The primary purpose of this study was to determine the differences in the levels of academic and social engagement and college self-efficacy between first-generation and other college students enrolled in a STEM discipline at a Historically Black College and University. A two-group ex post facto research design using two questionnaires was used for the study. A stratified sample of 90 college students participated in the study. The data for the research questions were analyzed using descriptive and inferential statistics based upon the subscales of the College Student Experiences Questionnaire and the College Self-Efficacy Inventory.

These findings indicated that there were significant differences among first-generation and other college students who were enrolled in a STEM discipline at a HBCU. Statistically significant differences between first-generation and other college students were found for 3 items in the academic integration category: used a computer to analyze data \( (p = .044) \), talked about art or theater \( (p = .044) \), and talked about music or musicians \( (p = .003) \). First-generation college students felt that they “often” used a computer to analyze data and “often” talked about music or musicians with other students, friends, or family members whereas other students felt “very often” and “often” respectively. First-generation college students felt that they “occasionally” talked about art or the theater with other students, friends, or family members whereas other students reported that they “often” talked about art or the theater with other students, friends, or family members.
In addition, a statistically significant difference between first-generation and other college students was found for 4 items in the social integration category: “met other students,” \((p = .017)\); “used campus recreational facilities,” \((p = .050)\); “identified with a character,” \((p = .050)\); and “became acquainted with student,” \((p = .035)\). Both groups felt that meeting others and identifying with a character would happen “often.” Both groups differ for using campus recreational facilities and becoming acquainted with students whose family background was different. First-generation students reported that “occasionally” and “often” whereas the other college students felt “often” and “very often” that using campus recreational facilities and becoming acquainted with students whose family background was different would happen.

The study documented the impact of the nurturing environment that exist at an HBCU and focused on the academic and social engagement and self-efficacy aspects of attending college. This research provides clues on ways that college administrators and researchers can assist this group of students. Implications for future research and policymakers are discussed.
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College Experiences and Self-Efficacy of First-Generation Students versus Other Students Enrolled in a STEM Discipline at a Historically Black College and University

by
Terence Hicks

A dissertation submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the Degree of Doctor of Philosophy

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2012

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Currently, I am a tenured associate professor of research in the Department of Educational Leadership at Fayetteville State University. Most recently (July 2007 through July 1, 2010), I served as the department chairperson. I earned my bachelor and master degrees from Virginia State University, a doctorate in Educational Leadership from Wilmington University, Delaware and a Ph.D in Counseling and Counselor Education from North Carolina State University.

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Chapter 1

Introduction

Past studies have documented the college student experiences and college self-efficacy beliefs of African American students at Historically Black Colleges and Universities (HBCUs). There have been relatively few studies; however, that have examined these experiences and beliefs among African American first-generation college students in a Science, Technology, Engineering and Mathematics (STEM) disciplines while attending HBCUs. HBCUs are essential in providing a supporting and nurturing environment for African American students, regardless of their academic and social circumstances. Furthermore, HBCUs have been known to provide the kind of academic and social environment that many African Americans need for surviving and persisting through college.

Swail et al. (2003) noted that minority serving institutions (MSIs) play a vital role in providing educational opportunities to minority students. Such institutions are reported as having environments that aid in the self-pride and confidence of African American students, thereby leading to academic and social success (Johnson, 2002; Swail et al., 2003). HBCUs are known for aiding in the “holistic” development of African American students through outreach programs, counseling (Barton, 2002), and personal faculty-to-student relationships (Bonous-Hammarth, 2000; Derlin & McShannon, 2000; Fleming & Morning, 1998; Kobrak, 1992; Sondgeroth & Stough, 1992). According to data from the National Science Foundation (2008) Science and Engineering Indicators, 34% of African American freshmen intended to major in science, technology, engineering and mathematics (STEM) fields.
According to the same study, that number is larger than the percentage of incoming white freshmen (29.5%) who planned to major in science and engineering.

Given the abundance of stories in the media about the underrepresentation of minority students in STEM fields, these data are encouraging and surprising, but the trend is not especially new. The majority of those working in STEM-related fields in the United States have been white males. However, in recent decades, there have been significant efforts made to attract more women and minorities to STEM-related fields. In 2000, HBCUs awarded 40% of the baccalaureate degrees to African Americans in STEM fields (Southern Education Foundation, 2005). In fact, HBCUs outnumber Historically White Institutions (HWIs) in awarding degrees to African American students in most STEM disciplines (SEF, 2005). Educators believe that these findings can be improved and questions are beginning to be raised among educators regarding the minority students’ academic and social experiences and preparation before and during their enrollment in a STEM discipline. For example, African American students who enter engineering programs do not persist to graduate or they switch to non-STEM fields (Lowery, 2010; Strayhorn, 2009).

Increasing the diversity of the STEM workforce has been an issue of national concern for decades. African American and Latino students, from working class families, are significantly underrepresented in science and technical fields, and this is especially the case for African American students who are the first in their family to attend college. Students who are the first in their families to attend college, commonly known as first-generation college students, have been receiving the attention of researchers and practitioners. For example, a relatively new topic being studied is the difference between first generation
college students and other college students. These two groups are defined in different ways in the research literature. However, the dominant research available on first-generation college students would support the contention that most first-generation students are deficient in many aspects of the college experience, from pre-college through college and after graduation, than non-first-generation college students (Harper & Quaye, 2008; Hurtado, 2007; Murphy & Hicks, 2006; Hicks, 2003; Kuh, Kinzie, Schuh, Whitt, & Associates, 2005; Pascarella & Terenzini, 2005).

Adjustment to college for the first-generation student has been studied in different contexts such as academic or social and has included a wide range of constructs including motivation, psychosocial development, and personality (Barry & Finney, 2009). One particular construct that has received considerable interest in the domain of college student adjustment has been self-efficacy or “people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances.” (Bandura, 1986, p. 391). Researchers have suggested that self-efficacy is important to not only the academic and social adjustment of students but to their overall wellness and personal adjustment as well (DeWitz & Walsh, 2002; Gore, 2006; Solberg & Villareal, 1997). Self-efficacy in the academic and social domains in particular has been widely studied with college-aged populations because both are integral components of the college experience (Barry & Finney, 2009).

**Statement of the Problem**

A number of researchers have examined various relationships between college students’ educational experiences and college self-efficacy and the educational level of their
parents. The 2009 Annual Report of the National Survey of Student Engagement (NSSE) stated that first-generation college students were much less likely than other students to participate in high-impact activities such as learning communities, research with faculty members, study abroad, or a culminating senior educational experience. Furthermore, first-generation college students were found to also lack the inter-generational benefits of information about the college experience, making engagement, and participation in college a more daunting task (Engle, 2007; Kuh & Pike, 2005; Kuh, Kinzie, Schuh, Whitt, & Associates, 2005; Lohfink & Paulsen, 2005). Because first-generation college students may be perceived as having different expectations, poorer academic and social preparation, greater financial constraints, lower self-esteem, and insufficient parental support, it would seem logical that to suggest that they do not perform as well as non-first-generation college students (Hicks, 2002). The increased accessibility of higher education to minorities necessitates a clearer understanding of this causal relationship because their participation as first-generation students in the college or university process has dramatically grown. Additionally, because basic information about college survival and success may not be readily available from first-generation families, there is a need for more extensive research to determine the nature and type of academic, social and personal support systems needed for this population’s college success.

Well-established models of student involvement and integration have provided theories to guide program design and assessment of student learning and engagement. Tinto's (1975) model of student integration and Astin's (1993) model of student involvement both provide grounded theories supported by empirical research for how best to engage students in
active learning and development. Tinto (1975) theorized that students enter a college or university with a variety of patterns of personal, family, and academic characteristics and skills (e.g., sex, race, academic ability, secondary school performance, family social status) and goal commitments (e.g., highest degree expected, importance of graduating from college).

Astin (1993) used the I-E-O model as a conceptual guide to investigate the persistence effort of the college student. The I stands for input. It is the "...characteristics of the student at the time of initial entry to the institution" (p. 7). The E represents the environment. It refers to the "...various programs, policies, faculty, peers, and educational experiences to which the student is exposed" (p. 7). Astin noted that environmental variables could include the size of the institution, the student-to-faculty ratio, the racial makeup of the campus, the perceived academic competence of the students, the use of active learning on campus, and the required core curriculum. When students arrive on the college campus, individual members of that group may have different environmental experiences because of the curricular and extracurricular choices they make, Astin indicated. The O is for outcome. Astin noted that outcome refers to “...the student’s characteristics after exposure to the environment.” (p. 7). These are only two theories, but two theories that can inform today's faculty and student affairs professionals in developing pedagogy and interventions that are holistic in design and assessment.

Recently, a new domain of self-efficacy beliefs has been proposed for the college student population: that of college self-efficacy, or the degree of confidence students have for completing college-related tasks. Solberg and colleagues were interested in examining the
relationship between self-efficacy and college adjustment for Hispanic students (Solberg, O’Brien, Villareal, Kennel, & Davis, 1993). Because they wanted to assess college self-efficacy, or the degree of confidence students have in their ability to successfully perform a variety of college-related tasks rather than self-efficacy for only one aspect of the college experience (e.g., academics), they developed the College Student Self-Efficacy Inventory (CSEI).

To that effect, little is known about the college experiences and college self-efficacy barriers of first generation college students enrolled in a STEM discipline at a HBCU. With first-generation college students exhibiting one of the lowest retention and graduation rates among their racial counterparts, investigating their college experiences and self-efficacy barriers might aid in explaining their high rates of attrition especially in the STEM fields. As colleges and universities are welcoming more and more diverse student populations within the STEM disciplines, the number of first generation students that have access to these disciplines will continue to increase. With this in mind college administrators, faculty and counselors must be prepared to serve these students.

Unfortunately, there is an apparent gap in the knowledge of college administrators and faculty concerning the college experiences and college self-efficacy beliefs that are held by first-generation college students enrolled in the STEM disciplines and how these experiences and beliefs may relate to their persistence, or lack thereof, at post-secondary institutions. Until more accurate methods are developed to identify which type of first-generation college students are at risk of failing and leaving college, little can be done to intervene and avoid the undesired consequences of poor academic and social performances
and attrition that affect both first-generation college students enrolled in STEM disciplines and the institutions. Thus, it would be helpful to know what challenges and barriers exist for these first-generation students upon entering a college setting and enrolling in a STEM discipline. Such information is needed to assess more fully the at-risk potential of these students for non-completion of college.

Given that a relatively large percentage of African Americans entering college are first-generation students and considering the low completion rate among this group in the STEM discipline, it is important to explore means to improve their college completion rates. Furthermore, it is imperative that first-generation college students who are enrolled in a STEM discipline receive appropriate support in and out of the classroom in order to navigate successfully the educational pathway.

**Significance of the Study**

This research study is unique in several perspectives. First, it represents an initial attempt to incorporate both academic and social integration variables found in Tinto’s Theory and the contextual variable college student self-efficacy. In the past, researchers have investigated persistence behaviors among first-generation college students separately from Tinto’s perspective and that of college self-efficacy. Thus relationships between the academic and social variables used in Tinto’s conceptual model and college self-efficacy have not been examined with first-generation college students enrolled in STEM disciplines at HBCUs.

Second, this research targets first-generation college students majoring in a STEM discipline. Lewis (2003) investigated African American students majoring in a STEM
discipline. He noted that researchers attempting to ascertain why African American students leave the STEM educational pipeline and how to prevent their departure often focused on the deficiencies that exist within the African American student experience. Gary (2010) investigated the role of HBCUs in the development of African American Ph. D students. Clark (1999) investigated the African American student population majoring in the STEM discipline at a predominantly white institution. Green (2008) examined African American college students in STEM discipline and their relationship with faculty members. However, no research exists that investigates the applicability of the academic and social integration found in the College Student Experience Questionnaire and college self-efficacy constructs from the College Self-Efficacy questionnaire to the population of first-generation college students majoring in a STEM disciplines at HBCUs.

Third, the contextual variable college self-efficacy has never been used as a potential contributor to enhance the academic and social constructs in Tinto’s model for this particular group of college students enrolled in STEM disciplines. Career decision-making self-efficacy (CDMSE) was used in Peterson’s (1993) research and Sandler’s research (2000) to elaborate Tinto’s theory from a psychological perspective. However, it appears as if college self-efficacy was never used to elaborate on Tinto’s theory from a psychological perspective due partly to the fact that there are no studies testing Tinto’s model with first-generation college students enrolled in a STEM discipline as the target population. Lastly, this will be the first study to include first-generation status and the STEM participation with the academic and social integration constructs derived from Tinto theory as well as college student self-efficacy variables found in the College Self-Efficacy Inventory.
Research Questions

This study will focus on the following research questions:

1. What are the differences in the levels of academic engagement between first-generation and other college students enrolled in a STEM discipline?

2. What are the differences in the levels of social engagement between first-generation and other college students enrolled in a STEM discipline?

3. What are the differences in the college self-efficacy variables between college students enrolled in a STEM discipline and their levels of parental educational attainment?

4. What are the differences in the college academic and social self-efficacy variables between first-generation and other college students enrolled in a STEM discipline?

Definition of Terms

Academic integration. Academic integration refers to students' interaction and congruency with the academic system of the institution. It consists of structural and normative dimensions. The former entails meeting of explicit standards of the college or university, while the latter pertains to identification with the beliefs, values, and norms inherent in the academic system. Academic integration is measured by academic performance and interactions with faculty and staff.

College self-efficacy. This term refers to the degree of confidence students have in their ability to successfully perform a variety of college-related tasks. (Solberg et al., 1993).
**First-generation.** In this study the term refers to a college student or college students from a family in which neither parent or guardian graduated from a 4-year college or university.

