. However, the concern of whether Blacks and African-Americans perceive that there are significant barriers to entering STEM fields needs additional research. There was no support for hypothesis that academic major influences the perception of career and educational barriers. An examination of the mean scores on the barriers scales show that the scores show little change across the conditions. This was unexpected, given that it seems likely that there would be more anticipated barriers associated with Mathematics than Psychology. The rationale of the current study was that Black college students may be selecting career goals they perceive to have less barriers for Blacks (i.e. racial/ethnic traditional occupations) (Brown & Lent, 2005). It was the hope that through gathering more information about barrier perceptions would lead to developing interventions to combat these barriers, and reduce the effect that barriers have on barring Blacks from STEM fields. Disappointingly, the results of this study provide limited information about the perception of barriers.

A possible explanation about the lack of significant findings of the racial/ethnic traditionality of the academic major having an effect on barrier perceptions may be related to the previously discussed lack of representation of participants with mathematics as a major in the current study. The students in this sample may not be aware of or have had direct experience with barriers associated with being in a math major. Conceivably, lack of awareness or experience with such barriers certainly would affect the barrier
perceptions. A recommendation of future studies may want to assess direct exposure to barriers associated with the chosen major, in addition to the perceptions.

Additionally, the lack of significant findings in barrier perceptions may be related to the way barriers was measured in this study. The specific limitations of the barrier measures used in this study will be explored further in the limitations section of this chapter. However, evidence on any racial/ethnic related obstacles, challenges and barriers on Black college students and effects on a variety of different outcomes have been mixed at best (e.g., Byars-Winston, 2006; Rollins & Valdez, 2006; Witherspoon & Speight, 2007). For the context of this section, racial/ethnic traditionality of the academic major in Black college students is still a relatively unexplored concept. More research, more in depth exploration in what factors are contributing to the lack of representation of Blacks and African-Americans in STEM fields is still needed.

**Campus Environment**

The racial composition of the campus environment was chosen as a variable of the current study in part based on the assertion that self-efficacy and perception of barriers all occur within a larger socio-cultural environment (Brown & Lent, 2005). There are discrepancies in occupational attainment between professionals of color and their White counterparts (Bureau of Labor Statistics, 2010; Bureau of Labor Statistic, 2008; US Census, 2010). The assertion for the current study was that the different racial compositions found at HBCUs and PWIs would be similar to the occupational environments in the larger society where this gross discrepancy exists. It was expected that the campus environments would influence Black college students’ perceptions of
self-efficacy for traditional and nontraditional fields, as well as the perceived educational and career barriers to their occupational pursuits.

An explanation for lack of a main effect for campus environment on the dependent variables of study may be related to where the participants were located who participated in this study. Sample characteristics suggest that the participants in the current study were largely collected via social media sites, listservs, etc. from across the nation. However, participants were primarily located in Tennessee, Alabama, New York and California. One major limitation of the study is that information about which campus environment the participants attended was not collected. However, there are more HBCUs located in the southern regions than in the other areas where students were located (NCES, 2004). This may have affected any variability in campus environment that may have been found if location was accounted for on the perceptions of barriers and self-efficacy variables.

Additionally, all participants were asked to rate the perception of prestige of Georgetown University and Howard University, perception of ability to prepare students for STEM fields at Georgetown and Howard University, and general quality of education of Georgetown University and Howard University. There were no significant differences in perceptions of these campus environment based on the current sample, which is to say that the students did not perceive the universities as different. Thus, the manipulation at least based on campus environment was not successful in this study. This explains why there was not a significant main effect found for campus environment or the moderation effect interaction that was predicted. Participants may not have perceived these campus environments as being different and equally capable of preparing students to enter into racially/ethnic traditional or nontraditional environments. Future recommendations may
be to include universities that are perceived as different on some of the variables of interest to determine if the campus environment is indeed a predictor of self-efficacy or barrier perceptions.

Another explanation for the lack of significant effects of campus environment on barriers and self-efficacy may be previously discussed limitations of the experimental vignettes. Each condition reflected positive outcomes for the Black college student, regardless of the campus environment. This may have not triggered the accurate depiction of Black college students’ experience of campus climate and how it affects such documented negative outcomes such as self-efficacy, school performance (Aronson et al., 1999), poor physical health (Krieger & Sidney, 1996), negative emotional responses and negative cognitive reaction (Sue & Sue, 2007), and psychological risks (Harrell, 2000). Future research recommendations would be to construct vignettes that depict negative outcomes, as well as positive outcomes, to determine if any differences can be attributed to campus environment. An alternative recommendation would be to describe the conditions as they exist in the actual different campus environments and construct vignettes that reflect those conditions as opposed to explaining that the conditions were the same across the campus environment.

