Faculty Interactions with Black Male Students at HBCUS and Community Colleges as Predictors of Academic Achievement in STEM

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FACULTY INTERACTIONS WITH BLACK MALE STUDENTS AT HBCUS AND COMMUNITY COLLEGES AS PREDICTORS OF ACADEMIC ACHIEVEMENT IN STEM

by

Antoine Toray Gates

A Dissertation
Submitted to the Graduate School,
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and the Center for Science and Mathematics Education
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

Approved by:

Dr. Sherry S. Herron, Committee Chair
Dr. Lilian H. Hill
Dr. Richard S. Mohn
Dr. Robert T. Palmer
Dr. Kyna S. Shelley

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ABSTRACT

A myriad of studies in STEM education aim to identify the underlying reasons behind poor achievement of Black males in higher education. Research studies have indicated that HBCUs make significant advances in various desired outcomes such as graduation rates for Blacks, especially males. However, Black males at community colleges do not always fare similarly to their counterparts at HBCUs. There are limited studies on faculty interactions with Black males in STEM at community colleges. Therefore, the goal of this study was to identify whether significant differences existed in the interactions STEM faculty formed with Black males at community colleges and HBCUs. Also, its intention was to determine if aspects of faculty interactions with these males from each type of institution correlated with student achievement. One-hundred and fifteen Black male students who were STEM majors and who were freshmen or sophomores at a Mississippi HBCU (N=56) or a community college (N=59) were the participants for this study. Survey data from the Student-Professor Interaction Scale (SPIS) were analyzed using SPSS. Logistic regression used the students' STEM achievement measured by self-reported STEM GPA and each subscale in the survey instrument to determine if a significant relationship existed with either type of institution. To identify the best set of predictor variables, multiple regression analyses were conducted for both institution types to show the relationship between the participants' interactions with STEM faculty and their STEM achievement. Black males at the HBCU had significantly higher STEM achievement than Black males at the community college. There were significant differences in off-campus interactions and career guidance subscales of faculty-student interactions in this study. Off-campus interactions with
STEM faculty were more likely for Black males who attended the HBCU than the males who attended the community college. STEM faculty at the community college were more likely to discuss career opportunities with Black males than the HBCU faculty members were with this group. There was a statistically significant relationship between the accessibility subscale and STEM achievement for Black males at the community college. However, none of the faculty-student interactions were significant predictors of STEM achievement for Black males at the HBCU.
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Last, I would be remiss not to show my appreciation for Mrs. Celia Young and Mrs. Emily Lymon. As a commuter student, I appreciate every email and phone call you answered to clarify a question or point me in the right direction. I acknowledge the value you two have had in my life and salute you for helping me and countless others achieve our goals.
DEDICATION

I thank Jesus for providing me with the vision to complete a doctorate. I am grateful for His traveling grace and protection during the years I had to commute from home to class. The persistence and stamina needed to complete a dissertation study were His gifts to me, and I just have to say, “thank you, Lord for all you’ve done for me.”

Proverbs 18:22 states that “He who finds a wife finds a good thing and obtains favor from the Lord.” Zundra, you are definitely my good thing. When I began this journey to earn a doctorate six years ago, I never imagined I would also gain a family. You entered my life at an unsuspecting time, but I thank God for interceding on our behalf. You have made me a better man, and I am excited to see what is in store for us and our family in the future. I love you! To my darling Allison, I love you more than life itself. Each day I am allowed to wake up and see you is another blessing. I hope you to take after your mother and pursue in life whatever interests you (it better be science).

My parents and siblings have been a tremendous support system. My mother and her friends have prayed many prayers for me and Zundra. Well, those prayers worked! My father, brother, and sister motivated me by asking me the same question almost each time they saw me. I ran out of ways to explain why I am just now making this much progress on my dissertation when I finished coursework years ago. My brother Rell was the first in my entire family to earn a doctorate, so as his little brother, it was only right that I get one too. To my in-laws, nieces, nephews, aunts, uncles, and cousins, thanks for encouraging me at our family functions to complete my degree.

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CHAPTER I – INTRODUCTION

Background

The growth and advancement of the American society and economy rely on a workforce strong in the number and skill sets of its citizens. According to the U.S. Department of Labor, less than 10 percent of Americans work in a science, technology, engineering, and mathematics (STEM) field even though these jobs account for approximately half of the country’s economic activity in the world. To be more competitive against top countries such as China and Japan with STEM graduates and workforce, the U.S. began efforts in the early 2000s to address declining numbers of graduates and employees in STEM. Many of these efforts have targeted not only the quantity of individuals in academia and the workforce but also the quality in respect to gender and racial diversity. A low STEM population is indicative of a small pool of graduates throughout the first decade of the twenty-first century. A great deal of research, therefore, has since been invested in exploring the reasons behind this STEM deficit.

Numerous studies have investigated characteristics that students who excel in STEM share. Among the attributes, students’ preparation for and exposure to STEM are important for success (Jackson, 2013; Mcgee & Bentley, 2017; Mitchell, 2011; Palmer, Maramba, & Dancy, 2011; Simon, Aulls, Dedic, Hubbard, & Hall, 2015). However, not all students have the privilege to receive opportunities to learn about STEM. The research addresses means to overcome students’ deficiencies prior to matriculation into a STEM program with the inclusion of relevant activities, remediation, research programs, and better mentoring and advisement (Eagan, Sharkness, Hurtado, Mosqueda, & Chang, 2011; Micari & Pazos, 2012; Sutton & Sankar, 2011). Furthermore, resources available to
STEM students at their institutions are stated as essential for the students’ longevity in a program that includes intrinsic factors such as motivation (Kendricks, Nedunuri, & Anthony, 2013).

Additionally, the literature attributes the experiences that STEM students encounter at various institutions as an integral factor of their steadfastness to their STEM program. For example, research programs that occur throughout the regular school year or during summer internship opportunities aid the faculty in establishing a rapport with students (Jackson, Starobin, & Laanan, 2013; Schwartz, 2012; Sutton & Sankar, 2011). Student engagement with peers, advisors, and faculty shapes students’ attitudes about their sense of being in STEM. Moreover, student interactions with faculty members were documented as widespread as other noted factors in the research regarding students’ persistence (Palmer, Maramba, & Dancy, 2011), among other desired outcomes, in STEM. Aside from persistence, studies measuring retention, attrition, and graduation rates attempt to outline strategies that can be implemented from the institutional level itself to lower levels that comprise the institution (Mau, 2003).

The literature includes many studies on recruitment and retention of minorities in STEM. Women and underrepresented minorities such as the Latino (Cole & Espinoza, 2008) and Black students are expected subjects in these studies. As the shift in the demographics of the American people continues in the twenty-first century, the declining minority representation in STEM seems to be unfortunately present in the literature. Even studies seeking to explore reasons for a low presence of Black males in STEM have informed decisions and policies governing the need for reform in recruitment and retention practices for this particular group (Chang, 2005; Ervin, 2010; Fife & Byars-
Winton, 2011; Hargrave, 2015; Jackson, 2013; Palmer, Maramba, & Dancy, 2011; Sandoval-Lucero, Maes, & Klingsmith, 2014; Woods, McNiff, & Coleman, 2018). Of all the underrepresented minority groups in America, Black males have exhibited the least growth in STEM graduates in relation to their population (Hargrave, 2015; Kendricks, Nedunuri, & Anthony, 2013). Mississippi, one of the poorest and least educated states, ranks high among similar southern territories with Black males showing minimal improvement in STEM in the most recent decade (National Academies of Science, Engineering, and Medicine [NASEM], 2018; National ACT, 2016; National Science Foundation [NSF], 2017).

Research purports that Black students at Historically Black Colleges and Universities (HBCUs) fare better compared to their counterparts at Predominantly White Institutions (PWIs). Suitts (2003) reported higher success and satisfaction rates for Blacks who pursued STEM degrees at HBCUs compared to Blacks at PWIs. Although this minority group is better equipped for success at HBCUs, its fate at community colleges is substantially different (Wood & William, 2013). Because there is minimal research exploring the academic success of Black males at community colleges, especially in the STEM areas, studies seeking to investigate this group’s academic experiences is paramount to fill the void in the literature.

The racial and ethnic minority (REM) population comprises a much smaller percentage of STEM majors in American colleges and universities (Bahr, Jackson, McNaughtan, Oster, & Gross, 2017; Kendricks, Nedunuri, & Anthony, 2013). Therefore, attention to the failures of desired outcomes in STEM for minority groups sustains its immediacy in STEM education research. Previous studies on REM students in STEM
have demonstrated predictive factors that successful students had that resulted in measurable successful desired outcomes such as graduation rates, persistence, and retention in STEM. The literature, however, is not as rich in information regarding the faculty’s role in these desired outcomes.

Existing literature suggests that faculty-student interactions, for example, are critical to whether a student persists in STEM and, especially, for REM students’ persistence in STEM fields. (Jackson, 2013; Mcgee & Bentley, 2017; Mitchell, 2011; Palmer et al., 2011). Much of the research on faculty-student interactions provides examples of studies where both the faculty member and students shared the same gender or racial and ethnic classification. For example, studies have shown that gender could play a role in student achievement as well as the ethnicity of faculty members promoting or hindering student achievement (Dee 2004; Hester, 2011; Prince, 2010). In fact, research conducted using Black faculty and students at HBCUs yielded some of the most prominent findings regarding faculty-student interactions. Although some behaviors the faculty possess that contributed to desired outcomes have been identified, mechanisms outlining specific behaviors have yet been sufficiently addressed in the literature for minority students (Bahr et al., 2017; Kendricks, Nedunuri, & Anthony, 2013).

On the contrary, similar studies on faculty-student interactions conducted at two-year institutions, i.e., community colleges, provide more results about students in general but lack extensive research on racial and ethnic classifications. The few studies on Black males in community colleges focus on teaching strategies faculty use to deliver content and faculty-student interactions (Wood & Turner, 2011). For Black males who, based on Census data, make up 12 percent of the American population and 5 percent of STEM
careers, increasing their presence in STEM fields necessitates a study of this nature (National Science Board Science & Engineering Indicators [NSBSEI], 2018).