**Self-efficacy.** This term refers to people’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performances (Bandura, 1986).

**Social integration.** Social integration refers to students' interaction and congruency with the social system of the institution. Social integration occurs primarily through informal peer group associations, and semi-formal extracurricular activities within the college. The concepts of social integration are composed of students' levels of interaction with peers and involvement in campus life and participation in extra-curricular activities.
Chapter II

Review of the Literature

A review of the literature was conducted to provide a framework for studying the college experiences and college self-efficacy of first-generation college students enrolled in a STEM discipline at a HBCU. This chapter is divided into four sections: (a) characteristics of first-generation college students, (b) Tinto’s Student Integration Model, (c) College student self-efficacy, and (d) STEM programs.

Inclusion Criteria

This review was conducted primarily through the use of Ebsco Host, a component of the Online Computer Library Center (OCLC) search. This electronic search of databases enables researchers to utilize three primary research indexes: Ebsco Host Electronic Journal Service (EJS), Digital Dissertation Abstract International, and the Educational Research and Information Center (ERIC). A Boolean search under college or university, along with the following key words, was used to develop an appropriate reference list for the literature review and encompassed the following terms: first-generation, college transition, retention, academic and social integration, self-efficacy, and STEM. This produced more than 50 cited resources with numerous scholars including peer-reviewed articles, reports, books, book chapters, conference papers and dissertations.

Characteristics of First-Generation College Students

College campuses across the United States, both two-year and four-year institutions, share a growing area of focus. First generation students make up 34% of students enrolled in four-year institutions and 53% of two-year colleges (Choy, 2001) making them a significant
demographic group to be studied. First-generation college students are on every campus and represent students that many institutions seek to recruit and retain. Women, students of color, nontraditional-aged students, and low-income students are overrepresented in the first-generation college student population (Hurtado, 2007; Horn & Nunez, 2000; Terenzini et al., 1996; Choy, 2001; Lohfink & Paulsen, 2005). For this study, the term "first-generation college student" is defined as an individual with neither parent completing a baccalaureate degree (Billson & Terry, 1982; Hicks, 2002).

Research on first-generation college students is typically in three categories (Terenzini et al., 1996). The first category refers to demographic studies and pre-college preparation—academic and personal decision making about the college choice process and college engagement that compares first-generation college students to other college students (Murphy & Hicks, 2006; Upcraft, Gardner, & Barefoot, 2005; Kuh & Pike, 2005; Pascarella & Terenzini, 2005; Hurtado, 2007; Horn & Nunez, 2000; Hossler, Schmit, & Vesper, 1999; Kojaku & Nunez, 1998; Pratt & Skaggs, 1989). Students whose parents did not go to college are considerably less likely to be prepared for college than their peers (Choy, 2001). In regards to demographic studies and pre-college preparation, researchers found that a rigorous high school curriculum, particularly one that includes advanced math, can greatly improve the changes that first-generation students will go to college. Horn and Nunez (2000) found that taking advanced math courses in high school more than doubles the chances that first-generation students will enroll in a four-year college. They also found that the likelihood that first-generation students will take college preparatory courses is limited by a lack of availability in high schools that have significant populations of potential first-generation
college students and from lack of familial encouragement. Horn and Nunez (2000) explained that increased levels of parental encouragement and involvement greatly increase the likelihood that students will take a rigorous high school curriculum and enroll in college, regardless of parental educational level.

Furthermore, first-generation students tend to have lower educational aspirations than non-first-generation students (Saenz et al., 2007). Inman and Mayes (1999) suggested that these students were less prepared both academically and psychologically for college. Hicks and Dennis (2005) stated that first-generation college students were not generally considered ideal students in regard to being well prepared, having earned good grades in high school, or having the self-esteem and self-efficacy to successfully graduate. However, their study found that first-generation students were more motivated in achieving a specific goal and “wanted to accomplish something in life” (Hicks & Dennis, 2005, p. 47). The researchers suggested that first-generation students were increasingly realizing that they were at a disadvantage when it comes to preparing for and participating in college, but, with this realization, they were becoming more knowledgeable of the personal, social, and academic abilities needed to persist in college.

First generation students are also less likely to engage in activities that are believed to enhance college students’ experiences such as living on campus and participating in extracurricular activities (Pascarella, Pierson, Wolniak, & Terenzini, 2004). The need to work long hours possibly to support oneself financially, may be a reason for first generation students' lack of participation in college life. While some may suggest to first generation students that they should simply take on fewer hours at work to focus on school, this may not
be an option for most first generation students. Many first generation students tend to come from families with much lower socioeconomic status (SES) than non first generation students (Choy, 2001; McCarron & Inkelas, 2006) making it nearly impossible to afford college by working only a part time job. First-generation students are further characterized by their higher propensity of working full-time while attending college part-time (Nunez & Cuccaro-Alamin, 1998; Warburton et al., 2001). These attributes and qualities each influence the likelihood of persistence for first generation students. The less engaged these students are and the less committed to the full college experience, the more likely they will be to drop or fail out of college (Pascarella & Terenzini, 1991). Pascarella and Terenzini cite Tinto’s theory of student departure, which argues that having positive experiences in social and academic settings during college improves a student’s likelihood of persistence. By having to dedicate a great deal of time to non class related activities, such as work or family responsibilities, first-generation students have less time to focus on their courses. This often has negative implications for their academic performance, persistence and eventually their graduation.

Pike and Kuh (2005) mentioned the varied findings that have been identified in previous literature related to the role of educational aspirations of first-generation students. They cite a study by Billson and Terry that suggests no differences exist in the educational aspirations between first generation students and their non-first-generation counterparts. On the other hand, they pointed to Terenzini and his colleagues, who believe that first-generation students were more likely to have lower educational goals than non-first-generation students (Pike & Kuh, 2005). Pike and Kuh offered that the discrepancies in the findings likely result from different data collection methods and/or historical context changes. More recent
findings show a connection between first generation students and lower levels of educational expectations. Choy (2001) pointed out that according to the responses given by eighth grade students in the National Education Longitudinal Study in 1988, 93% of students who graduated in 1992 planned on continuing their schooling after high school. As noted previously, Choy stated that educational aspirations rose as the level of parental education completed increased.

In Choy’s (2001) study of first-generation students, the differential in academic preparedness for first-generation students as compared to non-first-generation students was discussed. First generation students were much more likely to be marginally qualified or not qualified to be accepted at a 4-year institution, and less likely to be highly qualified for postsecondary education as compared to non-first-generation students (Choy, 2001). Achieving the appropriate qualifications is necessary in order to open up the doors to institutions that students prefer. Unfortunately, due to lower achievement while in high school, first-generation students are not well prepared or qualified to attend the more prestigious colleges and universities. As noted in by Choy (2001), an important factor in the likelihood that first-generation students will enroll in a postsecondary institution and persist through graduation is their level of academic preparation. Warburton, Bugarin, and Nunez (2001) cited a number of mechanisms that can be utilized to assess the level of academic preparation. The courses that students take, the rigor of those courses, the number of advanced placement courses taken, as well as their scores on standardized tests give an indication as to their college readiness.
College is seen by many as a stressful transition from high school life. One study sought to investigate how important disclosing stress can be to success in college. Barry et al. (2008) studied the differences in stress disclosure between first generation and non-first generations students. While nearly all students entering college experience stress from moving away from home or their familiar environments, having an increased work load and dealing with taking care of themselves, first generation students have additional stressors that non first generation students may not experience. First generation students not only experience the common stress of college, but, since they are usually working longer hours or may be taking care of family responsibilities, they have more stress than non-first generation students (Curtona, Cole, Colangelo, Assouline, & Russell, 1994).

Barry et al. (2008) sampled 1,539 students who were taken from four universities to participate in a web based survey. Questions were posted on a secure, password protected web site and passwords were given out in email invites to the study. The web based survey consisted of 39 questions ranging from factors affecting participants' college choices, to high school experiences and college experiences. Of the 39 questions, 13 were based on discussing college experiences and social support. The results indicated that first generation students display lower levels of disclosure with peers than non-first-generation students. The cause was believed to be a lack of social support for these students in both home and school life based on the lack of experience their parents have in a college environment which leads to students being unprepared for what to expect. Other studies examined friendship and establishing intimate relationships (Karp & Holmstrom, 1998; Bassoff, 1998) while in
college, these researchers note that new life identities and developing skills and knowledge is important while in college.

**Vincent Tinto’s Theory of Academic and Social Integration**

Tinto (1975) theorized that students enter a college or university with a variety of patterns of personal, family, and academic characteristics and skills (e.g., sex, race, academic ability, secondary school performance, family social status) and goal commitments (e.g., highest degree expected, importance of graduating from college). These background characteristics and goal commitments are subsequently modified and reformulated on a continuing basis through a longitudinal series of interactions between individuals and the members of the academic and social systems of the institution. Academic and social integration influence a student's subsequent commitment to the institution and to the goal of college graduation. The greater the student's level of academic integration, the greater the level of subsequent commitment to the goal of college graduation. Furthermore, the greater the student's level of social integration, the greater the level of subsequent commitment to focal institutions.

Tinto proposed his original Integration Model in 1975. Afterwards, he continuously revised his theory in response to the criticisms and suggestions from other researchers who tried to validate his theory. In response to Pascarella and Terenzini (1980) and Bean and Metzner (1985) work, Tinto modified his theory (1987) by adding several major components. First, he added student intentions into the model, positing that they have a strong effect on persistence. Second, a distinction between formal and informal communication with faculty was added. In subsequent refinements Tinto (1993) recognized that not all students in higher
education attend four-year institutions; he modified his original theory to account for commuter and two-year college students, though he had addressed some of these issues in his earlier research. Additionally, he also asserted that academic integration was more important than social integration for commuting and community college students. Finally, he accounted for the external events such as employment or family responsibilities in his revision. Although Tinto continuously revised his theory to respond to others' opinions, the criticisms have not stopped. One of the biggest problems is that Tinto did not give a clear definition of the model constructs, specifically integration variables, which lead to very different operational definitions constructs in studies attempting to assess the validity of the model. In addition, the individual and longitudinal nature of persistence and associated research allows for criticism of the model's validity.

Academic and social integration are the two most important concepts in Tinto's model. Integration is a process in which an individual identifies with, or shares and incorporates the normative attitudes and values of his or her instructors and classmates, and becomes a member of the college community (Tinto, 1987, 1988, 1993; Terenzini & Pascarella, 1991). Tinto distinguished between the academic and social systems of college. The activities of the academic system in college center on classrooms and laboratories and involve various faculty and staff whose primary responsibilities are the education of students. The latter, social system, centers on the daily life and personal needs of various members of the institutions, especially students. It is made up of those recurring sets of interactions among students, faculty, and staff that take place largely outside the formal academic domain of the college. Academic integration results from sharing information, perspectives, and
values common to other members of the community. Social integration pertains to the extent of congruency between the individual student and the social system of a college or university. Tinto held that social integration occurs both at the level of the college or university and at the level of a subculture of an institution (Braxton et al., 2004; Braxton, & Hirschy, 2004). Even though Tinto tried to distinguish the academic and social systems in the college; the concepts contained within his theory were not rigidly defined, were relatively flexible, and relied on researchers’ conceptualizations. According to Brunsden et al (2000), the lack of definitions reduced the model to a series of loosely sensitizing concepts rather than a theory from which testable hypotheses can usefully and pragmatically be derived. Further, Tinto did not empirically test his theory. Thus, a lack of clear operational definitions resulted in some difficulties and confusion for later researchers.

Similar to the two core concepts of integration, Tinto did not operationally define the commitment construct. However, because he had given a clearer theoretical definition of commitment, there was less confusion and argument about how to operationalize that construct compared with the integration variables. Individual commitment is expressed as motivation, intention, drive, or effect, and takes two major forms, goal and institution. Goal commitment refers to a student’s commitment to personal, educational, and occupational goals. For example, it is the commitment to the achievement of the final goals which drive students to remain in their program of study. Institutional commitment refers to commitment to the institution in which one is enrolled. It indicates the degree to which students become integrated within the educational institution and come to feel a bond with that institution.
Persistence is defined as students staying in college until they get a degree. However, student departure is particularly difficult to define. The operational definition under which research is conducted may make a significant difference in the results and findings. For example, some researchers define actual student persistence behavior from the student college record as student persistence, while other researchers define student intent to persist as persistence. Some students have a goal of completing a specific set of classes and not of graduating with a degree.

Tinto's Integration construct has been widely tested in the literature. Pascarella and Terenzini tested the initial model of Tinto's (1975) theoretical framework. Their initial studies indicated two central concepts, academic integration and social integration and its role in college students' persistence. Terenzini and Pascarella (1978a; 1978b) noted that both academic integration and social integration could significantly discriminate those who stayed in college and from those who left. Further, some subpopulations of the campus were more susceptible to specific influences of integration than others (1978a, 1978b). For example, Terenzini and Pascarella (1980b) summarized six studies done in the previous five years that reviewed Tinto's (1975) model. Their conclusions were that Tinto's model had solid support and the core concepts, academic integration and social integration, have been consistently significant in discriminating between persisters and drop-outs. In addition, Mallette and Cabrera (1991) empirically examined whether the determinants of decisions to withdraw from the institution were similar to those affecting decisions to transfer to other institutions of higher education. Institutional commitment, academic performance, and student
perceptions of faculty concern for student development and teaching discriminated between persisters and dropouts.