**Limitations**

Several limitations were discussed in previous sections. However this section will focus on other limitations that should be considered in context of the findings of the current study. Limitations to this research include threats to internal and external validity. First, there were external validity concerns with the use of an analogue study. The vignettes used in this study were developed for the current study. Although a pilot study
was conducted in order to ensure that the vignettes produced the sufficient amount of information to create the conditions of study, it is possible that the manipulation was not strong enough or realistic enough to influence participants’ ratings of the target. Additionally, initial conversations about the vignette construction involved using a written vignette, a written vignette with a picture included of the target student in a historically black college or university environment or a picture included of the target student in an predominantly white campus environment (depending on the randomized assigned condition), or a video vignette providing the information to participants as options for the experimental manipulation. Perhaps if one of the other options discussed was used, perhaps the stimulated conditions of the major or the campus environment may have been a more realistic approximation to the participants of the conditions, as they exist in the U.S.

Other limitations of the study are the use of self-report measures, particularly the OSE-NON and OSE-TRAD measures that were developed for the study. These measures were created from recent census data, but there may be social desirability of the occupations (i.e. fields depicted in the occupational self-efficacy for nontraditional fields may have been more socially desirable than fields depicted on occupational self-efficacy for traditional fields). Without a measure of social desirability of the occupations chosen, it is unclear if the social desirability of the occupations themselves affected the higher ratings in occupational self-efficacy for nontraditional fields over ratings of occupational self-efficacy for traditional fields.

Witherspoon and Speight (2007) used a similar methodology and reported initial validity evidence but more study is needed to determine if the measure has solid
psychometric properties. Although there was evidence of adequate reliability of the scores on the measures for this sample, exploration of other methods of measuring the constructs of study may be needed in order to ensure factors such as social desirability do not influence the results. Additionally, the measures themselves were limiting and only consisting of a single Likert rating scale that assessed participant’s self-efficacy for a given field. Future recommendations would be to include a task-specific measure of self-efficacy for a traditional and nontraditional field to determine if the findings reported here were consistent.

Another limitation of the current study may be the use of the general barriers measure. Future studies may want to consider developing more specific measures that reflect barriers and obstacles to Black college students entering STEM fields. Discussed in previous sections, barrier perceptions may not be tapping the actual phenomena contributing to the observed occupational segregation. There is a burgeoning awareness of discriminatory job ceilings that are both negatively associated with the career development and career choices of Black students at various developmental levels (Rollins & Valdez, 2006; Taylor, Casten, Flickinger, Roberts, & Fulmore, 1994). However, barrier perceptions has been met with mixed results (Constantine, Wallace, & Kindaichi, 2005; Lent et al., 2000; Evan & Herr, 1994) or insignificant results such as the case with the current study or the study conducted by Witherspoon and Speight (2007). More research is needed to determine if perhaps another construct would better explain the lack of diversity in STEM fields.

Lastly, the amount of missing data was substantial that contributed to unequal sample sizes and a large amount of missing values. This may be related to using a web-
based survey instead of paper administration. Additionally, the length of stimulus 
materials may have also contributed to the missing values. All missing values had to be 
removed through listwise deletion. Based on the data screening procedures, the data 
appeared sufficient to proceed through major analysis; however, using less lengthy 
measures and perhaps finding an alternative measures to barriers perceptions might better 
tap the experience of students of color in different campus environments in STEM majors 
or social-related majors.

**Implications for Future Research and Practice**

According to recent census data, the poverty level for Blacks and African-
Americans is at an all time high, and the average household income for Blacks and 
African-Americans is $32,000 (US Census Bureau, 2011). This information cannot be 
interpreted apart from the nationwide increase in poverty and job loss; however, the 
Black and African American community has consistently had lower salaries in relation to 
their White peers (US Census Bureau, 2011; US Census Bureau, 2007). Black and 
African-Americans are consistently barred from higher salaried, higher prestige positions 
and there is not enough information to explain this phenomenon. The goal of this study 
was to examine the Black students’ perceptions of the workforce discrepancy, primarily 
by attempting to better understand the relationships between campus environments, 
traditional and nontraditional fields of study, perception of barriers and confidence in 
one's ability to accomplish a task in Black college students. Although very few of the 
predictions were supported, the current study provides information about how students 
perceive different level of barriers and different levels of confidence in their ability based 
on their major and campus environment.
This study has provided more information about Black college students’ vocational behavior than existed previously in the career literature. In this study, students in math were perceived to have higher self-efficacy for going into STEM compared to students in psychology for social or service-related fields, regardless of whether they are at a PWI or HBCU. This was the only significant finding of this study, which doesn’t answer the above question and even suggests that even the racial/ethnic traditionality of the academic major in this study may not have been measured effectively.