Finally, the body of current literature is inundated with qualitative studies (Cox & Orehovec, 2007; Hong & Shull, 2010; Jett, 2013; Palmer, Maramba, & Dancy, 2011; Schwartz, 2012) that add richness to the quality of faculty interactions with students but lacks the generalizability that quantitative studies afford. This study seeks to identify essential aspects of faculty-student interactions that can be applied to a larger group, while yet investigating the quality of these interactions among many Black males.

Statement of the Problem

Faculty interactions with students both internal and external to the classroom have been extensively researched at various institutional levels. Many findings from the studies support the notion that faculty members, especially in STEM, play a significant role in whether students are satisfied and, thus, persist in STEM. However, Black males’ interactions with faculty at community colleges need further exploration. In fact, not many studies in the literature investigate the relationships Black males have with faculty members at community colleges. As for Blacks’ success at HBCUs, many factors including faculty-student interactions have been identified although the specifics surrounding them require further exploration as well. Addressing these issues in a study could aid in increasing the number of Black males in STEM and promotes reformatory practices of retention and recruitment efforts in community colleges. Because community colleges send a significant number of students to four-year colleges and universities, it is expected that persistence and graduation rates in STEM at these institutions would improve.
Purpose Statement

Due to the limited research on faculty interactions with Black males in STEM at community colleges, this study sought to compare the interactions these students formed with STEM faculty at community colleges and HBCUs. Then this study explored which faculty interactions predict high academic achievement in STEM among Blacks males. The similarities in the outcomes could offer insight into areas STEM faculty at community colleges could address to yield higher academic achievement in the Black male population.

Hypotheses

1. There is a statistically significant difference in STEM achievement of Black males between Mississippi community colleges and HBCUs.

2. There is a statistically significant difference in the types of STEM faculty interactions with Black males between Mississippi community colleges and HBCUs.

3. There is a statistically significant relationship between STEM achievement and the types of STEM faculty interactions Black males experience at Mississippi community colleges.

4. There is a statistically significant relationship between STEM achievement and the types of STEM faculty interactions Black males experience at Mississippi HBCUs.

Overview of Theoretical Framework

Several theories have been used to explain student engagement in college. However, the theoretical frameworks that best provide the foundation on which this study
rests are Chickering and Reisser’s Student Development Theory (Chickering & Reisser, 1993) and Astin’s Student Involvement and Student Development (Astin, 1993). Collectively, these theories explain how the experiences students have in college can affect desired outcomes such as academic achievement. In other words, student engagement is important to student achievement.

Chickering and Reisser (1993) use seven vectors to explain how students develop their identity during their time in college. The seven vectors are developing competence, managing emotions, moving through autonomy toward interdependence, developing mature interpersonal relationships, establishing identity, developing purpose, and developing integrity. Each vector or task has to be resolved to achieve identity; however, students may undergo multiple vectors simultaneously rather than experiencing each in a successive manner.

Astin’s Student Development Theory or the inputs-environment-outcomes (I-E-O) model connects the qualities students have prior to college to the educational experiences they endure while in college to student achievement in the forms of grades and satisfaction among other factors. In this study, the students’ environments directly affect their outcomes; thus, for this study, the students’ interactions with STEM faculty will be explored in regard to their academic achievement as reported from their STEM Grade Point Averages (GPAs).

Delimitations

This study was delimited to Black males in Mississippi who were enrolled in a Mississippi public community college or an HBCU as a freshman or sophomore student. Also, it was delimited to students whose institutions agreed to participate in this study.
Justification

Studies indicate that exploring faculty-student interactions would be beneficial to understanding what factors deter Black males from persisting in STEM while in college (Christe, 2013; Mitchell, 2011). This study seeks to identify whether significant differences exist between interactions STEM faculty have with Black males at community colleges and HBCUs. Also, its intention is to determine if aspects of faculty-student interactions between the studied groups correlate with student achievement in regard to their STEM grade point average. If there are certain interactions that are linked to higher GPAs; then attention in future studies can be directed at investigating each aspect further to deduce causality.

Black males who attend Mississippi community colleges and HBCUs share similarities. According to Lee (2001), the main reasons Black males in Mississippi attend community colleges are due to their “affordability, funding availabilities, location convenience, accessibility for programs of study, and reputation of institution.” Mississippi community colleges have tuition costs that are almost half the tuition of Mississippi public HBCUs, but community colleges award more financial aid such as Pell Grants than HBCUs. Mississippi community colleges are known for their low tuition costs, which often attract students with academic abilities similar to students who attend four-year institutions after graduating high school.

Although Wood & Turner (2011) advise researchers to not assume that Black males have similar experiences at different institutions, the nature of community colleges and HBCUs in Mississippi provide some flexibility in comparing these males in this study. The caution that Wood & Turner (2011) provide in their study comes from a study
Flowers (2006) conducted where he examined Black males at two-year and four-year institutions. Flowers (2006) concluded that Black males had “lower social integration” at community colleges than four-year institutions and were “less likely to engage in campus and extracurricular activities.” In a study by Scaggs (2004), she found having fewer extracurricular activities on campus to be a major finding in her research that investigated poor retention of Black males in Mississippi community colleges. Taking into consideration Scaggs’ and Flowers’ findings, one could imply that Black males at Mississippi community colleges may be less engaged not due to their own inability to integrate socially but by not being afforded the same opportunities to become involved on campus as the Black males at Mississippi HBCUs. For this reason, comparing Black males at Mississippi community colleges and HBCUs may be more appropriate than comparing these males at these institutions in other states.

Additionally, Mississippi HBCUs, unlike other four-year institutions, have similar open admissions policies that community colleges in the state have. Both types of Mississippi institutions have orientation and remedial courses, programs, or services designed to prepare students who lack the adequate academic skills for college to have a better chance of being successful (e.g., earning a degree) in college. Social integration could differ between four-year institutions such as PWIs and HBCUs, thus making it reasonable for this study to compare Black males from HBCUs and community colleges to each other. Furthermore, this study is unique in comparing Black males in STEM opposed to Black males of diverse majors.

Aside from their race and gender, these individuals often lack proper preparation for college (not necessarily self-induced) and may have endured hardships that members
of the same race and culture often face. Excluding these factors, one major factor that affects the achievement, retention, and persistence of Black males in STEM is how they interact with their peers and faculty in college. Only a small number of studies about faculty-student interactions at community colleges exist, but regarding Black males at these institutions, the studies are even fewer (Perna et al., 2009). Therefore, this study is unique in its aim to compare how STEM faculty engages with this minority group at these colleges. Because community colleges serve students for the first two years of an undergraduate degree, it is proper to compare freshmen and sophomore students from each institution. Black males also make up a large portion of the population of students from community colleges who transfer to four-year institutions. Last, research supports this group being studied due to higher STEM attrition during the first two years of college than the latter two years.

Assumptions

An assumption of this study was that participants were currently enrolled full-time either at a community college or an HBCU in Mississippi. Furthermore, the participants’ honesty in reporting their STEM grade point averages (GPA) and responses to items on the questionnaire were also assumed. Finally, the Student-Professor Interaction Scale (SPIS) instrument was assumed to adequately measure the quality of faculty-student interactions the participants encountered.

Definition of Terms

The following definitions are to terms used in this study:
• Desired outcomes - factors used to measure effectiveness of an experience; attrition, retention, student achievement, graduation rates, persistence, and self-concept are examples (McClenny, Marti, & Adkins, 2012)

• Faculty-student interactions - encounters where faculty members can engage with students through academics, advisement, and research (National Survey of Student Engagement, 2019)

• Racial and ethnic minorities – include African-Americans, American Indians and Alaska Natives, Hispanics, and Asian and Pacific Islanders (Population Reference Bureau, 2018)
CHAPTER II – REVIEW OF RELATED LITERATURE

Introduction

Within the last few decades, the U.S. among other countries has steadily encouraged its citizens to pursue careers in STEM. Since the beginning of the last century, jobs in this country have transitioned from the factory-based jobs that provided a reliable income for Baby Boomers to careers that require more STEM-related education and training. As the STEM field increases in the number of job opportunities, there appears to be a decline or steady rate of graduates, with STEM degrees in some regions in America. Due to the urgency of this situation, several politicians and even former President Obama made rising STEM numbers a goal for this country (Holdren, 2013). To respond to governmental involvement will require colleges and universities to address issues that underlie the shortage of quality STEM graduates. Aside from reasons such as pre-college preparation and socioeconomic status that institutions of higher learning cannot remedy, post-secondary institutions have to examine their practices on each level of operation to discern which reforms could be most beneficial to the retention, persistence, and achievement of STEM students (Christe, 2013; Graham, Frederick, Byars-Winston, Hunter, & Handelsman, 2013; Mitchell, 2011). Furthermore, once students attain STEM degrees, attention must be placed on job placement even though the number of jobs is expected to increase in future years.

Studies that explore factors that result in an increase or decrease in students pursuing a STEM field are of most significance to STEM education (Weaver, Garcia, & Broussard, 2015). In order to meet the economic demands of a thriving society, secondary and post-secondary entities have created opportunities for STEM to be
incorporated in curricula even beginning with elementary-aged students (Palmer, Maramba, & Dancy, 2011). Although STEM courses have become increasingly common in schools, limited access to research programs and highly trained teachers have caused disparities in STEM knowledge among various racial and ethnic groups (Eagan et al., 2011; Jackson, 2013; Mcgee & Bentley, 2017; Palmer, Maramba, & Dancy, 2011; Simon et al., 2015).