Several scholars and researchers have challenged Tinto's theories for ignoring specific groups of students in higher education, particularly minorities, and community college students. Previous research has suggested that Tinto’s Theory may not be applicable to different institutional types or student populations. Tinto initially based his theory on research that involved a single four-year largely residential institution. However, compared to traditional residential college students, commuter and community college students are likely to experience a wide range of competing external pressures. These commuter and community college students typically do not spend significant amounts of time on campus interacting with other students and faculty members. According to Grosset (1989), many scholars have assumed that person-environmental fit models of retention may not be applicable to these students because of lack of social integration. For example, in commuter colleges most students do not live on dormitories but rather live off-campus. When Tinto's model was applied to commuter colleges, the findings of academic and social integration were apparently mixed. While some research indicated that both academic integration and social integration had relatively strong direct effects on college student persistence (Pascarella et al., 1983), other research revealed that only academic integration has a direct effect on persistence (Allen, 1986; Pascarella et al., 1981). For commuter students, the role of social integration is not consistent with Tinto's model. Researchers found that social integration either has a direct and indirect negative impact on persistence (Pascarella et al., 1983) or is not statistically significant.
Community colleges are primarily two-year public institutions providing higher education and lower-level tertiary education, granting certificates, diplomas, and associate degrees. The emergence of research applying Integration Theory in the two-year college environment started in the 1990s. Although the results have been largely congruent with Tinto's integration framework, there have been some inconsistencies with previous studies in other institutional types. The core concepts of academic integration and social integration have consistently been found to differentiate persisters from non-persisters at community colleges, but the relative degree of influence of academic and social integration may be mixed. While some studies in community college settings may reveal that academic integration (especially operationalized as interaction with faculty members) is a stronger predictor of persistence than social integration (Barnett, 2006; Halpin, 1990), some research showed that social integration made a larger contribution (Bers & Smith, 1991).

Although the results of the aforementioned studies indicated that students in different institutional types had somewhat different patterns in Integration Theory, these studies were mostly conducted in a single institutional type. Some researchers have tried to explore the impact of academic and social integration on student success across different institutional types. The results have suggested that patterns of student involvement in social and academic life depend on the factors such as institutional size, institutional type (residential or commuter colleges) and institutional level (four-or two-year colleges) (Pascarella & Chapman, 1983a; 1983b). Specifically, as the size of the college decreases, informal social and academic contact with the faculty increases (Pascarella, 1982; Pascarella & Chapman, 1983b). For example, students in residential institutions tended to have higher levels of
academic and social integration (Pascarella & Chapman, 1983b). While social integration had a direct or indirect influence on residential students, social integration had neither a direct nor indirect influence on persistence for commuter students (Pascarella & Chapman, 1983a). Students enrolled in four-year institutions are more involved in the social activities than two-year students. In addition, students in liberal arts colleges have been found to be the most academically integrated, while the four-year commuter students were the least (Williams & Creamer, 1988; Pascarella, 1982; Pascarella & Chapman, 1983b). Institutional commitment has been found to have a much stronger direct effect for four-year college students, while goal commitment was found to have a somewhat stronger direct effect for two-year commuter students (Pascarella & Chapman, 1983b). However, other research has suggested that two-year students have slightly higher institutional commitment scores than four-year college students. Moreover, classroom experience may be a more influential predictor of institutional commitment at two-year institutions, while social integration has more impact on for students at four-year institutions (Strauss & Volkwein, 2004).

The impact of academic integration and social integration may be different for male and female students. While academic integration may be more influential for male students, social integration may have a stronger impact on female students' persistence. While academic integration leads to social integration for male students, social integration leads to academic integration for female students (Stage, 1989a). Furthermore, institutional and goal commitment and, in particular, range of relationships with faculty have somewhat stronger positive influences on persistence for males than females (Pascarella & Terenzini, 1979b, 1979c, 1983). Furthermore, the racial/ethnic dynamic affects the process of academic
integration and social integration in college. Studies have suggested that the lack of academic integration more often bore negative consequences for ethnic minorities, especially in student academic achievement. In addition, academic integration served as the most important determinant of a minority student's perception of quality of the institution, which played a key role on minority students' intention to persistence. This is due to the fact that minorities usually are more likely to perceive discrimination and prejudice while on campus (Cabrera, Nora, Terenzini, Pascarella & Hagedorn, 1999; Nora & Cabrera, 1996). Further, students from different minority groups have different degrees of integration. Latino students usually score higher on the academic integration and social integration subscales than Asian students (Strage, 1999). In studying the effects of ethnicity on Tinto’s retention model, Pascarella (1985) found that none of the background variables predicted persistence for Caucasians and African Americans collapsed across gender. However, for African American males, attendance at a large institution had negative effects on retention, presumably though the greater difficulty African American males may have in becoming socially integrated at large, impersonal institutions. Pascarella noted that for Caucasian males and females, academic integration had a larger effect on persistence, whereas social integration was more important for African American males, and both were equally important for African American females. Pascarella (1985) then examined the types of social engagement that most impacted each group. He found that for Caucasian males and females, faculty interaction was most important. For African American males and Caucasian females, serving on an institutional committee had more impact.
Grosset (1995) tested the invariance of Tinto's model for low, middle, and high SES groups of African Americans attending a community college. Grosset determined that the model was invariant, that is, the basic structure of the model did not differ between groups. However, the model needed modification. None of the background variables or initial commitments affected academic integration, but commitments affected social integration. Otherwise, both academic and social integration had positive effects on retention, as well as subsequent goal and institutional commitment. Finally, a reciprocal relationship was found between academic and social integration, such that each influenced the other. Similarly, Saenz, Marcoulides, Junn, and Young, (1999) found that social integration is associated with one marker of academic integration, namely GPA. For Hispanic and Chicano students, initial goal and institutional commitment affect social integration, but neither social nor academic integration had direct effects on retention (Nora, 1987). The largest direct effects on retention came from initial goal and institutional commitment. However, Kraemer (1997) suggests that Tinto's operational definitions of academic and social integration may not be appropriate for the Hispanic ethnic group. Kraemer speculated that the constructs may be multidimensional in these groups, and, if so, he suggested that subcomponents of the academic and social constructs should be examined separately because the subcomponents of the constructs may have different relationships to persistence.

In addition, very little research has been done on the Native American population. The work that has been done on Native American students suggests that family background, subsequent goal commitment, and academic integration are among the stronger predictors of retention (Pavel & Padilla, 1993). Understanding the impact of race/ethnicity on students'
academic integration and social integration may require consideration of gender at the same time. In other words, there may be some interaction between gender and ethnicity. For example in Stage’s (1989a) study, minority females with higher levels of social integration were more likely to drop out. However, male minorities with high levels of academic integration were more likely to persist.

Researchers have integrated Tinto's theory with competing theories (Cabrera et al. 1992; Cabrera et al., 1993) and have elaborated on Tinto's theory using a number of different perspectives. These perspective include the economic perspective (Braxton, Breir, & Hossler, 1988; Cabrera et al. 1993; Cabrera, Stampen, & Hansen, 1990; St. John, Cabrera, Nora, & Asker, 2000), the sociological perspective (Anderson, 1988; Berger, 2000; Tinto, 2000), the psychological perspective (Baird, 2000; Bean & Eaton, 2000; Bean & Eaton, 2001-2002; Brower, 1992; Eaton & Bean, 1995; Peterson, 1993, Stage, 1989b), and the organizational perspective (Berger & Braxton, 1998; Braxton & Brier, 1989).

The work of Cabrera and colleagues (Cabrera et al., 1992; Cabrera et al.1993) illustrates the theory integration approach using the organizational perspective. Cabrera et al. (1992) brought together Tinto's (1975; 1987) Student Integration Theory and Bean’s (1983) Work Turnover Model into an integrated model. Cabrera et al. (1992) contend that the two models are compatible in major tenets, such as regarding the persistence process as longitudinal and depending on a match between the student and the institution. Bean's model emphasizes external factors that affect attitudes, such as family support and approval of institutional choice, encouragement by others to continue attending the institution, and satisfaction with perceived ability to pay for college in addition to perceptions of the ease of
transferring to another institution. However, Tinto included GPA in the operational definition of academic integration, whereas Bean considered GPA to be a result of psycho-social processes. Cabrera and colleagues' main purpose was to determine whether Bean's courses concept (i.e., satisfaction with course selection) was essentially the same construct as Tinto's Academic Integration. They also wanted to determine whether Bean's concept of Institutional Quality and Fit measured the same underlying construct as Tinto's Institutional Commitment. The results supported the merger of these two sets of constructs. Other researchers have used the organizational perspective to elaborate on Tinto's theory (Berger & Braxton, 1998; Braxton & Brier, 1989). Braxton and Brier tested Tinto's model with the inclusion of organizational variables, such as the effectiveness of the university in conveying rules and expectations, in enforcing the rules fairly, and in seeking students' participation in campus decision-making. They found that perceived fairness of the organization was the only organizational variable of the three that had a direct effect on social integration.

**College Student Self-efficacy**

Many studies have used the College Student Self-Efficacy Inventory to establish a body of evidence showing relationships of self-efficacy to academic performance and persistence among college students. For example, Gore at el. (2005) used the CSEI to examine college student’s self-efficacy in a three credit freshman experience course. These researcher explored academic self-efficacy in terms of three factor structures: academic, social, and roommate self-efficacy to establish concurrent and predictive validity of the 20-item College Self-Efficacy Inventory (CSEI) (Solberg, O'Brien, Villarreal, Kennell, & Davis, 1993; Solberg & Villarreal, 1997), using a sample of college students enrolled in a three-
credit freshman year experience course \( (N = 257) \) at a medium sized public midwestern university. Persistence was measured over a two-year period, defining retained students as those still enrolled after two years \( (N = 143, 59 \% \text{ of sample}) \) and withdrawn students as no longer enrolled \( (N = 100, 41\% \text{ of sample}) \). The retention rate was consistent with university student population. Predictive validity was estimated by comparing CSEI total scores with retained \( (M= 7.15, SD = 1.08) \) and non-retained students \( (M= 6.73, SD = 1.42) \) at two-years, resulting in significantly higher CSEI scores in retained students \( F (1,173) = 4.52, p < .05) \). Higher results were shown for the course subscale score, but no difference was observed in social or roommate subscales. Likewise, a similar pattern existed in comparison of CSEI with GPA measured at a two-year interval; however, no statistics are listed, other than discussing the pattern in terms of significant correlations. Predictive validity for CSEI academic scores (not total, social, or roommate) was estimated as accounting for 7% of variance in cumulative GPA, with total CSEI score accounting for 3% of variance in cumulative GPA. One item regarding joining an intramural sports team was excluded from the instrument. Gender differences on total score, course scores, and roommate scores were found with females significantly higher than males.

Multiple studies have examined the relationship of self-efficacy to college student persistence. For example, Gloria and Kurpius (2001) examined the relationships of social support, comfort in the university, and self-beliefs, operationally defined by measures of the College Self-Efficacy Inventory (CSEI) (Solberg et al., 1993) \( (a = .74) \), Educational Degree Behavior Self-Efficacy Scale (EDBSES) (Gloria et al., 1999), and Rosenberg Self-Esteem Scale (Rosenberg, 1965) of American Indian undergraduates. Course self-efficacy subscale
and social self-efficacy subscale were used from CSEI, roommate subscale was omitted. One item was deleted from social self-efficacy subscale to achieve adequate internal consistency ("ask a professor a question"). The sample included 83 American Indian undergraduates (Age: $M = 23.42$ years, $SD = 6.12$, range 17 to 43 years, Gender: 80.7 % female). Comfort in the university environment construct was measured by the University Environment Scale (Gloria & Kurpius, 1996), Cultural Congruity Scale (Gloria & Kurpius, 1996), and College Environmental Stress Index--Modified scale (Munoz, 1986). The University Environment Scale seeks to measure university perceptions and academic concerns of ethnic and racial minority students, consisting of questions such as "I do not feel valued as a student on campus," and "university staff has been warm and friendly." Significant correlational relationships to academic non-persistence measures were social support, specifically mentor relationships ($r = -.47, p = .01$), university comfort, specifically cultural congruity ($r = -.28, p = .05$), perception of university environment ($r = -.36, p = .01$), and self-beliefs, specifically measures of self-esteem ($r = -.40, p = .01$) and degree seeking self-efficacy ($r = -.29, p = .05$). In order of strongest to weakest predictors, social support measures, specifically mentor relationships, university comfort measures, specifically cultural congruity and perception of university environment, and self-beliefs measures, specifically self-esteem and degree seeking self-efficacy, were shown to significantly account for academic non-persistence decisions ($R^2$ range .21 to .12). Friend and family social support measures were not shown to be significantly correlated with non-persistence, authors suggest the family support was equal among students, and friend support was not specific to academic persistence decisions.
Gloria et al. (1999) examined the relationships of self-beliefs, operationally defined by measures of college self-efficacy, educational degree self-efficacy, and self-esteem, social support, and university comfort with academic persistence of 98 African American undergraduates at a large, mostly white southwestern state university (Age: \( M = 22.95 \) years, \( SD = 6.78 \), range 17 to 51 years, gender: female = 71, male = 27). Academic persistence was measured by a self-report instrument, Persistence/Voluntary Dropout Scale (a = .86) (Pascarella & Terenzini, 1980) rather than actual student retention at the university. Self-efficacy was measured using College Self-Efficacy Inventory (CSEI) (Solberg et al., 1993) which includes three factors of course efficacy (seven items), social efficacy (seven items), and roommate efficacy (six items). The CSEI was modified to exclude measure of roommate efficacy. Combined subscales (course and social) demonstrated a reliability coefficient of .92. Students' confidence in completing degree requirements was measured using the Educational Degree Behaviors Self-Efficacy Scale (Gloria et al., 1999) with 14 degree-specific items (Cronbach's a = .93). Student’s \( t \)-tests were conducted to determine no gender or place of residence differences. A series of hierarchical regression analysis was conducted. Social support (\( K^2 = .11 \)) and university comfort (\( R^2 = .10 \)) accounted for about the same variance of persistence decisions, both are considered weak relationships.