Some recommendations for future research have been made in previous sections, such as including other measures of self-efficacy, varying experimental vignettes that depict positive and negative outcomes, as well as exploring modes of measuring race-related distress, well being, and motivation of Black college students in Predominantly White Institutions and Historically Black Colleges and Universities. It is important to reiterate that the sample population was generated through web-based modes of recruitment and may not be representative of the experience of students at both PWIs and HBCUs. Further study is needed to adequately understand and explain the career development of Blacks and African-Americans and the factors that lead to the lack of representation of Blacks and African-Americans in STEM fields.

Further, it is the strong recommendation that future research on Black college students focus on developing better methods of capturing or highlighting the important elements of the campus environment, such as the racial composition, finding alternative methods of measuring occupational self-efficacy (e.g., the addition of a task-specific self-efficacy for STEM fields versus social or service-related fields), and exploration of a measurable way of explaining what influences, bars, and/or disrupts Black students from
pursuing STEM-related interests. More in depth exploration of the college student experience at each of these types of environments may help in gleaning more information about variables that may be important in the self-efficacy for entering nontraditional fields, as well as assisting in coping with anticipated and unanticipated challenges of these fields. By better understanding these relationships through scientific research, and disseminating these findings to the psychological community, these findings could inform intervention efforts to reduce the lack of Black students in racially/ethnically nontraditional fields and understand the effect of the campus environment in this decision making process.

A great deal of colleges and universities are seeking to further diversify student body, faculty, and staff. Fostering diversity within university settings may aid in further reducing the occupational segregation that bar certain people of color from certain fields. Higher education has traditionally been the gateway for all students to enter into higher salaried, higher prestige positions. Through support of HBCUs and further diversification of other PWIs, the discrepancy that has existed across the U.S. workforce may begin to change. However despite this increase in diversity, universities would do well to attend to fostering culturally affirming climates regardless of the racial composition of their institution. Though people are drawn to those that share aspects similar to their own experience, identity status, background, etc., the promotion of increased communication between students of diverse backgrounds is essential in creating healthy, encouraging climates where all students can do well.

Some universities and colleges have initiated creating and fostering these type of environments through a number of ways. Chang (1999) suggested implementing a first
year student experience that includes exploration of different cultural worldviews within the population in order to increase awareness of cultural variations and encourage them to interact with students of various cultural backgrounds. Other universities have created “themed” floors or dormitories that promote communication across various cultural divides, including international ones, in an effort to increase awareness of differing worldviews. Watkins, Labarrie, and Appio (2010) suggested the importance of increasing student interactions throughout the college experience through cultural enrichment and appreciation workshops, diversity initiatives, residential life programming, and campus dialogues around critical topics of race and diversity. These are just some the ways colleges and universities can help in terms of creating spaces that are more culturally-affirming and promotive of student success, to match the growing diversification of the U.S. workforce.

These methods however may not be enough. More may be needed to affect change U.S. labor force at the university level. Some suggestions for further investigation of university administrators would be to look at what is successful at other universities (e.g., what characteristics of historically black colleges and universities lead to being greater STEM degrees awarded). Not only has the work force changed, but campus environments have as well. Preventative methods to eradicate hostile, nonsupportive environments may lead to higher degrees in STEM fields for Blacks and African-Americans across differing campus environments as well as lead to facilitating change agents in the students who enter the work-force. Informational events (e.g., job fairs, internships, etc.) that encourage and stimulate STEM interest across diverse populations, and programs that focus on work-place equity starting through campus environment equity could also
facilitate greater awareness of inequitable conditions and empower students to take action. These are just some ideas of many that may be implemented at different colleges and universities across the nation. Being self-aware of the challenges faced by diverse student populations on predominantly white institutions and efforts to create supportive, inclusive environments could also be rather helpful in supporting and preparing this economy for further work-place diversification that is predicted.