Diversity in STEM

While growth among all minorities is evident in recent years, white males continue to lead the U.S. in high performance in STEM areas (Mcgee & Bentley, 2017). Black males show the least improvement (Hargrave, 2015; Kendricks, Nedunuri, & Anthony, 2013). Overall, the literature has shown that regardless of racial and ethnic differences, certain factors such as preparation for and exposure to STEM early in life and interactions with peers and faculty can promote success in STEM achievement (Jackson, 2013; Mcgee & Bentley, 2017; Mitchell, 2011; Palmer, Maramba, & Dancy, 2011; Simon et al., 2015). Seemingly, any factor could be deemed positive or negative in regard to its execution. Among the factors mentioned in the literature, the relationships students form with faculty at their institutions have been documented as significant to how students perform in STEM (Christe, 2013; Hargrave, 2015; Micari & Pazos, 2012; Wang, BrckaLorenz, & Chiang, 2015). A review of the current literature conducted by Christe (2013) highlighted the importance of faculty-student connections in STEM. The study stated that high performing students leave STEM as often as low performers; to address student retention would involve promoting an academic culture that nurtures and supports the student. This would be particularly beneficial for minorities such as Black
males who tend to achieve at greater rates when they are engaged with their peers, the
subject matter, and their faculty (Ervin, 2010). Schwartz (2012) conducted a study
exploring effective faculty-student undergraduate relationships in STEM. The study took
place at a Black-Serving Institution that was formally not designated as an HBCU, with a
population comprising 85% students of color. Semi-structured interviews, written
surveys, and member checking were employed to examine relationships students formed
with faculty mentors over a two-year period. All students benefited from their
experiences with faculty members; they remained in college either at the institution
studied or a nearby college to attain a STEM degree and planned to pursue graduate
studies in STEM. Unfortunately, the faculty mentors struggled with performing their
duties as tenured faculty members and researchers while taking on student mentees. The
study reports faculty who decided to no longer accept students after the two-year cycle
ended while only one agreed to continue his role as a mentor. Schwartz (2012) offered
recommendations to assist institutions with retaining faculty members as research
mentors for students of color. For example, a few institutions were decreasing teaching
load for faculty who participate as mentors, re-evaluating tenure and promotion
guidelines to provide incentives for mentors, and encouraging graduate assistants and
postdoctoral students to assist faculty with student mentees. It appears community
colleges and four-year institutions with a high population of minorities would most
benefit from the findings of this study. Other factors may need to be addressed to sustain
students of color, and this issue deserves additional reflection (Schwartz, 2012).
Faculty Characteristics and Interactions on Student Desired Outcomes

Faculty characteristics and personality traits have been observed in numerous studies to determine how they influence desired outcomes. Some studies have found correlations between faculty who create positive experiences for students with student persistence, retention, and achievement in STEM. Faculty who create meaningful activities (Palmer, Maramba, & Dancy, 2011; Simon et al., 2015) within their lectures excite and engage students. Instructors who are inviting and personable to students engage students inside and outside of class appeal to the students’ emotions, which assists in their confidence or self-identity in STEM (Allen et al., 2013; Ervin, 2010; Mitchell, 2011; Sandoval-Lucero, Maes, & Klingsmith, 2014). Micari & Pazos (2012) conducted a study surveying 113 undergraduates in six organic chemistry courses to investigate the role of faculty-student relationships in a highly challenging classroom setting. Researchers used regression analyses to identify predictors of grade, confidence, and science identity based on these relationships. Students who looked up to their professors, felt comfortable approaching them, and who felt their professors respected them showed a correlation to positive student outcomes although science identity did not show any significance. In a related study, Hargrave (2015) applied Pearson’s correlation and hierarchical multiple regression to determine if a significant relationship existed between faculty-student interactions with Black male high school students’ and their academic self-concept. The interactions were measured using the Student-Professor Interaction Scale (Cokley et al., 2004b), and academic self-concept was measured using the Academic Self-Concept Scale (Reynolds, Ramirez, Magrina, & Allen, 1980). Of the
interactions measured, negative experiences and accessibility were significant in predicting academic self-concept with this group.

Faculty-student interactions, often referred to as teacher-student interactions, have been studied since the 1970s (Firestone & Brody, 1975; Rubovits & Maehr, 1973; Weinstein & Middlestadt, 1979). These studies have explored many facets of students’ experiences with their teachers. A link to desired outcomes is apparent in much of the literature. For instance, Weinstein & Middlestadt (1979) claimed in their study that there was a significant relationship to the academic achievement of elementary-aged boys in California. Basch (2011) reported specifically that the quality of interactions is the key to the academic outcome. While frequency of interactions was one of the most measured constructs of faculty-student interactions, currently, exploring quality of interactions has become prevalent in current studies (Cokley et al., 2004a). Although faculty-student interactions differ based on the race and ethnicities of the faculty and students, most studies purport that Black students have poorer experiences, not necessarily outcomes, than White students (Irvine, 1986; Huges & Kwok, 2007; Rubovits & Maehr, 1973). Last, studies indicate greater measurable gains in achievement after faculty-student interactions were modified to address the weaknesses of the relationships (Boykin & Noguera, 2012; Dobransky & Frymier, 2004)

Many studies focus on interactions that students in kindergarten through twelfth grade (K-12) have with their teachers (Furrer & Skinner, 2003; Irvine, 1986; Roorda, Koomen, Spilt, & Oort, 2011). The instruments used to measure outcomes from interactions were best suited to evaluate the efforts of a single teacher, which makes an instrument such as the Questionnaire on Teacher-Student Interaction not adequate for
secondary and post-secondary students. Furthermore, existing studies often express the views of the teachers regarding their encounters with students (Huges & Kwok, 2007; Irvine, 1986), which omits a critical perspective of faculty-student interactions that could be valuable in reforming educational practices.

Of the two common types of interactions, informal interactions with faculty have been reported to be more influential on students in regard to their persistence and academic achievement (Endo & Harpel, 1982). Students who view faculty as empathetic, nurturing, and inviting tend to interact more with faculty outside of the class. Formal interactions have importance in the success of students; however, compared to informal interactions, they could force relationships with students that may generally be neutral or negative (Boykin & Noguera, 2012; Murray & Malmgren, 2005). Students are more likely to approach an instructor to discuss grades than to question him about his interests in music. Positive experiences in either form can enhance a student’s ability to communicate to his instructor misconceptions or concerns the student has with the course content. In fact, college students favor a relationship with their instructor over a non-existent one (Sanchez, Martinez-Pecino, Rodriguez, & Melero, 2011). On the contrary, research has shown that college students typically have little to no interaction with their faculty, especially during the first two years of college (Cotton & Wilson, 2006; Fusani, 1994; Keup, 2007).

The influence of faculty demographics and dispositions has both been discussed in the literature, however, with mixed outcomes. According to Wang, BrckaLorenz, and Chiang (2015), faculty demographics matter in how faculty interact with students, which if positive, can benefit students regarding engagement and success. In a related study of
faculty characteristics, the gender of faculty members mediated by the student perception of faculty validation was useful in predicting academic success (Hester, 2011). The same study claimed ethnicity of both student and faculty had a direct effect on success. According to Hester (2011), students enrolled in courses taught by White instructors had higher achievement than did students enrolled in courses with faculty of color as instructors. Similar gender studies involving faculty-student interactions indicated that no difference existed in degree attainment with female students enrolled in courses taught by female faculty (Canes & Rosen, 1995; Hoffman & Oreopoulus, 2009; Prince, 2010) while a positive correlation was seen in other studies (Robst, Keil, & Rosso, 1998; Rothstein, 1995). As for studies researching faculty interactions with students of the same race or ethnicities, the majority claimed higher achievement in terms of test gains for Blacks (Ehrenberg & Brewer, 1995) and higher retention and persistence for multiple students of color (Cole & Espinoza, 2008; Fries-Britt, Younger, & Hall, 2010; Prince, 2010; Saenz, Hoi, & Hurtado, 2007). In some cases, no effect was seen in achievement of the same-race peers and faculty (Ehrenberg, Goldhaber, & Brewer, 1995).

Black Males at Four-Year Institutions

Black males are poorly retained in higher education. A few who begin college actually complete a degree within a six-year timeframe. Fewer of these males complete a bachelor’s degree in the standard four years (National Center for Education Statistics, 2017). Problems with retention do not initiate in higher education, however. Issues begin in elementary and middle school and worsen as Black males enter high school (Jones, 2001). Inadequate preparation for college courses due to parental involvement and motivation from teachers and peers has been presented in the literature (Strayhorn, 2008).
When enrolled in colleges or universities, institutional support systems are vital to Black males’ persistence. Especially at PWIs, Black males could sense racial undertones and may fall victim to faculty’s prejudices and stereotypes.

Disengagement in academics has been researched extensively. Comparative studies attempt to understand the reasons behind the lack of involvement Black males have in college (Harper & Quaye, 2009; Roach, 2001). According to Harper (2009), Black males are most disengaged on college campuses than females and White males, predominantly at PWIs. At one time having a higher level of engagement compared to Black females, Black males are less involved in campus and classroom activities, and they show disinterest in leadership on campus (Roach, 2001). The highest level of engagement for Black males based on National Survey for Student Engagement (NSSE) data is rooted in sports and fitness. Black males appear more engaged in extracurricular activities such as athletics and exercising in the campus gym rather than studying, reading, and preparing for class (Harper et al., 2004).

A sense of belonging to the institution correlated with engagement and persistence in college for Black males (Bensimon, 2005; Harper, 2009; Strayhorn, 2008). Specifically, interaction with peers who differ in their race and ethnicity was cited as significant for them. Poor-achieving Black males at PWIs felt distant from other Blacks who excel academically, which furthered a gap within this population and the institution. However, there are studies that report factors that contribute to the success of Black males in higher education (Hamilton, 2005; Strayhorn, 2008). Faculty relationships, institutional support systems via mentorships, and supportive administration and campus environment were cited as crucial for their success. Strayhorn
(2008) used the College Student Experiences Questionnaire (CSEQ) to measure success of 231 Black males using quantitative methods. His findings indicated a connection between supportive faculty, staff, and peers and the academic achievement and satisfaction Black males attained in a college setting.

Black Males at Two-Year Institutions

Completion of two-year degrees is also difficult for some Black males at community colleges. Scaggs (2004) conducted a study investigating the low retention of Black males at Mississippi community colleges in hopes of identifying best practices for increasing retention of these males at community colleges in the state. She used data from the statewide system that reports graduation rates, and she ranked the colleges based on the graduation rates of Black males. Later, the highest three community colleges were surveyed and interviewed in the qualitative phase of her study. College administrators from the top three colleges were asked to give their perception of the institutional policies and services that affect the retention of Black males at their respective college. Triangulation methods involving qualitative strategies such as categorizing and contextualizing strategies were used to add more support to the researcher’s design. Scaggs (2004) concluded that “student development, services for at-risk students, course placement testing, and extracurricular activities” were programs or services the top three community colleges that produced the most Black male graduates had in common.