Rayle et al. (2006) examined academic self-efficacy in a sample of female university students. They analyzed the relationships of grade point averages with self-beliefs, including one measure of self-esteem, and combined measures self-efficacy, social support, and university comfort for 527 female, first semester, undergraduates. Hierarchical regressions were performed indicating social support, self-beliefs, and university comfort predicted
54.2% of variance in academic retention decisions \( F(10, 512) = 60.52, p < .001 \). In addition, following data collection, the sample was split into two groups, women of color and Euro-American women, to compare academic persistence decisions and first-year GPA's. A MANOVA was used to test for group differences, with persistence decisions and GPA used as the dependent variables, showing significantly lower first-year GPA for women of color \((M = 2.62, SD = .79)\) compared to Euro-American women \((M = 3.53, SD = .40)\). This was the only difference between these groups. Self-efficacy was measured by combining the 14-item College Self-Efficacy Inventory (CSEI) (Solberg et al., 1993) and the 14-item Educational Degree Behaviors Self-Efficacy Scale (EDBSE) (Gloria et al., 1999). Cronbach's alpha was listed for the combined measures for this sample \((r = .95)\). This reference may provide evidence of the reciprocal relationships between self-efficacy, social support, and perceived university climate/culture, or alternatively, the relationships may indicate confounding variables when not controlled in studies of self-efficacy. The duration of college success courses or other interventions may be related to self-efficacy change, although optimal duration has not been determined. A short, five day course was insufficient to increase student self-efficacy scores. Likewise, retention rates showed no difference compared to those who did not attend the course.

**Science, Technology, Engineering and Mathematics (STEM)**

Academic performance and self-perceptions of academic ability are two factors associated with participation and persistence in STEM education, especially for underrepresented groups such as women and ethnic minorities (Betz, 2005; Dweck, 2007; Lupart et al., 2004). In one 2008 study, high school and freshman year grade point average
(GPA) have the highest importance for predicting the persistence of female and male students majoring in science or engineering (Mendez, Buskirk, Lohr, & Haag, 2008). Other studies show a positive relationship between women's persistence in "nontraditional" majors and careers and indicators of performance. For example, academic performance as measured by standardized test scores and GPA is related to persistence whereby people who achieve higher scores and grades persist longer (Fassinger, 1985; 1990).

Self-perception of ability is another factor related to retention in STEM fields. Female and males have been found to differ in their self-perceptions of STEM-related abilities and their attributions regarding a success or failure (Dweck, 2007; Lupart et al. 2004). For example, in one study, boys demonstrated greater endorsement of statements such as "I am good at science/math," "If I were to rank the students in my science/math class from the lowest to the highest, I would put myself in the highest group," and "I would be successful in a career that required science/math ability" as compared to girls (Lupart et al. 2004). In the same study, girls consistently held the perception of having to work harder at science as compared to boys with greater endorsement of statements such as "I have to work hard to get good grades in science." Research has shown that there has been an increase in the representation of women in STEM disciplines over the years; however, gender inequality still remains in the number of women in these fields (American Association of University Women [AAUW], 2010).

The patterns of gender differences are relatively similar for all racial and ethnic groups. However, when compared to African-American men, the proportion of African-American women in STEM disciplines is low and continues to decline at every level of
degree attainment (National Science Foundation, 2009). Many explanations have been given for the underrepresentation of women in STEM disciplines. For example, in Blickenstaff’s (2005) review of the literature on the factors associated with the underrepresentation of women in STEM disciplines causes have been attributed to biological differences, lack of academic preparation in science and mathematics, absence of female science and engineer role models, cultural pressure to conform to traditional gender roles and an unwelcome climate that favors male students.

Furthermore, the lack of effective academic and career advising has been recognized as a central factor in the small number of African Americans pursuing STEM fields both academically and vocationally (Hall & Post-Kammer, 1987; Seymour & Hewitt, 1997). Gainor and Lent (1998) argued that interest in mathematics is the most crucial factor in African American students deciding to major in a STEM discipline. They found that African American students' with high mathematics self-efficacy also possessed higher expectations regarding their performance within the discipline. This high level of self-efficacy and self-expectations led to enrollment in higher level mathematics courses, resulting in a greater interest in STEM disciplines. They agreed that it is this interest that ultimately results in students selecting a STEM field major.

**Summary**

There were a number of specific researchers cited in this literature review that contributed either general philosophies or specific works that may influence, guide, or inform this current research. The literature reviewed in this chapter is relevant to concepts concerning incoming first-generation students who are enrolled in a STEM discipline and
their transition to a higher educational setting. The first section detailed a review of first-generation college students’ characteristics and experiences. The second section discusses Tinto’s Theory of academic and social integration and the theory assumptions, key constructs and its usefulness to the college student population. The third section examines college student self-efficacy and the many studies that have used the College Student Self-efficacy Inventory to establish relationships between self-efficacy and academic performance and persistence among college students. The fourth section provided a brief review of research conducted with students enrolled in STEM.

Most of the studies cited in this literature review have been descriptive and have relied on data collected from other institutions. Researchers apparently continue to examine options for effective and appropriate methods of data collection, and cite various challenges to exploring perceptions, attitudes and belief structures while designing scientifically accurate studies. There appear to be many implications from the literature concerning effective retention models for retaining first-generation college students enrolled in a STEM discipline at a HBCU. These sections of the literature review guided in formulating the following research questions: (a) What are the differences in the levels of academic engagement between first-generation and other college students enrolled in a STEM discipline? (b) What are the differences in the levels of social engagement between first-generation and other college students enrolled in a STEM discipline? (c) What are the differences in the college self-efficacy variables between college students enrolled in a STEM discipline and their levels of parental educational attainment? (d) What are the differences in the college academic and social self-efficacy variables between first-generation
and other college students enrolled in a STEM discipline?

Common themes that existed from the present review were the impact of academic and social engagement on how minority students persist in college and the differences found between the background, academic and social characteristics among first-generation and other college students. Based on these themes, the results of this study should be meaningful and relevant to educators interested in investigating college student experiences and college self-efficacy among first-generation enrolled in a STEM discipline at a HBCU. The implications of this study might also be meaningful to educators interested in determining which policies and procedures can be implemented in an effort to match these students' expectations with their experiences and level of college self-efficacy. Thus, the findings of this study may be used to improve the existing policies and practices of higher education in the area of retention and successful persistence.
Chapter III

Method

The primary purpose of this study was to determine the differences in the levels of academic and social engagement and college self-efficacy between first-generation and other college students enrolled in a STEM discipline at a HBCU.

Research Design

A two-group ex post facto research design using two questionnaires was used for this study. Ex post facto designs are used when the researcher is not able to randomly assign participants into experimental groups; rather, the groups are determined by a pre-existing or naturally occurring condition (Breakwell, Hammond, Fife-Schaw & Smith, 2006; Schenker & Rumrill, 2004). In this study, the predetermined group variable was parental level of education. A group of college students enrolled in a STEM discipline will be gathered and divided into groups based on their parental level of education; groups will be determined based on the levels of parental education revealed. Categories are: no college; yes, both parents; yes, father only; yes, mother only; and don’t know. The researcher will make an effort to recruit a sufficient number of participants to represent each group rather than simply operationalizing parental level of education as a dichotomous variable. Quantitative data will be obtained from the College Student Experiences Questionnaire and the College Self-Efficacy Inventory. This study will survey both students whose parents graduated from a 4-year college (other college students) and students whose parents who did not graduate from a 4-year college (first-generation).
Profile of Participants

Fayetteville State University is a constituent institution of the University of North Carolina and the second-oldest public institution of higher education in the state. Founded in 1867 as the Howard School for the Education of African Americans, today FSU serves a growing student body of over 6,600 and ranks among the nation's most diverse campus communities. The primary mission of Fayetteville State University is to provide quality education to its students through a basic liberal-arts foundation, specialized professional training, and specific graduate programs. The university offers bachelor's degrees in 43 areas, Master's degrees in 22 areas, and one doctoral degree in educational leadership. The university is fully accredited by the Southern Association of Colleges and Schools.

The percentage of undergraduate students enrolled in STEM fields at Fayetteville State University was at 10% in 2003-2004 (Title III B Report, 2010-2011). This was much lower than the national percentage of 14% for the same time period. Although the overall number of STEM majors increased to 441 in fall 2007, this is about 6.7% of the total student population. More importantly, the number of STEM majors is about the same as that of psychology majors (6.3%) and lower than that of criminal justice (7.1%) (Title III B Report, 2010-2011). In fall 2009, STEM undergraduate enrollment increased to 531 students. This is about 9.5% of the institution's overall undergraduate enrollment. The number of baccalaureate degrees in STEM disciplines conferred declined from 82 in 2005-2006 to 67 in 2008-2009, a decrease of about 21% while the institution's overall number of baccalaureate degrees increased by about 9% within the same period. It must be noted that the percentage of baccalaureate STEM degrees in 2005-2006 was about 11.6% compared to 8.7% in 2008-
2009. These numbers were lower than those of single majors such as criminal justice (14.2%, 15.1%), psychology (11.7%, 15%) and sociology (8.2%, 9.6%) (Title III B Report, 2010-2011). While the institution as a whole continues to struggle with retention and graduation rates, the problem is more severe in STEM disciplines. The average SAT scores of first-time freshmen of 846/865 are low compared to the 1072/1082 average for all 16 UNC institutions and 1009/1017 nationwide (fall 07/fall 08). Research has linked student academic performance in math and science to their SAT scores and a program to improve SAT scores of students, particularly those interested in math and science, is clearly an imperative (Title III B Report, 2010-2011).

**Instrumentation**

**College Student Experiences Questionnaire (CSEQ).** Robert Pace developed the CSEQ at the University of California Los Angeles in the 1970s and introduced it as a multi-institutional survey tool in 1979. It has been revised three times since: the second edition in 1983, the third edition in 1990, and the fourth edition 1998. The fourth edition of the CSEQ (Pace & Kuh, 1998) is designed for students attending four-year colleges and universities and gathers information about students' background (age, major field, and so forth) and their experiences in three areas. With over 150 items, the CSEQ provides colleges and universities with a comprehensive inventory of the student experience. The first area is the amount of studying, reading, and writing students do and the time and energy (quality of effort) they devote to various activities measured by items contributing to 13 Activities Scales. One of these scales, Computer and Information Technology (C&IT), is composed of nine items describing various forms and uses of computers and information technology. The response
options for all Activities items are: 4="very often," 3="often," 2="occasionally," and 1="never."

The second area includes 10 Environment items representing student perceptions of the extent to which their institution emphasizes important conditions for learning and personal development. Student responses are scored on a 7 point scale ranging from "strong emphasis" = 7 to a "weak emphasis" = 1. The final set of questions asks students to estimate the extent to which they have made progress since starting college in 25 areas that represent desired outcomes of higher education. Response options for the Gains items are: 4="very much," 3="quite a bit," 2="some," and 1="very little."

Since its inception, the CSEQ has been administered to over 300,000 students attending more than 400 different colleges and universities in the United States making it the third largest national database on college student experiences. Over 100,000 students at 200 different institutions have completed the fourth edition alone. The CSEQ data have been cited in over 250 articles, books, and dissertations, and probably an equal number of institutional reports. The CSEQ remains one of the few national assessment instruments that inventories both the processes of learning (e.g., interactions with faculty, collaboration with peers, and writing experiences) and progress toward desired outcomes of college (e.g., intellectual skills, interpersonal competence, and personal values). The comprehensive nature of the CSEQ makes it possible for researchers to identify different combinations of survey items that measure useful constructs within the study of higher education. These can be derived empirically using factor analysis, or constructed using expert judgment and knowledge of the literature. Consistent with previous versions of the CSEQ Norms, a factor
analysis of the 10 College Environment items produced three factors and the 25 Estimate of Gains items were reduced to five factors.

The validity of self-reported information such as that obtained by the CSEQ has been thoroughly examined (Baird, 1976; Lowman & Williams, 1987; Pace, 1985; Pike, 1995; Turner & Martin, 1984). Generally, self-reported information is likely to be valid if five conditions are met: (a) if the information requested is known to the respondents, (b) the questions are phrased clearly and unambiguously (Laing, Sawyer, & Noble, 1988), (c) the questions refer to recent activities (Converse & Presser, 1989); (d) the respondents think the questions merit a serious and thoughtful response (Pace, 1985), and (e) the questions do not threaten, embarrass, or violate the privacy of the respondent or encourage the respondent to respond in socially desirable ways (Bradburn & Sudman, 1988). CSEQ items satisfy all these conditions. The questionnaire requires that students reflect on what they are putting into and getting out of their college experience. The items are clearly worded, well defined, and have high face validity. The nature of the questions refers to common experiences of students during the current school year, typically a reference period of about six months or less. The format of most response options is a simple rating scale that helps students to accurately recall and record the requested information, thereby minimizing this as a possible source of error. Based on their review of the major college student research instruments, Ewell and Jones (1996) concluded that the CSEQ has excellent psychometric properties and high to moderate potential for assessing student behavior associated with college outcomes. The validity of the CSEQ is well substantiated. It has been used extensively in college impact research studies (Pike, 1993, 2000); it’s self-reported “gains scales” are highly consistent
with criterion-based achievement test results (Pascarella, 2001; Pike, 1995); and it has “excellent” psychometric properties (Ewell & Jones, 1996. Researchers calculated internal consistency indices (for instance, Cronbach’s alpha) to establish reliability. Kuh, Pace, and Vesper (1997) report that alpha values for the CSEQ subscales are high, ranging from .81 to .91. Thus, the CSEQ is regarded as a reliability instrument as well.