Though findings of this study were not significant in terms of which campus environment truly lead to greater self-efficacy, practitioners may be helpful to students who are looking to explore STEM careers through providing career explorative outreach activities to students to learn more about the different careers and the tasks that are involved with them. There are a number of resources available to students, such as O*NET, Eureka, and MyRoad, that can be helpful not only in assisting students in choosing a major that's right for them but also finding a job that fits the major that they interested in. Some of the information may require an account, but they are free to use and have a variety of helpful information for students trying to find the right major and the right career. A practitioner would be very helpful in assisting a student in this exploration process and helping in terms of suggesting further activities that made aide in increasing encounter experiences in order to increase self-efficacy in fields Black college students may be interested in. Additionally, counseling may also be helpful in assisting students in anticipating and preparing for any barriers or hindrances that may accompany the career explorative process, as well as entering into nontraditional fields.
References


National Center for Education Statistics (NCES). (2004). *Characteristics of Minority-
Serving Institutions and Minority Undergraduates Enrolled in These Institutions.
pubid=2008156.


APPENDIX A
Pilot Test Questionnaire

The following questions are about your reactions regarding Alex Johnson. Based on what you read, select the item that best describes him.

1) What was Alex Johnson’s race/ethnicity? (Please check only one)
   __ Asian       __African-American       __Caucasian
   __Latino/Hispanic   __Native American   ___ Other (specify: _____)

2) What is Alex’s Major? (Please check only one)
   __ Psychology       __Mathematics

3) Which best describes Alex Johnson’s campus environment?
   __Historically Black College or University   __ Predominantly White Institution

4) Using your best guess, how would you describe the level of encouragement Alex receives from professors?
   1   2   3   4   5
   Not At All Encouraged                     Extremely Encouraged

5) Using your best guess, how would you describe Alex Johnson’s peer relationships?
   1   2   3   4   5
   Generally Negative                      Generally Positive

6) Using your best guess, how would you describe the racial/ethnic composition of Alex Johnson's campus environment?
   1   2   3   4   5
   Mostly Black                           Mostly White
APPENDIX B
Occupational Self-Efficacy Scale (OSE)


1 2 3 4 5 6 7
Not At All Confidant Totally Confidant

OSE – NON

How much confidence do you think Alex has for entering and mastering the educational job requirements to be a ________

1. Computer Programmer?
2. Software Engineer?
3. Mathematician?
4. Statistician?
5. Architect?
6. Mechanical Engineer?
7. Physical Scientist?
8. Medical Doctor?
9. Psychologist?
10. Sociologist?
11. Lawyer?

OSE – TRAD

How much confidence do you think Alex has for entering and mastering the educational job requirements to be a ________

1. Budget Analyst?
2. Teacher or Administrator?
3. Human resources, training, and labor relations specialist?
4. Tax examiner, collector, and revenue agent?
5. Computer Support Specialist?
6. Chemical Technician?
7. Counselor?
8. Social worker?
9. Paralegal and Legal Assistant?
10. Dietician or Nutritionist?
11. Nurse?
APPENDIX C
Participant Interest Scale (PIS)


1  2  3  4  5  6  7
Not At All Interested  Totally Interested

PIS – NON

How interested are you in being a _________

1. Computer Programmer?
2. Software Engineer?
3. Mathematician?
4. Statistician?
5. Architect?
6. Mechanical Engineer?
7. Physical Scientist?
8. Medical Doctor?
9. Psychologist?
10. Sociologist?
11. Lawyer?

PIS – TRAD

How interested are you in being a _________

1. Budget Analyst?
2. Teacher or Administrator?
3. Human resources, training, and labor relations specialist?
4. Tax examiner, collector, and revenue agent?
5. Computer Support Specialist?
6. Chemical Technician?
7. Counselor?
8. Social worker?
9. Paralegal and Legal Assistant?
10. Dietician or Nutritionist?
11. Nurse?
APPENDIX D
Perception of Barriers Scale (McWhirter, 1997)

1 2 3 4 5
Strongly Disagree Disagree Agree Strongly Agree

Career Barriers:

1) In his future job, Alex will probably be treated differently because of his sex.

2) In his future job, Alex will probably be treated differently because of his ethnic/racial background.

3) In his future job, Alex will probably experience negative comments about his sex (such as insults or rude jokes).

4) In his future job, Alex will probably experience negative comments about his racial/ethnic background (such as insults or rude jokes).

5) In his future job, Alex will probably have a harder time getting hired than people of the opposite sex.

6) In his future job, Alex will probably have a harder time getting hired than people of other racial/ethnic backgrounds.

7) In his future job, Alex will probably experience discrimination because of his sex.

8) In his future job, Alex will probably experience discrimination because of his ethnic/racial background.