Because studies on the academic success of Black males in community colleges are limited, Wood & Turner (2011) conducted a qualitative study that identified aspects of interactions that Black males at a community college shared with faculty who created a nurturing environment for the students. Twenty-eight participants were interviewed in a
semi-structured approach. Concept mapping was also used to help guide the line of questioning during the interviews. Wood & Turner (2011) concluded that Black males found faculty who were friendly during the students’ initial encounter with them to appear caring. This trait was also heightened by faculty members’ monitoring the students’ progress in class. The Black males perceived the faculty as even friendlier and easily approachable when faculty took an interest in their well-being. Furthermore, the students appreciated faculty who accommodated them during times when they needed, for example, additional time to complete work. The Black males enjoyed faculty members who were “attentive to their needs” (Wood & Turner, 2011). Last, the students had a positive experience when interacting with faculty who encouraged them to succeed. The students perceived the “push” from faculty as supportive and influential to their success in class.

Males in STEM

Males fare worse than women in academics in secondary and post-secondary settings (Ewert, 2012). The number of hours studying had no effect in GPA in a study by Brunborg, Palesen, Diseth, & Larsen (2010), thus the quality of studying appears insignificant to academic achievement. Research is limited on why males perform poorer, but researchers propose exploring non-cognitive factors not associated with academics. Class attendance could explain low academic achievement, persistence, and graduation rates (Ewert, 2012; Marrs & Sigler, 2012). According to College Board (2012), less than 10% of males earn a STEM degree out of the 33% who declare a STEM major. The literature indicates economic and social issues may explain this statistic (Dennis et al., 2005; Laureau, 2002). Regardless of ethnicity, parents who are more educated are more
likely to possess and understanding of the rigors of academia to support their children in high school and college. The socioeconomic status of a family showed a correlation with attending and completing college in a study by Marsiglio, Amato, Day, & Lamb (2000). For instance, the income of the father strongly correlated with the GPA and college preparedness of the father’s child.

Black Males in STEM at HBCUs

For Black males, the literature includes comparative studies between males at different institutions. Particularly at HBCUs, Black males tend to make greater advances in STEM than the same group does at other institutions such as PWIs (Jackson, 2013; Jett, 2013; Kendricks, Nedunuri, & Anthony, 2013; NASEM, 2018; Suits, 2013; Toldson, 2018). The National Science Foundation stated in its Science and Engineering Indicators Report in 2010 that a third of Black science and engineering doctorates were HBCU graduates. In terms of only baccalaureate degrees, HBCUs award about as many degrees in science and engineering as non-HBCU institutions. Present studies on faculty interactions at HBCUs have focused on advisement and undergraduate research. Many of those studies report that students who are able to work closely with a faculty member have better access to resources and opportunities for mentorship than those who do not work closely with faculty members (Eagan et al., 2011). In the study of Kendricks, Nedunuri, & Anthony, 2013, researchers discussed the outcomes of the Benjamin Banneker Scholars Program (BBSP), an undergraduate program that provided mentoring to STEM students at an HBCU. Correlation analyses showed a strong association between academic success of student participants and degree achievement to mentoring as a positive experience in the students’ learning. A void in the literature, nonetheless,
lies in comparing faculty interactions with students at different institutions to determine what role the institutional makeup has on student outcomes (Cokley et al., 2006; Wang, BrckaLorenz, & Chiang, 2015). It would be especially beneficial to seek more understanding of the interactions Black males have with faculty at HBCUs and compare them to the relationships they form with faculty at other institutions that might prove valuable to the success of this minority group in STEM.

Black Males in STEM at Community Colleges

Community colleges are two-year institutions that offer promise for increasing the number of Black males graduating in STEM who can then matriculate to four-year colleges and universities (Bahr et al., 2017). Community college studies focus heavily on transferring students to universities where STEM education can be further pursued (Hirst et. al., 2014; Leggett-Robinson, 2015; Strawn, 2012), and a few of these studies often listed advisement (Museus & Ravello, 2010; Packard & Jeffers, 2013) as an area of interest for additional investigation. Both community colleges and HBCUs serve a large number of minority students in STEM areas (Perna et al., 2009), some of whom later attend institutions that award them STEM baccalaureate degrees. Unfortunately, Black males tend to not be as successful at community colleges as they are at HBCUs (Knapp, Kelly-Reid, & Ginder, 2012; Wood & William, 2013). Therefore, research could address the various institutional characteristics including faculty interactions in STEM between the two entities. The fate of minorities as a group has been better documented in the literature; many studies indicate that regular faculty interactions were significant to baccalaureate degree completion in STEM majors (Sandoval-Lucero, Maes, & Klingsmith, 2014). The experiences of Black females have been studied to note
successful attributes of this group in their transfer to HBCUs (Jackson, 2013). Jackson
(2013) used photovoice action research methods to record the experiences of Black
female STEM students at an HBCU who transferred from a community college. The
participants were interviewed in a semi-structured manner as well as had their
experiences collected via photographs. Findings of the study indicated that HBCUs
equipped students with decision-making skills regarding their academic and career paths.
Several students expressed the consistent relay of information among the community
college and HBCU that helped to promote their success as well. Also, the female
participants seemed motivated to persist in STEM after learning about the nurturing and
caring aspects of the field (Jackson, 2013). Unfortunately, there is currently limited
research about faculty interactions in STEM concerning Black males at community
colleges (Ervin, 2010; Palmer & Wood, 2013).

Conceptual Framework

Chickering & Reisser (1993) use seven vectors to explain how students develop
their identity during their time in college. Arthur Chickering first published his theory in
1969, and Chickering and Linda Reisser revised the theory in 1993 to account for the
latest findings since 1969. Based on Figure 1, students initially develop competence
through situations that require intellectual, task-oriented, and interpersonal abilities.
Students use their minds to think analytically and holistically about a concept sufficiently
to form a view to deal with the concept and related situations in life. They also rely on
their athleticism, creativity, listening skills, and forms of communications to develop
competence.
Students then develop the ability to manage their emotions and create a sense of self-control. This vector is important to prevent students’ emotional responses to circumstances from overwhelming their ability to continue in their education. The third vector is movement through autonomy toward interdependence, which claims that students transition from dependence on others to dependence on themselves. Emotional and instrumental independence are necessary for this transition. According to Chickering & Reisser (1993), “emotional independence occurs when there is a separation from a support group” while instrumental independence happens “once students are able to organize activities and learn how to solve problems on their own.” Developing mature interpersonal relationships is the fourth vector; students grow to acknowledge and accept others’ differences while building relationships that are valuable to their well-being. Essential aspects of this vector consist of tolerance of differences both interculturally and interpersonally and capacity for intimacy (Chickering & Reisser, 1993).

Next, students establish their identities and recognizes how others view them and how they perceive themselves. Students’ finding comfort with their appearance, establishing a sense of self in various contexts such as social and cultural, and having acceptance of themselves are incorporated in this vector. College students develop purpose for the sixth vector. They find value in their degree and discover ways their college experiences fulfill their purpose. Finally, integrity is established as students challenge practices possessed earlier in college that may conflict with their own beliefs. In this vector, as students think about others’ beliefs and perspectives, they have to maintain respect of their own views and behaviors (Chickering & Reisser, 1993).
Figure 1. Student Development Theory (Chickering & Reisser, 1993)

Astin’s Student Development Theory uses the Input-Environment-Output (I-E-O model) to explain how student involvement and development at their institutions and with faculty and peers can influence desired outcomes. The I-E-O model includes three constructs: inputs, environments, and outputs and is significant in its kind to address outcomes for students at institutions of higher learning. As it shows in Figure 2, the students’ inputs influence their environment, which influences their outputs. In other words, the experiences students bring with them to college play a role in how they develop in college. Likewise, the interactions with peers and faculty and co-curricular activities students encounter during their time in college affect the knowledge, beliefs, and values with which they leave college.
Examples of inputs consist of gender, pre-college preparedness, parental involvement, and socioeconomic status. These qualities “refer to those personal qualities the student brings initially to the education program” (Astin, 1993). Encounters with peers, faculty, administration, and other institutional representatives are a part of the students’ environment. Additionally, the students’ involvement inside and outside of the classroom setting via lecture discussions, clubs and organizations become their environment. Environments “refer to the student’s actual experiences during the educational program” (Astin, 1993). The result of students’ environments produces their outputs. For instance, the college degree, GPA, and other forms of academic achievement are the products of the students’ experiences in college. According to Astin (1993), outputs are the “talents we are trying to develop in our educational program.”
CHAPTER III  – METHODOLOGY

Introduction

The purpose of this study was to compare faculty-student interactions Black males experience at community colleges and HBCUs. This chapter describes the research design, participants, instrument, procedure, and data analysis.

Research Design

A quantitative survey design was used to address the research hypotheses. The Student-Professor Interaction Scale (SPIS) was used to compare faculty-student interactions of Black males at community colleges and HBCUs. The students’ self-reported STEM GPA was the basis of their academic achievement for this study. A category list of STEM courses offered at Mississippi community colleges and HBCUs was included in the questionnaire. Students selected if they earned an A, B, C, D, or F for each course taken during their first two years in college. Their STEM GPA was then calculated using SPSS software.

Participants

The goal of this study was to acquire data to make comparisons between faculty-student interactions that Black males at a community college and an HBCU in Mississippi experience. Likewise, because community colleges are two-year institutions, only freshmen and sophomore students at both institutions were asked to participate in this study. Contact was made to the representatives in each institution’s research department to invite participants to complete an emailed questionnaire during the Spring 2019 semester. All participants were at minimum 18 years of age; thus, no parental consent was necessary.
Instrumentation

The Student-Professor Interaction Scale (SPIS) instrument, one of the widely used instruments in studies on faculty-student interactions (Cokley et al., 2006; Hargrave, 2015; Mitchell, 2011), is framed after the works of Chickering & Reisser (1993). This instrument has questions grouped into nine subscales: caring attitude, off-campus interactions, career guidance, connectedness, approachability, accessibility, respectful interactions, negative experiences, and validity scale. The caring attitude subscale evaluates how faculty show care and support their students. The off-campus interactions subscale measures the meaningfulness of out-of-class experiences. The career guidance subscale assesses the faculty’s advisement in regard to professional school and career options. The connectedness subscale determines how relatable faculty members are to students. The approachability subscale measures the comfort students have approaching faculty to discuss grades and ask questions. The accessibility subscale ascertains how available students feel faculty members were to them outside of class. The respectful interactions subscale evaluates the level of respect the students can sense from their encounters with faculty members. The negative experiences subscale assesses aspects of negative interactions students have experienced. The validity scale, unlike the other subscales, determines “the validity of the SPIS scores by assessing whether student-professor interactions are important to the student” (Cokley et al., 2006).