**College Student Efficacy Inventory (CSEI).** The CSEI was developed by Solberg et al. (1993) in order to more fully understand the role of self-efficacy on college adjustment. When constructing an instrument to measure college self-efficacy, they did not specify a theoretical model upon which their conceptualization of college self-efficacy was based; they instead took a bottom-up approach by listing the various tasks that individuals encounter in college settings. They used college self-help manuals to develop a pool of 40 items that addressed various college-related issues. This pool of items was then rated with respect to their clear and specific nature and to their importance to and representation of the college experience. Twenty of the items had high consensus among the raters and were phrased to follow the statement: “How confident are you that you could successfully complete the following tasks:...” A 10-point scale was used to rate confidence. High scores equal greater confidence.

Although the authors of the measure did not have a theoretical model driving the development of the CSEI (they were simply writing items to encompass the college experience), it is not surprising that when examining the final 20 items, two broad categories emerge: items with an academic focus and items with a social focus. This is not entirely unexpected given that these two areas are at the heart of the college experience. Several
studies have examined the dimensionality of the CSEI. Initially, the scale authors conducted a principal components (PC) analysis to examine the dimensionality of scores using a sample of 164 second- and third-year, Hispanic university students (Solberg et al., 1993). Because only 19 of the 20 items had pattern coefficients greater than .50, the authors advised the use of a 19-item scale. PC 1, labeled Course Efficacy, consisted of seven items pertaining to course performance ($\alpha = .88$). PC 2, labeled Roommate Efficacy, consisted of four items reflecting aspects of interacting with roommates ($\alpha = .88$). Finally, PC 3, labeled Social Efficacy, consisted of eight items related to interpersonal and social adjustment ($\alpha = .88$). Both the Roommate and Social subscales were social in nature, but the Roommate items were more specific to social interactions with those you live with (e.g., “Get along with others you live with.”), whereas the Social items were largely specific to social interactions in the classroom or with university staff (e.g., “Participate in class discussions.”).

Several years after the CSEI had been developed; Solberg and colleagues (Solberg et al., 1998) reexamined the dimensionality of the 20-item CSEI by conducting a principal components factor analysis (PCA) with varimax rotation using a sample of 388 first- and second-year students. Here, the authors championed a four-component solution with the first three components represented by Course, Roommate, and Social self-efficacy items ($\alpha = .86, .89, .79$, respectively). The fourth component, named Social Integration Efficacy ($\alpha = .62$), consisted of three items, which the authors suggested connection to the institution. However, when examining the three social integration items, it appeared as if these items may not be applicable to all students (e.g., “Get a date when I want one.”). Thus, it seemed reasonable that these items function differently than the Social Efficacy items and that the fourth subscale
may be simply comprised of poorly functioning items. This is empirically evident by the low reliability and pattern coefficients associated with these items, but needs additional study. Interestingly, the authors reported Cronbach’s coefficient for the total scale score ($\alpha = .91$), even though they championed a four component solution. It is unclear if they were conceptualizing college self-efficacy as unidimensional even though they found a multidimensional structure.

More recently, the factor structure of the CSEI has been examined using confirmatory factor analysis (CFA). Using a sample of 257 first-year university students, Gore, Leuwerke, and Turley (2006) conducted a CFA to test the two previously identified CSEI factor structures. They tested the 19-item, three-factor model (Solberg et al., 1993), the 20-item, four-factor model (Solberg et al., 1998), and a one-factor model in which all 19 items were hypothesized to be related to a single underlying factor. If supported, this one-factor model would provide strong evidence for computing a total college self-efficacy score. The three-factor model had adequate model-data fit, the one-factor model did not fit the data, and the four-factor model failed to converge. Additionally, the authors reported adequate internal consistency coefficients for the three subscale scores (Course $\alpha = .88$, Roommate $\alpha = .83$, Social $\alpha = .86$). Thus, this study provided additional evidence for the three-factor structure of the CSEI.

**Demographic Survey.** This scale was created for the purposes of this study. The scale contains 12 questions that ask participants about their age, gender, race, living conditions, residency, classification at the university, parental educational achievement, source of income during the university year, educational or employment goals. In addition,
two questions ask the participant to list a person (by relationship, not name) of who either supported or not supported their educational plans. These two questions relate to parental involvement and the background contextual influences of being the first in the family to attend college.

Procedures

Data collection. Permission to use and administer the College Student Experiences and College Self-Efficacy Inventory was obtained from the Institutional Review Boards (IRB) of the participating institutions. In the spring 2012 semester, a stratified random sampling process was used to survey students enrolled in a STEM course. Stratified sampling is most likely to be used when the researcher is convinced that a particular variable is of such importance that the researcher wants to ensure that it is represented as it would be in the population. The strata for the sample were first-generation status: first-generation college student and other college student. A random sample of students was selected from 300 and 400 level STEM courses from the following departments: biological sciences, chemistry and physics and mathematics and computer sciences. After selecting the courses, the course professors were contacted to seek permission to administer the questionnaires and to determine the most desirable time for administering the questionnaire to the study participants. During the administering of the questionnaire, the researcher informed students that they were being asked to voluntarily participate in research that will examine their college experiences and college self-efficacy. The procedures of the study and the estimated time requirement of 30 minutes were discussed as well. Students were informed that their participation will be both anonymous and confidential as no identifying information will be
disclosed. In addition, students in attendance were given the opportunity to voluntarily participate in the research study or they could elect to decline participation and leave the event without penalty or question. Packets containing the CSEQ and the CSEI were distributed to all student volunteers. After completion of both questionnaires, they were returned to the researcher by each participant. Data collection was conducted during the first four weeks of the spring 2012 semester.

**Data analysis.** To ensure that the sample size is big enough, a power analysis calculation was conducted to determine what size sample was needed. For any power calculation, one needs to identify the statistical test being used, the alpha value or significance level, the expected effect size, and the sample size. To answer question number one, a one-way Analysis of Variance (ANOVA) was used to examine the differences between first-generation and other college students enrolled in a STEM discipline and their levels of academic engagement. The independent variables for this question consisted of first-generation and other college students. The dependent variables consisted of questions listed under the “college activities” academic category. The academic categories consisted of library, computer and information technology course learning, writing experiences, experiences with faculty and art, music, theater and scientific and quantitative experiences. An example of a question listed under the “library” category was, “*Found something interesting while browsing in the library,*” and a “computer and information technology question was’ “*Searched the World Wide Web or Internet for information related to a course.”*
To answer question number two, a one-way Analysis of Variance (ANOVA) was used to examine the differences between first-generation and other college students enrolled in a STEM discipline and their levels of social engagement. The independent variables for this question consisted of first-generation and other college students. The dependent variables consisted of questions listed under the “college activities” social category. The social categories consisted of campus facilities, clubs and organizations, personal experiences and student acquaintances. An example of a question listed under the “campus facilities” question was, “Used campus lounge to relax or study by yourself,” and a “clubs and organizations” questions was “Attended a meeting of a campus club, organization, or student government group.”

To answer question number three, a one-way Analysis of Variance (ANOVA) was used to examine the differences between the levels of parental educational attainment and college academic and social self-efficacy. The independent variable consisted of the college student’s parental educational attainment. The levels of parental educational attainment consisted of: (a) yes, both parents; (b) yes, father only and (c) yes, mother only. The dependent variables consisted of questions listed on the College Self-Efficacy Inventory. An example of questions listed on the inventory consisted of: “Make new friends at college,” “Ask a professor a question,” “Do well on exams,” and “Get along with others you live with.”

To answer question number four, Chi-square Analysis was used to examine the differences between first-generation and non-first-generation college students enrolled in a STEM discipline and their levels of college academic and social self-efficacy. The independent variables for this question consisted of first-generation and non-first-generation
college students. The dependent variables consisted of questions listed on the College Self-Efficacy Inventory. An example of questions listed on the inventory consisted of: “Make new friends at college,” “Ask a professor a question,” “Do well on exams,” and “Get along with others you live with.” The data were analyzed item by item by determining the number and percent of responses for each choice. This was done for first and non-first generation college students using the crosstabs routine in SPSS version 19.
Chapter IV

Results

The purpose of this study was to determine the differences in college student experiences and college self-efficacy among first-generation and other college students enrolled in a STEM discipline at a HBCU. Using the College Student Experiences Questionnaire and the College Self-Efficacy Inventory, the study focused on the following research questions: (a) What are the differences in the levels of academic engagement between first-generation and other college students enrolled in a STEM discipline? (b) What are the differences in the levels of social engagement between first-generation and other college students enrolled in a STEM discipline? (c) What are the differences in the college self-efficacy variables between college students enrolled in a STEM discipline and their levels of parental educational attainment? (d) What are the differences in the college academic and social self-efficacy variables between first-generation and other college students enrolled in a STEM discipline?

The sample consisted of 90 college students enrolled in a STEM discipline at a Historically Black College and University. There were 121 students who originally completed the CSEQ and the CSEI surveys. Thirty-seven percent (45) of the 121 college students were classified as other college student and 76 of the study participants were classified as first-generation college students. The Cohen’s G power analysis for Chi-square concluded that using a low effect size of ($f^2 = .33$) with 80% power that the sample size required was 89. For ANOVA, the Cohen’s G power analysis concluded that using a low effect size of ($f^2 = .33$) with 80% power that the sample size required is 38 per group.
Therefore, the data for the research questions were analyzed using descriptive and inferential statistics based upon the subscales of the College Student Experiences Questionnaire and the College Self-Efficacy Inventory with the sample size set at $N = 45$ for the first-generation college student group and $N = 45$ for the other college student group.

Data analysis was conducted on the mean scores and frequency distribution responses for the first-generation and other college student groups using the Statistical Package for the Social Sciences (SPSS), Version 19.0 to determine if there were differences on each of the dependent variables. A one-way Analysis of Variance (ANOVA) was used to examine the differences between first-generation and other college students enrolled in a STEM discipline and their levels of academic, social engagement and college self-efficacy. In addition, an ANOVA was used to examine the differences in the college self-efficacy variables between college students and their levels of parental educational attainment. Chi-square analyses were used to examine the differences between first-generation and other college students enrolled in a STEM discipline and their levels of college academic and social self-efficacy. The data were analyzed item by item by determining the number and percent of responses for each choice. This was done for first-generation and other students using the crosstabs routine in SPSS. This chapter examines the quantitative data that were gathered with the CSEQ and CSEI questionnaires. The questions on the two questionnaires explored the perceptions about the college experiences and self-efficacy beliefs held by first-generation and other students.

**Participant Demographics**

Examining the parent college education status in this study, 52.2% had parents with no college degree, 24.4% had both parents that had a college degree, and 23.4% had at least 1
college educated parent. At all degree levels, more mothers earned degrees than fathers did. This finding is consistent with another study of African American college freshmen where African-American students’ mothers were slightly more likely than their fathers to be college graduates (Astin, 1990). The majority of the participants (72%) were college students between the ages of 20 and 29 years, most of whom were African Americans (59%). However, the first-generation gender compositions and ethnicity of students in this study are consistent with other studies (Tinto, 1993, Hicks, 2003). Fifty-seven percent of the sample was female. This follows the trend for most college and universities that enroll African American students. National data demonstrates that African-American women outnumber African-American men on college campuses. In 2000 (Hoffman, Llagas, & Snyder, 2003), 63% of the African-American population on college campus were female and 37% was male.

The participants in the study comprised of 3.3% sophomores, 22.2% juniors, 72.2% seniors and 2.2% other. The majority of the participants (39%) were college students taking between 7 and 11 credit hours, 31% of the sample were taking between 15 and 16 credit hours and 20% were taking 17 or more credit hours. Forty-five percent of the study participants indicated that they had plans of attending a graduate school.

**Quantitative Analysis**

The between groups analysis was a comparison of the first-generation and other college students’ responses to the CSEQ and CSEI questionnaires. This analysis helped to determine if there were any differences in the perceptions and beliefs concerning college experiences and self-efficacy between first-generation and other college students enrolled in a STEM discipline at a Historically Black College and University.
Academic engagement by first-generation and other college student status. As can be seen in Table 1, a one-way ANOVA comparing the mean scores of the first-generation and other college student groups found a statistically significant difference ($F(1,88) = 4.108, p = .044, \eta^2 = .045$) between the means of the two groups for item, “used a computer to analyze data (statistics, forecasting, etc.).” The strength of the relationship between the dependent variable was moderate with 5% of the variability in the dependent variable is accounted for. This analysis revealed that the mean score for the first-generation college students was significantly higher ($M = 2.13, SD = 1.160, 95\% CI = [1.843, 2.424]$) than the mean of the other college students ($M = 1.71, SD = .757, 95\% CI = [1.421, 2.001]$). First-generation college students felt that they “often” used a computer to analyze data, whereas the other college students felt that they “very often” used a computer to analyze data. For item, “talked about art (painting, sculpture, artists, etc.) or the theater (plays, musicians, dance, etc.) with other students, friends, or family members,” a statistically significant difference ($F(1,88) = 4.183, p = .044, \eta^2 = .045$) was found between the means of the two groups. The strength of the relationship between the dependent variable was moderate with 5% of the variability in the dependent variable accounted for. The mean score for the first-generation college students was significantly higher ($M = 3.20, SD = .991, 95\% CI = [2.895, 3.505]$) than the mean score of the other college students ($M = 2.76, SD = 1.069, 95\% CI = [2.450, 3.061]$). First-generation college students felt that they “occasionally” talked about art or the theater with other students, friends, or family members. The other college students felt that they “often” talked about art or the theater with other students, friends, or family members.
It was interesting to note that for item, “talked about music or musicians (classical, popular, etc.) with other students, friends, or family members,” a statistically significant difference ($F (1, 88) = 9.383, p = .003, \eta^2 = .096$) existed between the mean score of the two groups. The strength of the relationship between the dependent variable was large with 10% of the variability in the dependent variable accounted for. The mean score for the first-generation college students was significantly higher ($M = 2.71, SD = .815, 95\% CI = [2.446, 2.976]$) than the mean of the other college students ($M = 2.13, SD = .968, 95\% CI = [1.868, 2.398]$). Both first-generation and other college students felt that they “often” talked about music or musicians with other students, friends, or family members.