9) In his future job, Alex will probably have difficulty finding quality daycare for his children.

10) In his future job, Alex will probably have difficulty getting time off when his children are sick.

11) In his future job, Alex will probably have difficulty finding work that allows him time to spend time with his family.

Educational Barriers:

12) In college, Alex will probably experience money problems.

13) In college, Alex will probably experience family problems.
14) In college, Alex will probably experience not being smart enough.

15) In college, Alex will probably experience negative family attitudes about college.

16) In college, Alex will probably experience not fitting in.

17) In college, Alex will probably experience lack of support from teachers.

18) In college, Alex will probably experience not being prepared enough.

19) In college, Alex will probably experience not knowing how to study well.

20) In college, Alex will probably experience not having enough confidence.

21) In college, Alex will probably experience lack of support from his friends to pursue his educational aspirations.

22) In college, Alex will probably experience barriers related to his gender.

23) In college, Alex will probably experience barriers related to people's attitudes about his gender.

24) In college, Alex will probably experience barriers related to his ethnic background.

25) In college, Alex will probably experience barriers related to childcare concerns.

26) In college, Alex will probably experience lack of support from his "significant other" to pursue education.

27) In college, Alex will probably experience barriers to his desire to have children.

28) In college, Alex will probably experience barriers related to relationship concerns.

29) In college, Alex will probably experience barriers related to having to work while he goes to school.

30) In college, Alex will probably experience lack of role models or mentors.

31) In college, Alex will probably experience a lack of financial support.
APPENDIX E
Career Barriers Inventory – Revised (CBI; Swanson & Tokar, 1991)

Please think about each of the common barriers listed below in terms of Alex’s career progress. Then, for each, please indicate:

- how likely you think it is that Alex may experience each one, and then;
- how much each barrier would hinder or interfere with his career progress: in other words, how much would each barrier make his progress difficult?

**Choice of career**

1. Lacking information about possible job/careers

   How likely is it that Alex will encounter this barrier?

<table>
<thead>
<tr>
<th>Very Unlikely</th>
<th>Very Likely</th>
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<tbody>
<tr>
<td>0 1 2 3 4 5 6</td>
<td></td>
</tr>
</tbody>
</table>

   If encountered, how much would this barrier hinder his career progress?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Completely</th>
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<tbody>
<tr>
<td>0 1 2 3 4 5 6</td>
<td></td>
</tr>
</tbody>
</table>

2. Being undecided about what job/career he would like

   How likely is it that Alex will encounter this barrier?

<table>
<thead>
<tr>
<th>Very Unlikely</th>
<th>Very Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6</td>
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</table>

   If encountered, how much would this barrier hinder his career progress?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Completely</th>
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<tbody>
<tr>
<td>0 1 2 3 4 5 6</td>
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</table>

3. Being limited to certain career choices

   How likely is it that Alex will encounter this barrier?

<table>
<thead>
<tr>
<th>Very Unlikely</th>
<th>Very Likely</th>
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</thead>
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<tr>
<td>0 1 2 3 4 5 6</td>
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</table>

   If encountered, how much would this barrier hinder his career progress?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6</td>
<td></td>
</tr>
</tbody>
</table>
4. Being limited to certain career choices because of my race/ethnicity

   How likely is it that Alex will encounter this barrier?

   Very Unlikely
   
   Very Likely

   If encountered, how much would this barrier hinder his career progress?

   Not at all
   
   Completely

5. Being discouraged from pursuing nonmath/science fields (e.g., engineering)

   How likely is it that Alex will encounter this barrier?

   Very Unlikely
   
   Very Likely

   If encountered, how much would this barrier hinder his career progress?

   Not at all
   
   Completely

6. Other people's beliefs that certain careers are not appropriate for him

   How likely is it that Alex will encounter this barrier?

   Very Unlikely
   
   Very Likely

   If encountered, how much would this barrier hinder his career progress?

   Not at all
   
   Completely

Finding a job

7. Lacking the necessary experience for a job

   How likely is it that Alex will encounter this barrier?

   Very Unlikely
   
   Very Likely
If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6

8. Not being able to find a job after graduation

How likely is it that Alex will encounter this barrier?

Very Unlikely 0 1 2 3 4 5 6

Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6

9. Not wanting to move away from his friends and/or family

How likely is it that Alex will encounter this barrier?

Very Unlikely 0 1 2 3 4 5 6

Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6

10. Unsure of how to actually find a job

How likely is it that Alex will encounter this barrier?