SPIS by Cokley et al. (2006) was used to collect data to address the research hypotheses (Appendix A). Permission has been received to use this instrument for this study (Appendix B). This survey instrument is a 40-item questionnaire that has been validated repeatedly in numerous studies (Cokley et al., 2006). It has a seven-point Likert
scale from which participants will choose strongly agree (7), agree (6), somewhat agree (5), neither agree nor disagree (4), somewhat disagree (3), disagree (2), and strongly disagree (1). Questions used to access the quality of the faculty-student interactions are found in the survey instrument (Appendix A).

SPIS examines the quality of faculty interactions in colleges and universities rather than the quantity or frequency of those interactions and differs from scales such as the College Student Experiences Questionnaire (CSEQ) Experiences with Faculty and Relationship with Faculty. SPIS has been used in many studies involving Black males in STEM and has impressive Cronbach’s alphas for each subscale (Cokley et al., 2006). Cronbach’s alpha is a measure of internal consistency (i.e., reliability) of an instrument in which higher coefficients indicate higher strengths of consistency for a concept measured in a longer-length questionnaire of related items (Tavakol & Dennick, 2011). Reliability of each subscale was checked from the many studies conducted using this survey instrument (Cokley et al., 2006). Cronbach’s alphas for the nine subscales assisted in determining internal consistency of the questionnaire. Reliability coefficients for each subscale are as follows: caring attitude (α=.87); off-campus interactions (α=.73); career guidance (α=.87); connectedness (α=.83); approachability (α=.82); accessibility (α=.85); respectful interactions (α=.87); negative experiences (α=.85); and validity scale (α=.75) (Cokley et al., 2006). SPIS measures what it intends to measure (Fraenkel & Wallen, 2009) and establishes a content domain (Cokley et al., 2006) as SPIS has been used to identify qualitative aspects behind faculty-student interactions of participants of varying demographics.
Cokley et al. (2006) created SPIS for a study to measure various dimensions of faculty-student interactions. Three-hundred and eighteen students of diverse racial and ethnic backgrounds were surveyed. Findings indicated that academic motivation and academic self-concept were related to interactions for White participants while participants of color related to academic self-concept. Cokley suggested that this instrument is useful in the assessment of how students view their encounters with their instructors. He stated that more studies should include White and ethnic students to make future study findings more reliable and generalizable (Cokley et al., 2004). Another of Cokley’s studies surveyed 290 psychology students ranging from freshmen to graduate students and included with different racial and ethnic backgrounds. He and his colleagues sought to assess the quality of faculty-student interactions at a large Midwestern university. Ethnic differences were assessed that resulted in no significant differences for the eight of the subscales. There was a significant difference on the Respectful Interactions subscale with White students having more respectful interactions with their instructors than Blacks had with their instructors. Furthermore, GPA was significantly correlated with the Approachability and Caring Attitude subscales for Blacks while Whites did not significantly correlate with any of the subscales. Cokley et. al. (2006) suggested that further studies should explore different types of institutions and whether the quality of faculty-student interactions differ based on specific institutional characteristics. Much of the future implications from these studies support the exploration of faculty interactions with Black males in STEM at community colleges and HBCUs.
Procedure

The researcher requested approval of the Institutional Review Board (IRB) at The University of Southern Mississippi. Once approval was granted (Appendix C), the researcher contacted the institutional researchers at a Mississippi community college and an HBCU to recruit Black males classified as freshmen and sophomores during the semester the study is conducted. Each student was emailed a link to a page outlining the purpose of the study and other pertinent information such as the time expectancy to complete the questionnaire, the researcher’s contact information, a statement of the USM IRB approval and a statement about his involvement in the study being voluntary and the ability to cease completion of the survey based on the participant’s discretion. This informed consent was documented on the standard consent form that USM IRB provided. Although the questionnaire should have taken participants no longer than twenty minutes to complete, students were informed that the questionnaire was not timed and that they were encouraged to complete it at their own pace. Their responses were recorded in the Qualtrics online survey tool with password-protected security. No personally identifying information such as name or specific college or university name was asked. Nonetheless, due to the nature of the study, identifying the type of institution which they attend was necessary to make comparisons between the participants’ interactions with STEM faculty.

Data analysis

After receiving completed questionnaires through the Qualtrics survey tool, the data were downloaded and analyzed using SPSS software. The first statistical test that was conducted on the data addresses the first two research hypotheses:
1. There is a statistically significant difference in STEM achievement of Black males between Mississippi community colleges and HBCUs.

2. There is a statistically significant difference in the types of STEM faculty interactions with Black males between Mississippi community colleges and HBCUs.

Logistic regression was used to describe and explain the relationships between multiple independent variables and their prediction on a binary dependent variable (Creswell, 2005; Field, 2009). The independent variables were the students’ academic achievement and each subscale in the instrument while the type of institutions (Mississippi community college and HBCU) was the dependent variable.

The second statistical test that was conducted on the data addresses the final two research hypotheses:

1. There is a statistically significant relationship between STEM achievement and the types of STEM faculty interactions Black males experience at Mississippi community colleges.

2. There is a statistically significant relationship between STEM achievement and the types of STEM faculty interactions Black males experience at Mississippi HBCUs.

To identify the best set of predictor variables, multiple regression analyses were used to show the relationship between the participants’ interactions with STEM faculty and their academic achievement. Numerous studies seeking to identify relationships involving faculty-student interactions and student desired outcomes have used regression analyses to suggest predictors for a particular concept (Cokley et al., 2006; Hargrave,
2015; Micari & Pazos, 2012). All of the subscales were independent variables to the students’ STEM achievement, the dependent variable. Two analyses were run for each type of institution involved in the study; then the results were compared to determine which predictors of the faculty-student interactions correlate best with high achievement in STEM for Black males.
CHAPTER IV – RESULTS

Introduction

The purpose of this study was to compare faculty-student interactions that Black males experience at community colleges and HBCUs. A total of 115 Black males were surveyed. Fifty-nine were enrolled in a Mississippi community college while fifty-six were students from an HBCU in Mississippi. Data collected from the survey questionnaires were analyzed in binary logistic and linear multiple regression analyses to identify predictors that attribute to higher STEM GPAs during the males’ first two years of college.

Logistic Regression Analysis

A logistic regression analysis was run to test for predictors of faculty-student interactions and STEM GPA for institution types. The Omnibus Tests of Model Coefficients indicate that this model provides a statistically significant improvement over the constant-only model ($\chi^2 [10, N = 115] = 28.700, p = .001$). Additionally, the Nagelkerke $R^2$ indicated that the model accounted for 29.5% of the total variance, suggesting that this set of predictors could be effective in discriminating between institution types. The Hosmer and Lemeshow Test assesses the viability of our model, and it indicates that the predictors in our model accurately predict the actual probabilities because it did not yield a significant value.

The classification table displayed as Table 1 shows that our model has an overall prediction success rate of 67.8%, with a correct prediction rate for Black males who attend HBCUs at 69.6% and Black males who attend community colleges at 66.1%.
These results further indicate the viability of our model, as this overall prediction rate is above the prediction rate of the constant model (51.3%).

Table 1 *Classification Table*

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted</th>
</tr>
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<tbody>
<tr>
<td>INS_TYPE</td>
<td>Community</td>
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<tr>
<td>HBCU</td>
<td>39</td>
</tr>
<tr>
<td>Community College</td>
<td>20</td>
</tr>
</tbody>
</table>

| Overall Percentage | 67.8 |

a. The cut value is .500

Table 2 shows the regression coefficients (B), significance level (p), and odd ratio (Exp[B]) for each of the factors. Three of the ten predictors are statistically significant for institution types: off-campus interactions, career guidance, and STEM GPA (p < .05). For a single point increase in off-campus interactions, there is a .459 times less likelihood that the Black males attended the community college, thus a greater chance they attended the HBCU. A single point increase in career guidance suggests a 1.866 times greater likelihood the Black males attended the community college. Finally, a single increase in STEM GPA claims a .549 times less likelihood that the Black males attended the community college, thus a greater chance they attended the HBCU.
Table 2 Variables in the Equation

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Sig.</th>
<th>Exp(B)</th>
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<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caring attitude</td>
<td>.154</td>
<td>.358</td>
<td>.667</td>
<td>1.167</td>
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<tr>
<td>Off-campus interactions</td>
<td>-.779</td>
<td>.210</td>
<td>.000</td>
<td>.459</td>
</tr>
<tr>
<td>Career guidance</td>
<td>.624</td>
<td>.316</td>
<td>.048</td>
<td>1.866</td>
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<tr>
<td>Connectedness</td>
<td>-.258</td>
<td>.288</td>
<td>.370</td>
<td>.772</td>
</tr>
<tr>
<td>Approachability</td>
<td>.142</td>
<td>.369</td>
<td>.702</td>
<td>1.152</td>
</tr>
<tr>
<td>Accessibility</td>
<td>.372</td>
<td>.385</td>
<td>.334</td>
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<tr>
<td>Respectful interactions</td>
<td>.301</td>
<td>.469</td>
<td>.521</td>
<td>1.351</td>
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<tr>
<td>Negative experiences</td>
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<td>.166</td>
<td>.812</td>
<td>1.040</td>
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<td>Validity scale</td>
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<td>.957</td>
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<td><strong>STEM GPA</strong></td>
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<td>.549</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>-2.058</td>
<td>3.181</td>
<td>.518</td>
<td>.128</td>
</tr>
</tbody>
</table>

Multiple Regression Analyses

Multiple regression tests were run for each institution type. Each analysis tested for predictors from faculty interactions that correlated with STEM GPA. The regression equations for each institution type were insignificant. For the HBCU institution type, $R^2 = .067$, adjusted $R^2 = -.116$, $F(9, 46) = 0.365, p=.946$. A negative variance suggests that there were a great deal of non-significant predictors involved in my model that inflated $R^2$, which makes the model not fit the data and have no predictive value (Field, 2009). Besides increasing the sample size, eliminating predictors that are too similar could increase variance for both institution types (Field, 2009). For the community college institution type, $R^2 = .211$, adjusted $R^2 = .066$, $F(9, 49) = 1.458, p=.946$.