Table 1

Means and Standard Deviations for Academic Engagement by First-generation and Other college students Status

<table>
<thead>
<tr>
<th>Group</th>
<th>First-generation $n = 45$</th>
<th>Other students $n = 45$</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used a computer to analyze data</td>
<td>$M/SD = 2.13/1.160$</td>
<td>$M/SD = 1.71/.757$</td>
<td>.044*</td>
</tr>
<tr>
<td>Talked about art or theater</td>
<td>$M/SD = 3.20/.991$</td>
<td>$M/SD = 2.76/1.069$</td>
<td>.044*</td>
</tr>
<tr>
<td>Talked about music or musicians</td>
<td>$M/SD = 2.71/.815$</td>
<td>$M/SD = 2.13/.968$</td>
<td>.003**</td>
</tr>
</tbody>
</table>

Note: *significant at .05; **significant at .01

Social engagement by first-generation and other college student status. As seen in Table 2, the distribution of responses for the first-generation and other college students were very similar for item, “met other students at some campus location (campus center, etc.) for a
A statistically significant difference \( F(1, 88) = 5.870, p = .017, \eta^2 = .063 \) was found between the means of the two groups. The strength of the relationship between the dependent variable was moderate with 6% of the variability in the dependent variable accounted for. The mean score for the first-generation college students was significantly higher \( (M = 2.57, SD = .941, 95\% CI = [2.294, 2.861]) \) than the mean score of the other college students \( (M = 2.08, SD = .973, 95\% CI = [1.805, 2.372]) \). Both first-generation and other college students felt that they “often” met other students at some campus location for a discussion. For item, “used campus recreational facilities (pool, fitness equipment, courts, etc.).” A statistically significant difference \( F(1, 88) = 3.957, p = .050, \eta^2 = .043 \) was found between the mean score of the two groups. The strength of the relationship between the dependent variable was moderate with 4% of the variability in the dependent variable accounted for. The mean score for the first-generation college students was significantly higher \( (M = 3.31, SD = 1.062, 95\% CI = [2.997, 3.625]) \) than the mean of the other college students \( (M = 2.86, SD = 1.057; 95\% CI = [2.553, 3.181]) \). First-generation college students felt that they “occasionally” used campus recreational facilities whereas other college students reported that they “often” used campus recreational facilities. For item, “identified with a character in a book, movie, or television show and wondered what you might have done under similar circumstances.” A statistically significant difference \( F(1, 88) = 3.960, p = .050, \eta^2 = .044 \) was found between the mean score of the two groups. The strength of the relationship between the dependent variable was moderate with 4% of the variability in the dependent variable accounted for. The mean score for the first-generation college students was significantly higher \( (M = 2.61, SD = .970, 95\% CI = [2.320, 2.907]) \) than the mean of the
other college students ($M = 2.20, SD = .991; 95\% \text{ CI} = [1.909, 2.491])$. Both first-generation and other college students felt that they “often” identified with a character in a book, movie, or television show and wondered what they might have done under similar circumstances. For item, “became acquainted with students whose family background (economic, social) was different from yours.” A statistically significant difference ($F (1, 88) = 4.601, p = .035, \eta^2 = .050$) was found between the means of the two groups. The strength of the relationship between the dependent variable was moderate with 5\% of the variability in the dependent variable accounted for. The mean score for the first-generation college students was significantly higher $M = 2.26, SD = 1.074; 95\% \text{ CI} = [1.990, 2.543]$) than the mean of the other college students ($M = 1.84, SD = .767; 95\% \text{ CI} = [1.568, 2.121]$). First-generation college students felt that they “often” became acquainted with students whose family background (economic, social) was different from theirs whereas other college students reported that they “very often” became acquainted with students whose family background was different.
Table 2
Means and Standard Deviations for Social Engagement by First-generation and Other college students Status

<table>
<thead>
<tr>
<th>Group</th>
<th>First-generation</th>
<th>Other students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n = 45$</td>
<td>$n = 45$</td>
</tr>
<tr>
<td></td>
<td>$M/SD$</td>
<td>$M/SD$</td>
</tr>
<tr>
<td>Met other students</td>
<td>2.57/.941</td>
<td>2.08/.973</td>
</tr>
<tr>
<td>Used campus recreational facilities</td>
<td>3.31/1.062</td>
<td>2.86/1.057</td>
</tr>
<tr>
<td>Identified with a character</td>
<td>2.61/.970</td>
<td>2.20/.991</td>
</tr>
<tr>
<td>Became acquainted with students</td>
<td>2.26/1.074</td>
<td>1.84/.767</td>
</tr>
</tbody>
</table>

Note: *significant at .05

College self-efficacy variables by levels of parental educational attainment

Table 3 presents a summary of college self-efficacy variables reported by levels of parental educational attainment. The table contains the mean scores for each question related to the college self-efficacy variables by students enrolled in a STEM discipline that had both parents or at least one parent that attained a four year degree. It is interesting to note that there was no statistical significant difference found between students enrolled in a STEM discipline that had both parents or at least one parent that attained a four year degree for the 20 items listed on the College Self-Efficacy Inventory. However, the distribution of responses by both groups was very similar for items 11, 13, 14, 15, 16, 18 and 20. For those items, both groups felt “very confident” that as a student that they could successfully complete the following tasks. For item 11, “talk to your professors,” $(F(1,41) = .291, p =$
.593, \( \eta^2 = .007 \)), the mean score for the STEM students with both college educated parents was slightly higher \( (M = 8.23, SD = 2.092, 95\% CI = [7.383, 9.072]) \) than the mean of the STEM students with 1 parent that graduated from a four year institution \( (M = 7.90, SD = 1.814; 95\% CI = [7.041, 8.769]) \). The strength of the relationship between the dependent variable was moderate with 0.7% of the variability in the dependent variable is accounted for by the relationship between the dependent (talk to your professor) and the independent variables (both parents educated vs. one parent educated). Both groups felt that they were very confident that they could successfully talk to their professors. A similar pattern existed for item 13, “ask a professor a question,” \( (F(1,41) = .800, p = .376, \eta^2 = .019) \), the mean score for the STEM students with both college educated parents was slightly higher \( (M = 8.55, SD = 1.896, 95\% CI = [7.760, 9.331]) \) than the mean of the STEM students with 1 parent that graduated from a four year institution \( (M = 8.05, SD = 1.746; 95\% CI = [7.244, 8.851]) \). The strength of the relationship between the dependent variable was small with 2% of the variability in the dependent variable accounted for. Both groups felt that they were very confident that they could successfully ask a professor a question. Item 14, “take good class notes,” \( (F(1,41) = .106, p = .746, \eta^2 = .003) \), the mean score for the STEM students with both college educated parents was slightly higher \( (M = 8.55, SD = 1.792, 95\% CI = [7.833, 9.258]) \) than the mean of the STEM students with 1 parent that graduated from a four year institution \( (M = 8.38, SD = 1.499; 95\% CI = [7.651, 9.111]) \). The strength of the relationship was small with 0.3% of the variability in the dependent variable accounted for. Both groups felt that they were “very confident” that they could successfully take good class notes. Item 15, “get along with others you live with,” \( (F(1,41) = 1.322, p = .257, \eta^2 = .031) \), the mean
score for the STEM students with both college educated parents was slightly higher ($M = 8.86, SD = 1.781, 95\% CI = [8.096, 9.632]$) than the mean score of the STEM students with 1 parent that graduated from a four year institution ($M = 8.24, SD = 1.786; 95\% CI = [7.452, 9.024]$). The strength of the relationship was small with 3\% of the variability in the dependent variable accounted for. Both groups felt that they were very confident that they could get along with others they lived with. With regards to item 16, “divide space in their residence, ($F(1,41) = .338, p = .564, \eta^2 =.008$); item 18, “keep up to date with their school work, ($F(1,41) = .016, p = .899, \eta^2 =.000$) and item 20, “socialize with others you live with, ($F(1,41) = .514, p = .478, \eta^2 =.012$) there were very little change in the response pattern for STEM students who had both college educated parents or at least one parent that attained a four year degree. The strength of the relationship was small with 0.8\%, 0\% and 1\% of the variability in the dependent variable accounted for respectively. The average mean score was 8.41 indicating that both groups felt that they were very confident that they could divide space in their residence, keep up to date with their school work and socialize with others they lived with.
Table 3

Means and Standard Deviations for Academic and Social Self-efficacy by Parental Educational Attainment Status

<table>
<thead>
<tr>
<th>Group</th>
<th>Both parents college educated</th>
<th>1 parent college edu.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n = 22$</td>
<td>$n = 21$</td>
</tr>
<tr>
<td></td>
<td>$M/SD$</td>
<td>$M/SD$</td>
</tr>
<tr>
<td>Talk to your professors</td>
<td>8.23/2.092</td>
<td>7.90/1.814</td>
</tr>
<tr>
<td>Ask a professor a question</td>
<td>8.55/1.896</td>
<td>8.05/1.746</td>
</tr>
<tr>
<td>Take good class notes</td>
<td>8.55/1.792</td>
<td>8.38/1.499</td>
</tr>
<tr>
<td>Get along with others you live with</td>
<td>8.86/1.781</td>
<td>8.24/1.786</td>
</tr>
<tr>
<td>Divide space in their residence</td>
<td>8.00/2.070</td>
<td>8.33/1.653</td>
</tr>
<tr>
<td>Keep up to date with their school work</td>
<td>8.18/1.296</td>
<td>8.24/1.578</td>
</tr>
<tr>
<td>Socialize with others you live with</td>
<td>8.36/2.517</td>
<td>9.00/1.414</td>
</tr>
</tbody>
</table>

College academic and social self-efficacy variables by first-generation and other college student status. Table 4 presents a summary of academic and social self-efficacy responses reported by first-generation and other college students. The table contains the distribution of the responses for each item related to the academic and social self-efficacy variables. Even though no statistical significant differences existed between the first-generation and other college students, the distribution of responses were very similar with the exception of item 7, “get a date when they want one,” item 8, “research a term paper,” item 12, “join an intramural sports team,” and item 16, “divide space in their residence.”
For item 7, “get a date when they want one” ($\chi^2 (9, N = 88) = 6.929, p = .645$), the majority (15.9%) of the first-generation college students responses were "extremely confident" that they could get a date when they wanted one as opposed to 11% of the other college students. For item 8, “research a term paper;” ($\chi^2 (7, N = 90) = 8.424, p = .297$) and item 16, “divide space in your residence,” ($\chi^2 (7, N = 90) = 5.991, p = .541$), 14% of the other college students reported that they were “extremely confident” they could research a term paper as opposed to 9% of the first-generation college students. Responses for item 16, “divide space in your residence,” were different for the two groups, 20% of the first-generation college students felt “extremely confident” that they could divide space in their residence as opposed to 15% of the other students. It is interesting to note that for item 12, join an intramural sports team; responses were similar for the two groups. Both first-generation (17%) and other college students (10%) reported that they were “not at all confident” that they could join an intramural sports team.
Table 4

Summary of College Academic and Social Self-efficacy variables by First-generation and Other college students Status

<table>
<thead>
<tr>
<th>Group</th>
<th>First-generation (n = 45)</th>
<th>other students (n= 45)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get a date when they want one</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“extremely confident”</td>
<td>15.9%</td>
<td>11%</td>
</tr>
<tr>
<td>Research a term paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“extremely confident”</td>
<td>14%</td>
<td>9%</td>
</tr>
<tr>
<td>Join an intramural sports team</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“not at all confident”</td>
<td>17%</td>
<td>10%</td>
</tr>
<tr>
<td>Divide space in your residence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“extremely confident”</td>
<td>20%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Summary of Findings

This research focused on the perceptions and beliefs of first-generation and other college students enrolled in a STEM discipline at a Historically Black College and University. The study sample included 45 first-generation and 45 other college students. Regarding research question one, “What are the differences in the levels of academic engagement between first-generation and other college students enrolled in a STEM discipline?”, a one-way ANOVA revealed a statistical significant difference for three academic engagement items between first-generation and other college students. A significant difference between the two groups were found for item, “used a computer to analyze data,” (p = .044); item, “talked about art or the theater with other students, friends, or family members,” (p = .044); and item, “talked about music or musicians with other students, friends, or family members,” (p = .003). First-generation college students felt that they “often” used a computer to analyze data and “often” talked about music or musicians
with other students, friends, or family members whereas other students felt “very often” and “often” respectively. In addition, first-generation college students felt that they “occasionally” talked about art or the theater with other students, friends, or family members whereas other students reported that they “often” talked about art or the theater with other students, friends, or family members.