Very Unlikely 0 1 2 3 4 5 6

Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6

11. Tight economy

How likely is it that Alex will encounter this barrier?
12. Not knowing the "right people" to get a job

How likely is it that Alex will encounter this barrier?

Very Unlikely
0 1 2 3 4 5 6

Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all
0 1 2 3 4 5 6

Completely

13. Racial discrimination in hiring for a job

How likely is it that Alex will encounter this barrier?

Very Unlikely
0 1 2 3 4 5 6

Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all
0 1 2 3 4 5 6

Completely

14. Sex discrimination in hiring for a job

How likely is it that Alex will encounter this barrier?

Very Unlikely
0 1 2 3 4 5 6

Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all
0 1 2 3 4 5 6

Completely
Performing the job

15. Not being able to perform his job well

How likely is it that Alex will encounter this barrier?

Very Unlikely 0 1 2 3 4 5 6  
Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6  
Completely

16. Lacking the required skills for his job

How likely is it that Alex will encounter this barrier?

Very Unlikely 0 1 2 3 4 5 6  
Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6  
Completely

17. Being dissatisfied with his job/career

How likely is it that Alex will encounter this barrier?

Very Unlikely 0 1 2 3 4 5 6  
Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6  
Completely

18. Not receiving support from his coworkers/supervisors

How likely is it that Alex will encounter this barrier?

Very Unlikely 0 1 2 3 4 5 6  
Very Likely

If encountered, how much would this barrier hinder his career progress?
19. Fear of being considered unattractive to the opposite sex because of his job/career

How likely is it that Alex will encounter this barrier?

Very Unlikely
0 1 2 3 4 5 6

Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all
0 1 2 3 4 5 6

Completely

20. Difficulty dealing with "politics" at work

How likely is it that Alex will encounter this barrier?

Very Unlikely
0 1 2 3 4 5 6

Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all
0 1 2 3 4 5 6

Completely

21. Racial discrimination in promotions in job/career

How likely is it that Alex will encounter this barrier?

Very Unlikely
0 1 2 3 4 5 6

Very Likely

If encountered, how much would this barrier hinder his career progress?

Not at all
0 1 2 3 4 5 6

Completely

22. Not being taken seriously at work because he's a man/woman.

How likely is it that Alex will encounter this barrier?

Very Unlikely
0 1 2 3 4 5 6

Very Likely
If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6

23. Sexual harassment on the job.

How likely is it that Alex will encounter this barrier?

Very Unlikely 0 1 2 3 4 5 6

If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6


How likely is it that Alex will encounter this barrier?

Very Unlikely 0 1 2 3 4 5 6

If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6

25. Lack of respect from coworkers/supervisor because of his gender

How likely is it that Alex will encounter this barrier?

Very Unlikely 0 1 2 3 4 5 6

If encountered, how much would this barrier hinder his career progress?

Not at all 0 1 2 3 4 5 6

26. Lack of respect from coworkers/supervisor because of his race/ethnicity

How likely is it that Alex will encounter this barrier?
27) Being the "token" in a job because of his gender

How likely is it that Alex will encounter this barrier?

Very Unlikely  Very Likely
0 1 2 3 4 5 6

If encountered, how much would this barrier hinder his career progress?

Not at all  Completely
0 1 2 3 4 5 6

28. Being the "token" in a job because of his race/ethnicity

How likely is it that Alex will encounter this barrier?

Very Unlikely  Very Likely
0 1 2 3 4 5 6

If encountered, how much would this barrier hinder his career progress?

Not at all  Completely
0 1 2 3 4 5 6
APPENDIX F
Demographic Questionnaire

Please answer the following questions.

What is your age? _____

What is your Gender?  __ Male  __Female  __ Other

Do you identify as Black or African American?
__Yes  __No __Other

If you were born in the U.S., what state are you from?

If you were born in a country other than the U.S., where were you born?

What year in school are you currently?
__ Freshmen  __ Sophomore  __ Junior
__ Senior  __ Graduate Student  __ Other

What is your religious/spiritual affiliation?
__ Jewish  __ Muslim  __ Christian  __ Buddhist
__ Taoist  __ Agnostic  __ Atheist  __ Other

What is the current annual household income (US dollars) of your family of origin?
__ Under $10,000  __$10,000 – 29,999  __$30,000 – $49,999
__$50,000 - $74,000  __$75,000 – $99,999  __$100,000 - $150,000
__ Over $150,000

Have you declared a major?
__Yes  __No

If you have chosen a major, what is your major?
______________________________
How sure are you about your chosen major?