Although none of the predictors were statistically significant in the model for the HBCU institution (Table 3), one of the predictors was statistically significant in the model for the community college institution: accessibility (Table 4). The standardized
coefficient was interpreted for accessibility due to it being a continuous variable. As accessibility to faculty increases by one standard deviation, STEM GPA for Black males at the community college decreases by .605. Likewise, accessibility had the greatest impact on STEM GPA for Black males at the community college because it had the largest absolute Beta value of .605. Tests to see if the data met the assumptions of collinearity indicated that multicollinearity was not a concern as all predictor variables had a reported tolerance well above the .2 minimum and report VIF values below 10.

Table 3 *Coefficients for HBCUs*

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
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<th>Sig.</th>
</tr>
</thead>
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<td></td>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
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<td>(Constant)</td>
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<td>1.577</td>
<td>.025</td>
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<tr>
<td></td>
<td>Caring attitude</td>
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<td>.164</td>
<td>.025</td>
</tr>
<tr>
<td></td>
<td>Off-campus interactions</td>
<td>.056</td>
<td>.105</td>
<td>.112</td>
</tr>
<tr>
<td></td>
<td>Career guidance</td>
<td>-.135</td>
<td>.148</td>
<td>-.190</td>
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<tr>
<td></td>
<td>Connectedness</td>
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<td>.114</td>
<td>.007</td>
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<tr>
<td></td>
<td>Approachability</td>
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<td>.149</td>
<td>-.068</td>
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<td>Accessibility</td>
<td>.009</td>
<td>.142</td>
<td>.016</td>
</tr>
<tr>
<td></td>
<td>Respectful interactions</td>
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<td>-.203</td>
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<tr>
<td></td>
<td>Negative Experiences</td>
<td>-.044</td>
<td>.084</td>
<td>-.102</td>
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<tr>
<td></td>
<td>Validity Scale</td>
<td>-.031</td>
<td>.098</td>
<td>-.055</td>
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</table>

a. INS_TYPE = HBCU  
b. Dependent Variable: STEM_GPA
Table 4 *Coefficients for Community Colleges*

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
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<tbody>
<tr>
<td>1</td>
<td>(Constant)</td>
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<td></td>
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<td></td>
<td>1.616</td>
<td>1.256</td>
<td>1.287</td>
<td>.204</td>
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<td></td>
<td>Caring attitude</td>
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<td>.150</td>
<td>.269</td>
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<td>Off-campus interactions</td>
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<td>-.333</td>
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<td></td>
<td>Career guidance</td>
<td>.281</td>
<td>.158</td>
<td>.365</td>
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<td>Connectedness</td>
<td>-.098</td>
<td>.169</td>
<td>-.119</td>
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<td>Approachability</td>
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<td>.220</td>
<td>.475</td>
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<td>Accessibility</td>
<td>-.633</td>
<td>.254</td>
<td>-.605</td>
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<td>Respectful interactions</td>
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<td>.214</td>
<td>.034</td>
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<td>Negative Experiences</td>
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<td>.071</td>
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<td></td>
<td>Validity Scale</td>
<td>.051</td>
<td>.081</td>
<td>.086</td>
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</table>

- a. INS_TYPE = Community College
- b. Dependent Variable: STEM_GPA

Examination of Figures 3 and 4 allow for normality to be assumed for each model as there are no drastic deviations in the normal Predicted Probability (P-P) plot.
The scatterplots of standardized residuals against standardized predicted values (Figures 5 and 6) show whether the assumption of homoscedasticity was violated. The HBCU scatterplot (Figure 5) displays a slight violation of homoscedasticity as it looks to
be slightly non-symmetrical in respect to plots around zero along the X and Y axes. The community college scatterplot (Figure 6) shows ideal homoscedasticity as it shows equal distribution around zero along both axes with no obvious pattern of the plotted points.

Figure 5. Scatterplot for HBCUs
Figure 6. Scatterplot for Community Colleges
CHAPTER V – DISCUSSION

Introduction

Faculty-student interactions emerged in the literature in the 1970s (Hussein, 2017). However, those studies were rarely done on high school and undergraduate student groups. Studies that focused on racial differences highlighted differences in the outcomes of Black and White students and not sufficiently on the students’ intra-racial differences (Hussein, 2017). Since the 1980s, other phenomena have been widely presented in the literature to the extent of faculty-student interactions becoming one of the least studied areas in higher education in the early 2000s (Dobransky, 2008). The literature has made it apparent in various studies that the connections faculty form with students can be crucial for academic success for students of color, particularly males (Hussein, 2017; Strayhorn, 2008). There are studies exploring the quantity and quality aspects of faculty-student interactions. Assessing both dimensions is necessary to gain a holistic understanding of these relationships. Historically, attention has been concentrated on measuring the frequency of faculty-student interactions. Research indicates that more frequent contacts with faculty yield better outcomes for students in higher education (Umbach & Wawrzynski, 2005). Limited research exists as to how frequent interactions affect students of various races and other demographics.

Black males are least likely of all racial and gender groups to interact with faculty, which could potentially explain why this group excels less and are less satisfied in college than their gender and race counterparts (Harper, 2012). Simpson (2014) compared faculty-student interactions between undergraduate men in STEM and non-STEM disciplines to see whether those relationships affected retention. In addition to
findings, other studies (e.g., Eagan et al., 2010) suggest “undergraduate men are challenged in developing quality relationships with faculty, especially at large research universities.” This study sought to identify predictors for success in higher education while previous studies centered on factors such as a lack of Black male role models at home and school which could explained failure of Black males in education (Harper, 2012; Strayhorn, 2010). The main purpose of the study was to determine if Black males perceived relationships they formed with STEM faculty differently if they attended a community college opposed to an HBCU. Secondarily, the study aimed to identify a significant difference in self-reported STEM GPAs of these males from different institution types. A final goal of this study was to examine the effect of faculty-student interactions on academic achievement, with STEM GPA as the outcome variable for the latter. Comparing community colleges to HBCUs is new in the literature, and there is hope that this study could open the door for further comparisons of institutions regarding Black males and their interactions with faculty. This chapter describes the major findings, implications, recommendations for future research, and limitations of the study.

**Major Findings**

Black males at the HBCU had significantly higher STEM achievement than their counterparts at the community college. This finding supports the hypothesis that there was a statistically significant difference in STEM GPAs of Black males at community colleges and HBCUs in Mississippi. It also aligns with the current literature that cites HBCUs as top producers of Black graduates in comparison to PWIs (Jackson, 2013; Jett, 2013; Kendricks, Nedunuri, & Anthony, 2013; NASEM, 2018; Suits, 2013; Toldson, 2018). Research claims that Black males perform poorer at community colleges than
females and White and Asian males (Knapp, Kelly-Reid, & Ginder, 2012; Wood & William, 2013). However, this claim was not measured in this study. In a similar study, Hussein (2017) explored the quality of faculty-student interactions between Black males and African immigrants. He used their GPA to assess their academic achievement. He concluded that no statistical difference between the two groups existed, which contradicted related studies in this area. He stated that the “overall quality of FSI appeared not to be dependent on the cultural background of study participants,” which implies an external factor to the race of the Black males in his study may explain low academic achievement in Black males.

There were significant differences in off-campus interactions and career guidance subscales of faculty-student interactions in this study. This finding addresses the second research hypothesis: there is a statistically significant difference in the types of STEM faculty interactions with Black males between Mississippi community colleges and HBCUs. Off-campus interactions with STEM faculty were more likely for Black males who attended the HBCU than the males who attended the community college. Hileman (2012) indicated in her study that off-campus interactions allowed for students to become more comfortable with instructors, making them less hesitant to seek guidance and ask questions. In a study from Thompson (2001), he asserted that informal (e.g., outside of classroom) interactions had a significantly statistical correlation to students’ perceptions of their improvements in mathematics and science. Chickering and Reisser (1993) stated that students begin their identity development by first developing competence. Students begin to make sense of what they learn inside and outside of the classroom environment from off-campus interactions with greater gain of knowledge coming from out-of-class
experiences (Thompson, 2001). In this study, STEM faculty at the community college were more likely to discuss career opportunities with Black males than the HBCU faculty members were with this group. Students who attend community colleges transfer to universities or enter the workforce. Perhaps students at community colleges are not as informed about career options compared to HBCU students, thus causing community college students to rely more on faculty for information concerning their careers. Career-technical education is growing at community colleges. Courses in this degree program train students with employable skills and career readiness they can use after graduation. Based on how STEM is defined, career-technical students could have participated in the study, which could explain this finding. Hussein (2017) found in his study comparing African immigrant males to African-American males that immigrant males tended to more frequently discuss their career plans and academic ambitions with faculty than the Black males did with faculty.

Simpson (2014) used the same survey instrument as this study when he compared undergraduate men in STEM opposed to non-STEM in regard to faculty-student interactions on retention in college. His findings indicated that the few interactions males had with faculty lack depth and may cause negative perceptions of their experiences with faculty members. This tainted view is heightened when males receive undesired feedback on assignments and tests, thus resulting in even fewer interactions. For this study, the negative experiences subscale was insignificant for either institution type. In a different study, Bachen et al. (1999) concluded that “male and female students will rate female faculty higher on caring teaching trait simply because of their gender schema
(stereotypes).” This finding is of interest as males tend to dominate faculty positions in higher education in STEM disciplines (Sheltzer & Smith, 2014).

There was a statistically significant relationship between the accessibility subscale and STEM achievement for Black males at the community college. This finding addresses the third hypothesis that there is a statistically significant relationship between STEM achievement and the types of STEM faculty interactions Black males experience at Mississippi community colleges. Black males had higher STEM GPAs when STEM faculty were less accessible to them. This finding was strikingly odd as one would think the opposite outcome would be more plausible in this context. Astin’s I-E-O model showed that the environment students experience in college can have either a positive or negative effect on their educational outcomes such as GPA. The nature of community colleges supports an environment conducive for commuter students. Community colleges usually have smaller campuses than four-year institutions and educate students who are not typically prepared or ready to attend four-year colleges or universities. Many students maintain full-time or part-time jobs while taking on a demanding course load. Students of this caliber may have more independence and find relying too heavily on faculty as a psychological crutch if they are readily accessible. A vector from the theory of Chickering and Reisser (1993) states students move toward interdependence as they develop their own identity. This may be the case for the community college students in this study.