Research question two was, “What are the differences in the levels of social engagement between first-generation and other college students enrolled in a STEM discipline? The first-generation and other college students’ distributions of responses for the social engagement category indicated that four statistical significant differences existed between the two groups. A statistical significant difference exist for item, “met other students,” (p = .017); item, “used campus recreational facilities,” (p = .050); item, “identified with a character,” (p = .050) and item, “became acquainted with student,” (p = .035). A similar pattern of responses for both the first-generation and other college students existed for meeting other students at some campus location for discussion and identifying with a character in a book, movie, or television show and wondered what you might have done under similar circumstances. Both groups felt that meeting others and identifying with a character would happen “often.” It was interesting to note that responses for the two groups differ for using campus recreational facilities and becoming acquainted with students whose family background was different. First-generation students reported that “occasionally” and “often” whereas the other college students felt “often” and “very often” that using campus recreational facilities and becoming acquainted with students whose family background was different would happen.
For Research Questions 3 and 4, “What are the differences in the college self-efficacy variables between college students enrolled in a STEM discipline and their levels of parental educational attainment? and “What are the differences in the college academic and social self-efficacy variables between first-generation and other college students enrolled in a STEM discipline?”, no statistical significance differences existed for the two groups. However for question 3, the distribution of responses by both groups was very similar for items 11, 13, 14, 15, 16, 18 and 20. The average mean score (8.35) for those items indicate that both groups felt that they were “very confident” that they could talk to professors, ask a professor a question, take good class notes, get along with others you live with, divide space in their residence, keep up to date with their school work and socialize with others they lived with. For research question 4, the distribution of responses were very similar with the exception of item 7, “get a date when they want one,” item 8, “research a term paper,” item 12, “join an intramural sports team,” and item 16, “divide space in their residence.” With the exception of item 12, both the first-generation and other college student groups felt “extremely confident” that those activities would happen. For item 12, they both reported that they were “not at all confident” that they could join an intramural sports team.
Chapter V
Discussion

The goal of this study was to document the differences in college student experiences and college self-efficacy between first-generation and other college students enrolled in a STEM discipline at a HBCU. A few studies were located that focused on interventions intended to improve college self-efficacy, academic and social under-preparedness for STEM students enrolled at a Historically Black College and University that included first-generation status as a variable. This study attempted to add to that body of literature on STEM college students who fit that first-generation status. The findings discussed below provide support for the concept of college self-efficacy, academic and social interventions for first-generation college students at an HBCU. This chapter discusses the findings in relation to the current study’s research questions. This discussion includes a summary of findings, limitations of the study, boundaries for possible generalizability, implications for practice and policymakers, recommendations for future research and conclusion.

Summary of Findings

The study sought to answer four research questions: a) What are the differences in the levels of academic engagement between first-generation and other college students enrolled in a STEM discipline? b) What are the differences in the levels of social engagement between first-generation and other college students enrolled in a STEM discipline? c) What are the differences in the college self-efficacy variables between college students enrolled in a STEM discipline and their levels of parental educational attainment? d) What are the
differences in the college academic and social self-efficacy variables between first-generation and other college students enrolled in a STEM discipline?

With regards to the first question, statistically significant differences between first-generation and other college students were found for 3 items in the academic integration category: used a computer to analyze data \((p = .044)\), talked about art or theater \((p = .044)\), and talked about music or musicians \((p = .003)\). First-generation college students felt that they “often” used a computer to analyze data and “often” talked about music or musicians with other students, friends, or family members whereas other students felt “very often” and “often” respectively. In addition, first-generation college students felt that they “occasionally” talked about art or the theater with other students, friends, or family members whereas other students reported that they “often” talked about art or the theater with other students, friends, or family members.

This finding is not surprising, because the college experience was not in their family’s backgrounds, first-generation students must adjust to a new culture—the academic and social culture of college life. Compared to their peers with more highly educated parents, first generation students are more likely to be disadvantaged in accessing and understanding information and attitudes relevant to making beneficial decisions about such things as the importance of completing a college degree and what kinds of academic and social choices to make while in attendance. In addition, due to the lack of prior academic performance that exists among the first-generation student population, it would make sense that most first-generation students would be less prepared than the other college students when it came to using a computer to analyze data and mathematical problems. The effect (or lack thereof) of
prior academic performance such as enrolling in rigorous mathematical and data analysis courses in high school or pre-college, academic experiences, and habits was recurrent themes in the studies examined. Warburton et al. (2001) found that students who were not prepared in higher-level mathematics had a difficult time in college. Findings from this present study indicated that the other college students were more confident than the first-generation students about their academic abilities in data analyze. Murphy and Hicks (2006) noted that mathematics in the high school may be the key to understanding student success in college. They stated that by not engaging in higher-level mathematics in high school, students’ academic progress in college typically is hindered, particularly for first-generation students who are already at risk of departure.

There has been little focus on why first-generation students remain in the pipeline and how low math and data analysis academic characteristics may affect their persistence in STEM disciplines. Prior academic performance in the mathematical and data analysis discipline is an important influence in attraction to and persistence in STEM disciplines for underrepresented students at a HBCU. Furthermore, understanding how to enhance academic performance in those fields during high school is a key element in addressing the low representation of ethnic minority students in STEM fields as well as addressing the concern of U.S. labor shortages in STEM fields. Gaining insight into this important factor can aid educators and policy makers by illuminating strategies for recruiting and retaining students from underrepresented groups in the STEM fields. Therefore, academic integration that dealt with math and data analysis skills can be enhanced through a number of support services and interventions. Math computation and data analysis skill-building workshops offered to first-
generation college students enrolled in a STEM discipline may be aimed at improving study skills, time management, and academic prioritization. Academic advising and data analysis tutoring also may play a critical role in improving this college success factor for the first-generation college student.

In addition to finding a significant difference between first-generation and other college students in *using a computer to analyze data*, it was interesting to note that a statistical significance difference was also found between the first-generation and other college students for items: *talked about art or theater and music and musician with other students, friends, or family members*. First-generation college students felt that they “*occasionally*” talked about art or the theater with other students, friends, or family members whereas other students reported that they “*often*” talked about art or the theater with other students, friends, or family members. In addition, both first-generation and other college students felt that they “*often*” talked about music or musicians with other students, friends, or family members.

This finding and lack of extracurricular art and theater exposure among first-generation college students was not surprising, Pascarella et al. (2004) found that first-generation college students benefited more from extracurricular activities and engagement with peers, but were less likely to participate in extracurricular beneficial activities than were those students who were not first-generation. Terenzini et al. (1994) similarly noted that first-generation students tended to delay involvement in extracurricular activities and informal peer groups during the initial transition period and were often likely to have friends who lived off-campus or who were not enrolled in college. This may not be a good trend for the
university if this item reflects involvement and retaining minority students within the university. In addition, this reinforces the research of Astin and Tinto that showed the need for student community and extracurricular involvement among college students. According to Astin (1993), the “lack of student community has stronger direct effects on student satisfaction with the overall college experience than any other environmental measure” (p. 351). Astin (1985) also indicated that the greater the involvement, the greater the learning and personal development of the students. Tinto (1987) found that central membership in a group “results in a greater array of benefits, social and intellectual, not the least of which may be the sense of being part of an important ethos or tradition which marks the continuing life of the institution” (p. 124). Tinto’s work also pointed out that it is the small communities on campus that allow students to break the university down into more manageable parts so that academic and social integration is readily possible. Therefore, on campus peer relationships can be influential in facilitating successful transitions for the general first-generation college student enrolled in a STEM discipline. To that effect, colleges and universities should provide support to first-generation college students to assist them in successfully attaining their desired degree in the STEM field. For example, intensive individual and group counseling and an intensive orientation program for freshman first-generation college students would be beneficial. In addition, implementing a first-year experience course would be a great retention strategy and ideal. This first-year experience course would include effective tools for combating the lack of social and academic support that are present with minority students enrolled in a STEM discipline. This type of course would allow the first-
generation student to learn about the resources that a university has to offer and about course expectations of faculty members.

In addition, first-generation retention strategies should be multifaceted, and assist students in developing a sense of social networking accompanied by a sense of academic competence. Furthermore, the implementation of learning communities that addresses extracurricular activities such as the art and music fields designed specifically for freshman first-generation STEM students would benefit both the university and students. Learning communities that surround the extracurricular activities would help these students form supportive peer groups that extend beyond the classroom. Learning communities could include integrated STEM course clusters. For example, a first semester calculus, math or data analysis course would be linked to a study skills course and a tutorial. Another type of learning community would integrate a summer program where students are exposed to the STEM curriculum for their intended major. Students would interact with faculty, peer mentors, and academic advisors.

With regards to the second question, a statistically significant difference between first-generation and other college students was found for 4 items in the social integration category: “met other students,” \((p = .017)\); “used campus recreational facilities,” \((p = .050)\); “identified with a character,” \((p = .050)\); and “became acquainted with student,” \((p = .035)\). Both groups felt that meeting others and identifying with a character would happen “often.” It was interesting to note that responses for the two groups differ for using campus recreational facilities and becoming acquainted with students whose family background was different. First-generation students reported that “occasionally” and “often” whereas the
other college students felt “often” and “very often” that using campus recreational facilities and becoming acquainted with students whose family background was different would happen.

This finding on meeting others and becoming acquainted with students whose family background was different was not surprising. Students appeared to be aware that going to college means changes in their friendship patterns, and, surely, part of the excitement of college relates to the anticipation of making new friends. For most first-time/first-year first-generation college students, the idea of making new friends is also filled with uncertainty. According to Karp and Holmstrom (1998), freshmen students are excited about new friends but worry about leaving their old friends. They know they need to make a social life for themselves in the new campus environment but worry that perhaps they will not.

In college, young people can “start over”; they can make friends, establish intimate relationships, and develop the skills and knowledge to help become self-supporting adults. “But the truth is that they are not sure they can take care of themselves or that they want to be left alone” (Bassoff 1988, p.3). Bassoff indicated that students see college as the time for discovering who they really are and who they really can become; they anticipate finding wholly new and permanent life identities during the college years. In addition, they believe that going to college provides a unique opportunity to consciously establish some new identities. Given the social needs of first-year, first-time college students who may be first-generation and enrolled in a STEM discipline, college personnel can play a pivotal role in expanding and providing social experience awareness at the junior and senior high school levels of the setting demands in postsecondary education. Innovative approaches such as
field trips to college campuses, presentations by other first-generation college students enrolled in a STEM major and collaborative planning for transition provide valuable opportunities to better prepare first-generation students before the beginning of their college studies.

With regards to questions 3 and 4, no statistical significance existed between the two groups in regards to academic and social self-efficacy beliefs. However for question 3, the distribution of responses from both groups was very similar for items, talking to professors, asking a professor a question, taking good class notes, getting along with others you live with, dividing space in their residence, keeping up to date with their school work and socializing with others they lived with. For research question 4, the distribution of responses were very similar with the exception of item, getting a date when they want one, researching a term paper, joining an intramural sports team and dividing space in their residence. With the exception of joining an intramural sports team, both the first-generation and other college student groups felt “extremely confident” that those activities would happen. They both reported that they were “not at all confident” when it came to joining an intramural sports team.

These similar findings among the two groups are not surprising and are consistent to Tinto’s philosophy about academic and social integration. Tinto (1975, 1987), noted that students who are academically and socially integrated into the campus environment are more likely to persist than those who are not well-integrated. Both group’s first-generation and other college students seems extremely confident that activities such as talking to professors, asking questions, taking good notes, socializing with others and getting along with others
would happen. These findings may be due to the large majority of juniors and seniors in this study. The two groups of students appeared to be quite sure that they knew exactly how college fits into their future goals and plans. This may have been because the students felt that pursuing and completing a college degree was important. Both groups of students in this study appear to feel more a part of the academic community in the nurturing, supportive environment of an HBCU. This finding is surprising and not similar to the findings presented by Terenzini et al. (1996), which indicated that first-generation students are less involved with peers and instructors. In fact, Terenzini et al. (1996) discovered that first-generation students were less likely to receive encouragement from friends to continue enrollment. The majority of research has indicated that parents who have had some college experience or who had earned a bachelor’s degree are able to provide the cultural capital needed to help their children realize the importance of meeting with professors and socializing with students.

With the nurturing nature of the HBCU environment, both groups of students in this study may have felt comfortable in meeting new friends and interacting with others. First-generation students were found to be no different from the other college students regarding these activities. These students may know just enough about college to feel confident about their social skills. They can “make friends, establish intimate relationships, and develop the skills and knowledge to help them become self-supporting adults” (Hicks, 2003, p.118). Previous studies document that first-generation students participated in fewer campus organizational than other college students (Hicks, 2002; Terenzini et al., 1996), but in this study, expected participation rates were similar between first-generation and other college
students for joining an intramural team. However, both groups showed a disinterest in becoming a member of the college intramural team.

**Limitations and Generalizability**

As with any study, there are a few possible limitations of this research that are noteworthy. First, the data obtained for this study consisted of responses from two groups of college students enrolled in a STEM discipline at a Historically Black College and University. One group consisted of first-generation students and the other group was other students. First-generation status was the variable of main interest. This study was limited to a single historically Black four-year university in the United States. It is acknowledged that a large number of first-generation students are concentrated at two-year community colleges (Inman and Mayes, 1999), and a considerable body of literature on first-generation students focuses on these institutions. To that effect, it is beneficial to examine students within a state system of higher education such as North Carolina. However, given the unique characteristics of the UNC system, it may be difficult to generalize the findings of this study to other state university systems. Furthermore, the limited demographic has the potential to impact the study findings as well. Although demographic variables such as age, gender and ethnicity were comparative to the national sample of first-generation college students, college academic and social experiences as well as self-efficacy beliefs may still differ based on the type of university where the student in enrolled. A public institution with a unique admission criteria and a majority first-generation student population, such as the participating university for this study, may enroll students with lower academic abilities than other universities. Therefore, there is potential for differences among the student body demographics compared
to other institutions with admissions criteria. College experiences and adjustment may be impacted based on these differences and therefore, this must be considered when interpreting the findings of this study.