1  2  3  4  5  6  7
Not At All Sure        Totally Sure

What is your highest level of education?

a. Undergraduate
b. Currently enrolled in a graduate program
c. Masters:
d. Psy.D.
e. Ph.D.
f. Other (specify _____________)

Using the Likert Scale Below, please describe the similarity between the racial composition of the community you were reared in and your current college racial environment.

1  2  3  4  5
Very Similar        Very Different

Using the Scale, please describe the similarity between the racial composition of the community you were reared in compared to your current college racial environment.

1  2  3  4  5
Very Similar        Very Different

Using the Scale, please describe the similarity between the racial composition of the high school you attended compared to your current college racial environment.

1  2  3  4  5
Very Similar        Very Different

How prestigious do you consider Georgetown University among other universities?

1  2  3  4  5  6  7
Not At All Prestigious        Totally Prestigious

How prestigious do you consider Howard University among other universities?

1  2  3  4  5  6  7
Not At All Prestigious        Totally Prestigious
How do you rate Georgetown University in its ability to prepare students for the STEM (Science, Technology, Engineering, & Mathematics) fields?

1 2 3 4 5 6 7
Extremely Poorly Extremely Well

How do you rate Howard University in its ability to prepare students for the STEM (Science, Technology, Engineering, & Mathematics) fields?

1 2 3 4 5 6 7
Extremely Poorly Extremely Well

How would you rate the quality of education at Georgetown University?

1 2 3 4 5 6 7
Totally Negative Totally Positive

How would you rate the quality of education at Howard University?

1 2 3 4 5 6 7
Totally Negative Totally Positive
Table 1

**Demographic Characteristics of the Pilot Study Sample**

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<thead>
<tr>
<th>Variable</th>
<th>HBCU/PSYCH</th>
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<th>HBCU/MATH</th>
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<th>PWI/PSYCH</th>
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<td>57.1%</td>
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Table 2

Demographic Characteristics of the Sample

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<td>N</td>
<td>%</td>
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Table 2 (Continued)

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<td>%</td>
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### Table 3

**Skewness Values for the Study Variables For the Four Conditions**

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### Table 4

*Kurtosis Values for the Study Variables For the Four Conditions*

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112
Table 5

*Kolmogorov-Smirnov Test for Study Variables By Condition*

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*Note:* OSE-NON, OSE-TRAD, PIS-NON and PIS-TRAD (N = 139); EB (N = 118); and CB (N = 118) Computed using alpha = .05
Table 6

Shapiro-Wilk Test for Study Variables By Condition

<table>
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Note: OSE-NON, OSE-TRAD, PIS-NON and PIS-TRAD (N =139); EB (N = 118); and CB (N = 118) Computed using alpha = .05
Table 7

Means and Standard Deviations of Study Variables for the Four Study Conditions

<table>
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<th>HBCU/MATH</th>
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<td>EB</td>
<td>74.7</td>
<td>21.5</td>
<td>78.5</td>
<td>21.1</td>
</tr>
<tr>
<td>CB</td>
<td>99.7</td>
<td>23.4</td>
<td>105</td>
<td>28.9</td>
</tr>
<tr>
<td>PIS-NON</td>
<td>25.6</td>
<td>9.9</td>
<td>29.8</td>
<td>12.7</td>
</tr>
<tr>
<td>PIS-TRAD</td>
<td>27.8</td>
<td>9.8</td>
<td>32.6</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Note: OSE-NON, OSE-TRAD, PIS-NON and PIS-TRAD ($N = 139$); EB ($N = 118$); and CB ($N = 118$) computed using alpha = .05
Table 8

*Intercorrelations of Continuous Dependent Variables and Demographic Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. EB</td>
<td></td>
<td>.564**</td>
<td>.113</td>
<td>.100</td>
<td>.243</td>
<td>.142</td>
</tr>
<tr>
<td>2. CB</td>
<td></td>
<td></td>
<td>.225</td>
<td>.204</td>
<td>.239</td>
<td>.160</td>
</tr>
<tr>
<td>3. OSE-NON</td>
<td></td>
<td></td>
<td>.912**</td>
<td>.245</td>
<td>.250</td>
<td></td>
</tr>
<tr>
<td>4. OSE-TRAD</td>
<td></td>
<td></td>
<td></td>
<td>.179</td>
<td>.192</td>
<td></td>
</tr>
<tr>
<td>5. PIS-NON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.628**</td>
<td></td>
</tr>
<tr>
<td>6. PIS-TRAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: OSE-NON, OSE-TRAD, PIS-NON and PIS-TRAD (N = 139); EB (N = 118); and CB (N = 118)*