Similar studies in the field reported conflicting results with respect to faculty-interactions and academic achievement. Delaney (2008) found significant correlations between faculty-student interactions and academic performance in the student’s field. A
significant correlation appeared in a study from Kommaraju, Musulkin, & Bhattacharya (2010) when they examined approachability of professors in response to students’ academic achievement. It is important to note that Blacks were participants in this study, and the participants’ overall GPA was used to assess academic achievement. In this study, approachability for Black male students at the community college had a significance of 0.51, yet still making it insignificant for consideration as a predictor for STEM achievement. Cokley et al. (2006) noted that no relationship existed between faculty-student interactions and GPA for the entire sample of participants of mixed races and genders. However, upon further analysis of data by ethnicity, Cokley and colleagues noticed the approachability and caring attitude subscales were significantly related to GPA for Black students, which was consistent with previous findings of his earlier studies on faculty-student interactions.

The fourth hypothesis was that there is a statistically significant relationship between STEM achievement and the types of STEM faculty interactions Black males experience at Mississippi HBCUs. This study rejects this finding as none of the faculty-student interactions were significant predictors of STEM achievement for Black males at the HBCU. A similar finding was presented in a study from Hileman (2012) who studied faculty-student interactions and college adjustment as predictors of academic achievement in an undergraduate psychology course. She used the students’ overall GPA as a proxy for the academic achievement. Her study concluded that none of the faculty-student interactions were significant in predicting academic achievement. However, other studies (Hylton, 2013; Kommaraju, Musulkin, & Bhattacharya, 2010) have found a
significant relationship between the quality of faculty-student interactions and academic achievement.

Implications

The findings of this study can be applied to institutions that identify Black male retention rates as a concern for their STEM programs. Mentorship programs have been documented as creating positive experiences for Black male students in college. A pipeline mentorship program where Black males are set up with mentors at each stage of their education (from elementary to college) may promote a high level of achievement. “If, before entering college, students are comfortable with interacting with their teachers, it would be a logical assumption that they may be more likely to interact with college professors” (Hileman, 2012). Faculty mentors could engage students in off-campus interactions that enrich the students’ college experience and strengthen the bond between them and their faculty.

Undergraduate research programs benefit students by offering them opportunities to develop their analytical and critical thinking skills. These programs also allow faculty researchers to advise students according to their specific needs and interests. Specialized courses designed to give Black males the skills they need to adequately transition to college could be established along with mentorship programs. Summer enrichment courses could offer Black males the pre-college preparation they need under the guidance of faculty mentors with whom they can build a rapport. Freshmen orientation courses can continue teaching the skills these males need to persist and complete their first year of college. Research has shown peer interactions in the form of tutoring and supplemental instruction are valuable to students of color (Dennis, Phinney, & Chuateco, 2005).
Academic learning communities consisting of a cohort of students who take the same introductory STEM classes can create a family-like environment in college for Black males.

Professional development for faculty members, especially faculty at community colleges (Scaggs, 2004), can focus on caring traits that have been evident in the literature and this study as being significant for Black males (Wood & Turner, 2011). Laanan (2011) states that STEM students are “less likely to establish quality relationships with faculty.” Restructuring the format of office hours afford faculty members an opportunity to accommodate the needs Black males may require in forming relationships with faculty who appear distant to them. Staff members at the institution can improve or enhance support services for these students as well. The literature indicates supportive campus climates have significance on retention, which could produce other desired outcomes such as academic achievement (Simpson, 2014).

Recommendations for Future Research

The target group of this study included freshmen and sophomore Black males who attended a community college or an HBCU in Mississippi and declared a STEM major. One way to increase the generalizability of this study is to extend the target group of Black males to other institutions in Mississippi and nearby states in this region (i.e., southeast) in the U.S. Qualitative or mixed methodology could provide richer data to clarify survey responses. For instance, an exploratory sequential design enables the researcher to use interviews or focus groups to create an instrument that can be used to survey a larger sample population. Triangulation methods can reveal the nuances of faculty-student interactions. Employing different methods of triangulation may enhance
understanding of the study by exploring various aspects of interactions Black males experience with STEM faculty. The use of the National Survey of Student Engagement (NSSE) and the Faculty Survey of Student Engagement (FSSE) instruments for their secondary data increases the sample size sufficiently to promote a better predictive value of the interactions and allow triangulation of faculty and student responses, respectively. To explore faculty interactions from the perspective of faculty or administrators would be worthy of future study as it will follow up studies from the 1970s and 1980s. As currently presented, this study offers a one-sided view of the experiences that involve multiple individuals. Surveying each party will make the findings less weighted on student opinion. The inclusion of attrition, retention, job placement, or other factors as outcome variables would offer additional forms of measuring STEM achievement aside from STEM GPA.

As with similar studies on ethnicity and faculty-student interactions, this study grouped the Black males without regard to socioeconomic status. Future studies should compare cultural groups (e.g., athletes vs. non-athletes and students who completed honors classes vs. students who did not) within the Black male student group. A look at intrinsic characteristics would be significant as they may change generationally for Black males. These characteristics “influence a student’s academic achievement” (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008).

Exploring how Black males interact with their peers and balance co-curricular activities such as athletics or part-time employment with academics would be beneficial to include in future research. As mentioned in the review of literature, support systems are critical for Black males in college. Future studies could examine the role of support
service along with the relationships these students form with faculty, administrators and other staff personnel. Due to the inclusion of teacher assistants (TAs) in courses at larger institutions, the role of TAs as liaisons in faculty-student interactions may be interesting to explore in future studies.

While this study compared a community college to an HBCU, future comparative studies could analyze faculty-student relationships at PWIs, minority-serving institutions (MSIs), and HBCUs. Upper-level students would be more appropriate as participants in these studies because these colleges and universities are all four-year institutions. Being two-year institutions restricted this study to using lower classmen. Freshmen and sophomores have low rates of faculty-staff interactions in relation to juniors and seniors in college. Therefore, it could be more promising to glean potential effects of faculty-student interactions on academic achievement from comparing these institution types.

Limitations

The following are limitations of this study:

1. The results were limited to a single trial of data from participants.

2. Findings may not be generalizable to all Black males in Mississippi because only participants from a single community college and a single HBCU who volunteered to complete the questionnaire were involved in the study.

3. Black males were grouped disregarding their socioeconomic status, but Black males are not a monolithic group. The literature supports that socioeconomic status has a strong effect on males pursuing and persisting in college.

4. The nature of self-reported data provides limitations. In this study, participants were asked to report grades in STEM courses taken during their first two years of
college. Relying on the participants’ recollection of their grades may have over- or under-reported the mean STEM GPA used as the outcome variable for the multiple regression models. Students did not earn grades for their courses taken that semester by the time the survey was administered. This skews findings as students estimated grades for courses taken in the current semester based on the running average at the time of the survey and not the final grade.

5. Freshmen and sophomores take classes that vary regarding their level of rigor. Usually introductory classes taken the first year of college provide the foundation for understanding higher-order concepts students learn the latter years of college.

6. The number of each majors may not adequately represent STEM. Fowlkes (2014) encountered this issue in her study where specific STEM majors outnumbered other STEM majors. If there are more biology majors at an institution than other STEM majors, the results are not as generalizable to all STEM majors if most participants were math majors.

7. No consideration of performance in high school or on standardized tests such as ACT or SAT scores was made for this study. “Past academic performance is predictive of future academic performance” (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008). However, scores on standardized tests may not be the best measurement of academic achievement for students of color especially Black males as they usually do not excel on standardized assessments compared to their female and other race counterparts (Fergus, Noguera, & Martin, 2014).
APPENDIX A – Survey Instrument

As a doctoral candidate at The University of Southern Mississippi, I am conducting research to identify whether significant differences exist in the interactions STEM (Science, Technology, Engineering, and Mathematics) faculty form with African-American males at community colleges and HBCUs. Also, the intention of this study is to determine if aspects of faculty-student interactions between the studied groups correlate with student achievement in regard to their STEM grade point average. The similarities in the outcomes could offer insight into areas STEM faculty at community colleges could address to yield higher academic achievement in the African-American male population. You are being asked to complete an online questionnaire to help aid in this research. There are minimal risks that may include the time it takes to complete the questionnaire.

Participants for this study should be African-American male students who are STEM majors and who are freshmen or sophomore students at either a Mississippi HBCU (Historically Black College and University) or community college. All participants must be at minimum 18 years of age. Completion of the questionnaire should take no more than 15-20 minutes. Participants will not be asked to include any identifying information on the questionnaire. All data will be compiled and reports will be developed based on the information obtained from the findings. The final summary reports will then be used in my dissertation and possibly published or presented in a professional venue.

Any personal information inadvertently obtained during the course of this study will be kept confidential and destroyed once all information has been compiled. All participants will provide consent prior to completing the questionnaire. It is important to note that participation in the research project is completely voluntary. Participation may be declined or discontinued at any point without concern over penalty, prejudice, or any other negative consequence. Feel free to contact me via email at antoine.gates@usm.edu if you have any questions and/or concerns regarding this research project. In addition, for overall results, you may contact me after April 8, 2020. This research is being conducted under the supervision of Sherry Herron, PhD (sherry.herron@usm.edu).

This project has been reviewed by the Institutional Review Board, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.

By completing this survey, you give the above mentioned researcher permission to use the data obtained from the questionnaire for the purposes outlined above.

The first section of this questionnaire lists a number of items concerning how you perceive your interactions with STEM (Science, Technology, Engineering, and Mathematics) professors. Read each item, and indicate to what degree it reflects how you feel most of the time, using the 7-point scale. Base your responses on your interactions with STEM professors or instructors only.

Caring Attitude: I feel that one or more professors are supportive of me.

Strongly Disagree  Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree  Strongly agree

Caring Attitude: I believe that there is at least one professor who cares about my well-being.

Strongly Disagree  Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree  Strongly agree

Caring Attitude: I believe there is a professor who is concerned about my future.