Second, the timing of the study was another limitation. Students participated in this study during the first two weeks of the spring 2012 semester. The results could be different if two semesters were included in this study or if students were asked to participate near the middle or end of the semester. Third, the lack of consistency in defining the first-generation student was another limitation. Some studies define the first-generation students as those whose parents have no college or university experience (Billson & Terry, 1982, Terenzini et al., 1996) while others define the first-generation students as those whose parents have some college (Warburton, Burgarin, Nunez, & Carroll, 2001), or as the first in the family to attend college (Inman & Mayes, 1999). Therefore, the complexities involved in identifying first-generation students across colleges and university campuses have created inconsistencies in the literature in terms of discussing this cohort. As a result, this study may not be generalizable to all first-generation students.

Finally, the questionnaires were based on self-report and student perceptions, so no information is available from parents, school personnel, or others who may know about the academic and social experiences, and self-efficacy beliefs of these students.

**Implications for Practice and Policymakers**

There are several implications for practice that exist for this population of students. A new developed enrichment program could consider those factors that are known to hinder a first-generation college student successful enrolled in a STEM discipline such as addressing
self-efficacy issues, academic advisement and social motivation. Research has indicated that STEM enrichment programs afforded students a level of familiarity in laboratories. According to Gary (2010), many campuses have instituted programmatic interventions to supplement the mathematics and science curricula of their campuses, many of these programs employ strategies, such as additional class time, learning in cohorts, formalized faculty-student mentor relationships and group study sessions to maintain underrepresented populations within the STEM pipeline. It has become typical for institutions to increase the flow of underrepresented minorities in science and mathematics through the development of intervention programs (Hurtado et al., 2009). These programs focus on students, who are academically and socially underprepared, very talented students and students who are trying to overcome the major academic and social barriers to STEM.

Furthermore, most of the first-generation students enrolled in the STEM courses acknowledged their lack of academic and social experiences within these surroundings; confirming their need for additional exposure beyond the offerings provided at their respective institution. Summer research programs have proven to be effective. The summer research experience immerses the student in the typical STEM environment, which also will allow them to assess their weaknesses and develop strategies to compensate for those academic and social deficiencies. In addition to the summer research programs, minority students in a STEM discipline need encouragement and support from both parents and teachers, and during the summer research experiences it would be a great idea for those students to be exposed to scientists of color both male and female who can awaken their dreams and demonstrate the real-world relevance of science and engineering. According to
Pizzolato (2007), this is pivotal in the construction of future possible selves and self-efficacy beliefs, particularly the segment of the process focused on students' interaction with their environment, as well as confirming appropriate adjustments to their educational plans to strengthen those areas. Likewise, these programs can continually assist the students in the socialization process. Early exposure and mentoring informed students of required expertise and continued engagement in normative STEM behavior and expectations. Therefore, STEM role models, K-12 teachers and administrators with STEM backgrounds, visitations to other universities and colleges STEM offices and laboratories all help minority students to become exposed and aware of the opportunities that the science and mathematics field have to offer.

There are also implications for policymakers, at the federal and state levels; there must be continued efforts to advance the STEM initiative. A call for STEM education reform may be beneficial. In *Rising Above the Gathering Storm*, the National Academies sought to answer a question posed by Congress about future American competitiveness: “What are the top 10 actions, in priority order, that federal policymakers could take to enhance the science and technology enterprise so that the United States can successfully compete, prosper and be secure in the global community of the 21st century?” The report highlights four major areas critical to future competitiveness at all levels of Government: K-12 education, research and development, higher education and policy incentives. This report emphasizes that STEM education is a critical component to future American competitiveness. It is the foundation upon which all other innovation elements rely, and states play a major role in shaping the system. One of the most visible actions states have taken in STEM education is increasing the number of math and science classes students need in order to graduate from high school.
According to the National Academies, states should strengthen the skills of its current STEM teachers by supporting master’s programs, summer training institutes and Advanced Placement training opportunities. Research shows that as teachers spend more time in professional development, higher percentages of their students meet science and math standards.

**Implications for Future Research**

Suggestions for further research that might provide additional information for the development of programs that support first-generation college students enrolled in a STEM discipline include the following: a) As other researchers have suggested, longitudinal research on disadvantaged groups such as the African American first-generation students enrolled in a STEM discipline also are needed. Longitudinal studies can help determine the academic and social challenges faced by these students. Comparisons could be made between first-generation college students enrolled in a STEM discipline and their peers over time to determine the academic, social and self-efficacy challenges that these students faced in a university setting. Furthermore, long-term studies can help determine when college-going intentions change, that is, when students stop believing that college was not important. Therefore, a longitudinal study is recommended between first-generation students over time to determine if differences grew or shrunk throughout high school. b) Learning disabilities, psychological, cognitive or other similar factors, conditions, or limitations were also not considered in this study. Any of these factors may have been operative in the present study and should be studied in the future. c) To more fully understand the phenomenon of first-generation college students enrolled in a STEM discipline and the supportive environment of
an HBCU, a qualitative approach is recommended. These studies could examine the perspectives of these students’ unique experiences and perceptions of the academic and social challenges faced in the STEM educational environment and their sense of belongingness to an HBCU. Furthermore, a qualitative approach that includes the parents’ perspectives about their sons or daughters attending college and enrolling in a STEM discipline will allow for a more in-depth rich analysis of these students’ perspectives about the academic and social experiences and challenges that they face. d) A study that examines the faculty/student interaction is recommended. Perhaps this study could look at the advantages and disadvantages of how the first-generation student views their relationship with a professor in and out of the classroom environment. e) It is vital that first-generation college students have realistic expectations and perceptions as to how success is achieved, that they interact effectively with their peers and instructors, and that they are able to control feelings of anxiety. Integration or transition programs aimed at first-generation college students enrolled in a STEM discipline should focus on developing these essential personal and social skills. It is important to acknowledge that non-academic attributes play a significant role in the success of high-risk students at the college level. f) This study did not take into consideration differences between coursework attempted and coursework completed, and differences in students’ major/concentration. These factors, singly or in combination, may have also had an effect on the outcome variables examined in this study. Therefore, a study that examines these factors should be undertaken.
Conclusion

As colleges and universities are welcoming more and more diverse student populations within the STEM disciplines, the number of African American first generation students that have access to these disciplines will continue to increase. This study adds to the body of research by providing a perspective on African American first-generation college students’ academic and social experiences and self-efficacy beliefs. Administrators and faculty members in the classroom setting could use these findings regarding African American first-generation students enrolled in a STEM discipline to demystify the college experience, to dispel some of the misconceptions about the difficulties of the STEM discipline and to assist them with effectively integrating into the university academic and social environment. Finally, this research provides clues on ways that policymakers, college administrators and researchers can assist a needy population toward persistence and graduation. Hopefully, this study has provided researchers and practitioners with next steps toward future work with African American first-generation college students.
References


National Science Foundation (2008). *Science and Engineering Indicators*.


Title III B Historically Black Colleges and Universities (HBCU) Undergraduate Program Project Plan (2010-2011), Fayetteville State University.


From: Deb Paxton, IRB Administrator
North Carolina State University
Institutional Review Board

Date: January 13, 2012

Title: College experiences and self efficacy of first-generation students versus other students enrolled in a STEM discipline at a historically black college and university

IRB#: 2448

Dear Dr. Hicks,

The research proposal named above has received administrative review and has been approved as exempt from the policy as outlined in the Code of Federal Regulations (Exemption: 46.101. b.2). Provided that the only participation of the subjects is as described in the proposal narrative, this project is exempt from further review.

NOTE:

1. This committee complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NCSU projects, the Assurance Number is: FWA00003429.
2. Any changes to the research must be submitted and approved by the IRB prior to implementation.
3. If any unanticipated problems occur, they must be reported to the IRB office within 5 business days.

Please forward a copy of this letter to your faculty sponsor, if applicable.

Thank you.

Sincerely,

Deb Paxton
NC State IRB
January 11, 2012

To: Dr. Terence Hicks, Educational Leadership, School of Education
IRB #: 2012-P-018
Study: “College Experiences and Self Efficacy of First-Generation Students versus Other Students Enrolled in a STEM Discipline at a Historically Black College and University”
Re: Notice of IRB: HRRC Expedited Review (under 45 CFR 46.110.a.7)
Submission Type: New Application
Expiration Date: January 11, 2013
Co PI: none listed

Your human subject research application, assigned IRB # 2012-P-018, has been reviewed and approved by the Human Rights in Research Committee (HRRC). Should the approved protocol change in the future, you are obligated to contact the Offices of Sponsored Research and Programs to obtain IRB approval for the change(s) before proceeding with your research. You are also required to contact the Office of Sponsored Research and Programs prior to your approval expiration date if you research has not been completed and your study closed. At that time you will be eligible to apply for approval to continue your study.

Please be reminded that you are required to indicate your study number on all documents relating to your study. If you have any questions, please feel free to contact Mrs. Shenetta Dudley, Interim Compliance Officer/IRB Administrator of Sponsored Research and Programs at sdudley@uncfsu.edu. Please reference your proposal title and number in all electronic communications.

This study was reviewed in accordance with federal regulations governing human subjects research including those found at 45 CFR 46 (Common Rule), 45 CFR 164 (HIPAA), where applicable.

Sincerely,

Dr. Robert A. Brown, Chair
Human Rights in Research Committee
APPENDIX C

DEMOGRAPHIC CHARACTERISTICS

1. Age
   1. 19 or younger
   2. 20-23
   3. 24-29
   4. 30-39
   5. 40-55
   6. Over 55

2. Sex
   1. Male
   2. Female

3. Race
   1. African American or Black
   2. Caucasian (other than Hispanic)
   3. Asian or Pacific Islander
   4. American Indian or other Native American
   5. Mexican American
   6. Puerto Rican
   7. Other Hispanic
   8. Multiracial
   9. Other

4. Where do you now live during the school year?
   1. dormitory or other campus housing
   2. residence (house, apartment, etc)
   3. having a family of one’s own
   4. living with parents

5. Resident of North Carolina
   1. yes
   2. no

6. Classification at University
   1. freshmen/first year
   2. sophomore
   3. junior
   4. senior
   5. graduate student
   6. just taking classes at university
7. Did either of your parents graduate from a 4-year college
   1. No
   2. Yes, both parents
   3. Yes, father only
   4. Yes, mother only
   5. don’t know

8. Source of income during the university year
   1. student loan only
   2. student loan and support from spouse/parents
   3. student loan and income from paid employment
   4. student loan and other source of income

9. What are your educational or employment plans after graduating from FSU?
   1. Attending graduate school
   2. Working in your field of study
   3. Just obtaining employment
   4. Other ____________________

10. Who has been the most supportive of your educational plans? List one person. Do not write the person’s name, just their relationship to you. For example—teacher, dad, cousin.
___________________________________________________________________________

11. Who has not been the most supportive of your educational plans? List one person. Do not write the person’s name, just their relationship to you. For example—teacher, dad, cousin.
___________________________________________________________________________

12. How many credit hours are you taking this term?
   1. 6 or fewer
   2. 7-11
   3. 12-14
   4. 15-16
   5. 17 or more
APPENDIX D

College Self-Efficacy Inventory (CSEI)
The following 20 items concern your confidence in various aspects of college. Using the scale below, please indicate how confident you are as student at FSU that you could successfully complete the following tasks. If you are extremely confident, mark a 10. If you are not at all confidence, mark a 1. If you are more or less confident, find the number between 10 and 1 that best describes you. Item responses are aggregated across all student respondents in order to better understand how confident the “average” FSU student feels. Levels of confidence vary from person to person, and there are no right or wrong answers; just answer honestly.

1. Make new friends at college.
   1 2 3 4 5 6 7 8 9 10
   Not at all Confident
   Extremely Confident

2. Divide chores with others you live with.
   1 2 3 4 5 6 7 8 9 10
   Not at all Confident
   Extremely Confident

3. Talk to university staff.
   1 2 3 4 5 6 7 8 9 10
   Not at all Confident
   Extremely Confident

4. Manage time effectively.
   1 2 3 4 5 6 7 8 9 10
   Not at all Confident
   Extremely Confident

5. Ask a question in class.
   1 2 3 4 5 6 7 8 9 10
   Not at all Confident
   Extremely Confident

6. Participate in class discussions.
   1 2 3 4 5 6 7 8 9 10
   Not at all Confident
   Extremely Confident

7. Get a date when you want one.
   1 2 3 4 5 6 7 8 9 10
   Not at all Confident
   Extremely Confident

8. Research a term paper.
   1 2 3 4 5 6 7 8 9 10
   Not at all Confident
   Extremely Confident
9. Do well on your exams.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

10. Join a student organization.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

11. Talk to your professors.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

12. Join an intramural sports team.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

13. Ask a professor a question.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

14. Take good class notes.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

15. Get along with others you live with.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

16. Divide space in your residence.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

17. Understand your textbooks.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

18. Keep up to date with your schoolwork.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

19. Write course papers.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident

20. Socialize with others you live with.

1          2             3             4             5             6             7             8             9            10

Not at all                                                                                          Extremely
Confident                                                                                          Confident