Computed using alpha = .05
Table 9

Analysis of Covariance of Occupational Self-Efficacy for Non-Traditional Fields (OSE-NON) as a Function of Campus Environment and Academic Major with Gender, Participant’s Occupational Interest in Non-Traditional Fields (PIS-NON), and Participant’s Occupational Interest in Traditional Fields (PIS-TRAD) as covariates.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>F</th>
<th>η²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>31</td>
<td>7.274</td>
<td>.733</td>
<td>.000</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>13.954</td>
<td>.145</td>
<td>.000</td>
</tr>
<tr>
<td>PIS-NON</td>
<td>1</td>
<td>1.817</td>
<td>.022</td>
<td>.181</td>
</tr>
<tr>
<td>PIS-TRAD</td>
<td>1</td>
<td>10.604</td>
<td>.115</td>
<td>.002</td>
</tr>
</tbody>
</table>

Note: Computed using alpha = .05; R Squared = .733 (Adjusted R Squared = .632)
Table 10

Analysis of Covariance of Occupational Self-Efficacy for Traditional Fields (OSE-TRAD) as a Function of Campus Environment and Academic Major with Gender, Participant’s Occupational Interest in Non-Traditional Fields (PIS-NON), and Participant’s Occupational Interest in Traditional Fields (PIS-TRAD) as covariates.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>F</th>
<th>η²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>29</td>
<td>5.668</td>
<td>.673</td>
<td>.000</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>8.350</td>
<td>.095</td>
<td>.005</td>
</tr>
<tr>
<td>PIS-NON</td>
<td>1</td>
<td>.795</td>
<td>.010</td>
<td>.375</td>
</tr>
<tr>
<td>PIS-TRAD</td>
<td>1</td>
<td>7.083</td>
<td>.081</td>
<td>.009</td>
</tr>
</tbody>
</table>

Note: Computed using alpha = .05; R Squared = .673 (Adjusted R Squared = .554)
Table 11

Analysis of Covariance of Perceived Educational Barriers (EB) as a Function of Campus Environment and Academic Major with Gender, Participant’s Occupational Interest in Non-Traditional Fields (PIS-NON), and Participant’s Occupational Interest in Traditional Fields (PIS-TRAD) as covariates.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>F</th>
<th>η²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>29</td>
<td>1.108</td>
<td>.315</td>
<td>.355</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>.515</td>
<td>.007</td>
<td>.475</td>
</tr>
<tr>
<td>PIS-NON</td>
<td>1</td>
<td>.282</td>
<td>.004</td>
<td>.597</td>
</tr>
<tr>
<td>PIS-TRAD</td>
<td>1</td>
<td>1.172</td>
<td>.016</td>
<td>.283</td>
</tr>
</tbody>
</table>

*Note: Computed using alpha = .05; R Squared = .315 (Adjusted R Squared = .031)*
Table 12

Analysis of Covariance of Perceived Career Barriers (CB) as a Function of Campus Environment and Academic Major with Gender, Participant’s Occupational Interest in Non-Traditional Fields (PIS-NON), and Participant’s Occupational Interest in Traditional Fields (PIS-TRAD) as covariates.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>F</th>
<th>η²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>31</td>
<td>1.005</td>
<td>.296</td>
<td>.476</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>.277</td>
<td>.004</td>
<td>.600</td>
</tr>
<tr>
<td>PIS-NON</td>
<td>1</td>
<td>2.235</td>
<td>.029</td>
<td>.139</td>
</tr>
<tr>
<td>PIS-TRAD</td>
<td>1</td>
<td>1.078</td>
<td>.014</td>
<td>.303</td>
</tr>
</tbody>
</table>

Note: Computed using alpha = .05; R Squared = .296 (Adjusted R Squared = .002)
### Classification Function Coefficients for Racial/Ethnic Racial Traditionality of the Academic Major

<table>
<thead>
<tr>
<th>Variable</th>
<th>Academic Major</th>
<th>Standard Canonical Coefficients</th>
<th>Structure Matrix Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSE-NON</td>
<td></td>
<td>2.65</td>
<td>.43</td>
</tr>
<tr>
<td>OSE-TRAD</td>
<td></td>
<td>-2.46</td>
<td>.08</td>
</tr>
<tr>
<td>PIS-TRAD</td>
<td></td>
<td>.23</td>
<td>.22</td>
</tr>
</tbody>
</table>

*Note: OSE-NON, OSE-TRAD, and PIS-TRAD (N = 139); Computed using alpha = .05*