Strongly Disagree  Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree  Strongly agree

Caring Attitude: I feel that professors generally care about me.

Strongly Disagree  Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree  Strongly agree
Off-Campus interactions: I have spent time with professors outside an academic setting.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
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</table>

Off-Campus interactions: I have a positive relationship with a professor outside of the classroom.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
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Off-Campus interactions: I have interacted with professors off campus.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
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Off-Campus interactions: Professors initiate contact with students after class.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
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Off-Campus interactions: Professors have encouraged me to go to graduate or professional school.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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<th>Agree</th>
<th>Strongly agree</th>
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Career guidance: At least one or more professors have provided me with guidance in developing my career goals.

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<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
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Career guidance: My professors have encouraged me to succeed in achieving my academic dreams.

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<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
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Career guidance: My professors provide information about career and academic options.

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<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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<th>Agree</th>
<th>Strongly agree</th>
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Connectedness: My professors demonstrate familiarity with my culture.

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<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
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Connectedness: I feel connected with faculty.

<table>
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<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
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Connectedness: I have faculty that I can identify with on campus.

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<th>Strongly Disagree</th>
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<th>Neither agree nor disagree</th>
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Connectedness: I feel a bond with one or more faculty.

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Approachability: I am comfortable approaching professors.

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<th>Strongly Disagree</th>
<th>Disagree</th>
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<th>Neither agree nor disagree</th>
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<th>Agree</th>
<th>Strongly agree</th>
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Approachability: I feel comfortable approaching professors to discuss my grades and class work.

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<th>Strongly Disagree</th>
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<th>Neither agree nor disagree</th>
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Approachability: I feel comfortable asking my professors questions about concepts that are not clear.

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<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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<th>Agree</th>
<th>Strongly agree</th>
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Approachability: I have not felt intimidated by my professors.

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<th>Strongly Disagree</th>
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<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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Accessibility: Professors are accessible outside of class.

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<th>Strongly Disagree</th>
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<th>Neither agree nor disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
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Accessibility: Professors are available when I need guidance or assistance.

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<th>Strongly Disagree</th>
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<th>Neither agree nor disagree</th>
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Accessibility: My professors make time to talk to me when needed outside of class time.

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<th>Strongly Disagree</th>
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Accessibility: Although professors are busy, I can talk to one or more of them whenever I need to.

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<th>Strongly Disagree</th>
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Respectful interactions: Professors show respect for all students in the classroom.

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<th>Neither agree nor disagree</th>
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Respectful interactions: My professors are clear about expectations regarding coursework.

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Respectful interactions: When I interact with my professors I feel s/he truly listens to me.

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Respectful interactions: My professors are alert and attentive when I approach them.

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<th>Strongly Disagree</th>
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<th>Neither agree nor disagree</th>
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Respectful interactions: When I interact with my professors, I feel s/he cares about my question or problem.

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<th>Strongly Disagree</th>
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<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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Respectful interactions: Professors show respect for ethnic minority students.

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<th>Strongly Disagree</th>
<th>Disagree</th>
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<th>Neither agree nor disagree</th>
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Respectful interactions: When I interact with my professors, I feel understood.

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<th>Strongly Disagree</th>
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<th>Neither agree nor disagree</th>
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Respectful interactions: My professors value my contributions and opinions.

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<th>Strongly Disagree</th>
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Respectful interactions: My professors seem comfortable interacting with students outside of their racial/ethnic group.

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<th>Strongly Disagree</th>
<th>Disagree</th>
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<th>Neither agree nor disagree</th>
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Negative Experiences: My professors seem distant and uninterested to me.

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<thead>
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<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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Negative Experiences: Professors do not value talking with students outside of the classroom.

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<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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Negative Experiences: I do not believe my professors treat me fairly.

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<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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<th>Agree</th>
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Negative Experiences: I feel isolated from my professors.

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<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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Validity scale: The quality of my relationships with professors impacts my academic performance.

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<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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Validity scale: I work harder to succeed in a class if I know my professor genuinely cares about me.

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<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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Validity scale: I think a positive relationship with a professor would enhance my experience at this school.

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<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
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For the second part of this questionnaire, indicate the grade you have earned in each course you completed. If you did not take the course or withdrew from it, indicate N/A. If you repeated a course, please provide the higher grade. Keep in mind that you and the information you provide will be kept confidential throughout this study. Therefore, please be as honest as possible in your responses.

<table>
<thead>
<tr>
<th>Course</th>
<th>A</th>
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<th>C</th>
<th>D</th>
<th>F</th>
<th>N/A</th>
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<td>General Biology I (Majors Biology)</td>
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<td>General Biology II (Majors Biology)</td>
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<td>Introductory Environmental Science or Ecology</td>
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<td>Anatomy &amp; Physiology</td>
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<td>Introductory Microbiology</td>
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<td>General Chemistry I (Inorganic chemistry)</td>
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<td>General Physics I</td>
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<td>Modern Physics</td>
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<td>Other physics course not listed</td>
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<td>Programming Fundamentals</td>
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<td>Programming in C/UNIX</td>
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<td>Programming in C++</td>
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<td>Course</td>
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<td>Programming in Java</td>
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<td>Programming for the Web</td>
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<td>Discrete Structures for Computer Science</td>
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<td>Engineering Mechanics I: Statics</td>
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<td>Engineering Mechanics II: Dynamics</td>
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<td>Mechanics of Materials</td>
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<td>Trigonometry</td>
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The final part of this questionnaire will ask you to identify yourself in regard to your classification, major, and the type of institution to which you belong. Keep in mind the information you provide will be kept confidential.

How would you classify yourself?
☐ Freshman (less than 30 credit hours)
☐ Sophomore (between 30-60 credit hours)

Your major falls best within which of the following?
☐ Biological Sciences
☐ Physical Sciences
☐ Computer Science
☐ Engineering
☐ Mathematics
☐ Neither

Your institution is best described as a/n
☐ Community College
☐ HBCU (Historically Black College & University)
☐ Both
APPENDIX B – Permission to Use Instrument

Gmail – Permission to use SPIS

Antoine Gates <antoinegates@gmail.com>

Thu, Sep 27, 2016 at 10:31 PM

Dr. Cokley,

I am Antoine Gates, a doctoral student at the University of Southern Mississippi. Prior to USM, I received Bachelor’s and Master's degrees from Jackson State University, an HBCU in central Mississippi. In addition to being a graduate student, I teach biology courses at a community college near Jackson, Mississippi. Because I am the only African-American male faculty member at my job, I have become increasingly interested in exploring African-American males' success at community colleges. Although early in the dissertation stage, I have read a number of studies that discuss the lack of this group in STEM, thus inspiring me to investigate how African-American males fare at various institutions and how they compare among other groups. From my review of related literature, I am motivated to explore African-American males' relationships with STEM faculty members at Mississippi community colleges compared to the relationships the same group has with STEM faculty at the state's HBCUs. Therefore, the purpose of this email is to seek permission to use in my study the Student-Professor Interaction Scale instrument that you and your colleagues constructed. I was able to read the 2004 article about the 40-item SPIS; however, I was unsuccessful in locating the 2006 article that discusses the 12-item SPIS. If you could assist me in acquiring that article, I would be most grateful. I look forward to hearing from you.

Sincerely,

Antoine Gates

Cokley, Kevin O <kcokeley@austin.utexas.edu>

Sat, Sep 29, 2016 at 4:29 PM

Hi Antoine,

I’ve attached a copy of my article and scale. Good luck with your research.

Sincerely,

Kevin Cokley, Ph.D.

Director, Institute for Urban Policy Research & Analysis [IUPRA]

UT System Distinguished Teaching Professor

Oscar and Anne Mauzy Regents Professorship for Educational Research and Development

Professor of Educational Psychology and African and African Diaspora Studies

The University of Texas at Austin

AADS Office: Direct: 512-471-4672  Main: 512-471-1764

Ed Psych Office: 512-471-7498

kcokeley@austin.utexas.edu

https://mail.google.com/mail/u/1/?ui=2&ik=8806bfcb40&view=pt&search=all&permthid=thread-a%3AsAei7626391527081652196&q=simplesearch:a%3Ac-e92b0424626000970...
www.kevincokley.com

Read about my book on the myth of Black anti-intellectualism: http://amzn.to/1LPTKE7

From: Antoine Gates <antoinegates@gmail.com>
Sent: Thursday, September 27, 2018 10:32 PM
To: Cokley, Kevin O <cokley@ausln.utexas.edu>
Subject: Permission to use SPIES

2 attachments

Cokley et al. (2006).pdf
135K

Student-Professor Interaction Scale.doc
108K
APPENDIX C – IRB Approval Letter

IRB-19-147 - Initial: Sacco Committee Letter - Exempt

irb@usm.edu

Mon 4/8/2019 1:41 PM

To: Antoine Gates <Antoine.Gates@usm.edu>; Sherry Herron <Sherry.Herron@usm.edu>; Michael Howell <Michael.Howell@usm.edu>; Michaela Donohue <Michaela.Donohue@usm.edu>

Office of Research Integrity

NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

The project below has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University Policy to ensure:

- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the incident template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.

PROTOCOL NUMBER: IRB-19-147
PROJECT TITLE: Faculty Interactions with African-American Male Students at HBCUs and Community Colleges as Predictors of Academic Achievement in STEM
SCHOOL/PROGRAM: Science and Math Education
RESEARCHER(S): Antoine Gates, Sherry Herron

IRB COMMITTEE ACTION: Exempt
CATEGORY: Exempt

   Category 2.(i), Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording). The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects.

APPROVED STARTING: April 8, 2019

Donald Sacco, Ph.D.
Institutional Review Board Chairperson
REFERENCES


Research, 54(2), 125-132.


Cole, D., & Espinoza, A. (2008). Examining the Academic Success of Latino Students 68


Hussein, H. (2017). *The teacher-student interactions and academic achievement of


Hong, B. S., & Shull, P. J. (2010). A retrospective study of the impact faculty dispositions have on undergraduate engineering students. College Student Journal, 44(2), 266-278.


Megee, E., & Bentley, L. (2017). The equity ethic: Black and Latino college students


VA: National Science Foundation (NSB 2018-1).

National Science Foundation, National Center for Science and Engineering Statistics.


