The Effects of Student Engagement on Retention: Comparing Male Undergraduate STEM Majors to Non-STEM Majors

Tourgee D. Simpson Jr.

Old Dominion University

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THE EFFECTS OF STUDENT ENGAGEMENT ON RETENTION: Comparing Male Undergraduate STEM majors to non-STEM majors

by

Tourgee D. Simpson, Jr.

B.S., May 2005, Georgia State University
M.Ed., May 2007, University of Arkansas

A Dissertation Submitted to the Faculty of Old Dominion University in Partial Fulfillment of the Requirements for the Degree of

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OLD DOMINION UNIVERSITY
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Approved by:

Cynthia Tomovic (Chair)

Patro Katsioloudis (Member)

Dana Burnett (Member)

Tisha Paredes (Member)
ABSTRACT

THE EFFECTS OF STUDENT ENGAGEMENT ON RETENTION: COMPARING MALE UNDERGRADUATE STEM MAJORS TO NON-STEM MAJORS

Tourgee D. Simpson, Jr.
Old Dominion University, 2014
Chair: Dr. Cynthia Tomovic

Researchers suggest certain benchmarks of student engagement (i.e., student-faculty interaction, level of academic challenge, enriching educational experiences, active and collaborative learning, and supportive campus environment) positively influence student success. This study investigated the relationship between student engagement and the retention of male, full-time undergraduate students in STEM majors by comparing male, full-time undergraduate students in select science, technology, engineering, and math (STEM) majors to male, full-time undergraduate students in non-STEM majors to identify best practices to improve retention and increase degree completion among men in STEM fields.

Students were invited to participate in the National Survey of Student Engagement (NSSE). Using NSSE data, the researcher determined if the benchmarks of student engagement influenced one-year retention of men from their first to second year at one large, public, research-intensive mid-Atlantic university. The five benchmarks of student engagement were used as independent variables and retention served as the dependent variable with GPA as the covariant. While this study was non-experimental, one-way analysis of variance (ANOVA) and one-way analysis of covariance (ANCOVA) were used to investigate the relationship between student engagement and retention of undergraduate men in STEM majors.
The results indicated a significant relationship between the supportive campus environment benchmark and retention of undergraduate men in STEM. GPA was not a covariant in fostering the relationship between supportive campus environment and retention of undergraduate men in STEM. The other four benchmarks of student engagement (i.e., student-faculty interaction, level of academic challenge, enriching educational experiences, active and collaborative learning) were not significant.

This study contributes to emerging research related to retention and academic success of undergraduate men in STEM majors. The researcher found little difference in how the benchmarks of student engagement influence retention between STEM and non-STEM majors among undergraduate men. Additionally, recommendations for future research and program implementation are provided to administrators and educational researchers to better address the needs of undergraduate men in STEM majors.
This dissertation is dedicated to my wife – Denise – who gives me unlimited love, time, and support. You simply make me a better person and I thank God for allowing me to have your friendship and love for a lifetime. Thank you for encouraging me to persevere and overcome barriers and obstacles encountered during my dissertation journey.

Tourgee D. Simpson, Jr.
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My family provided a foundation to learn, create, and aspire to greatness even during the most challenging times. I appreciate my Mom’s sacrifice of her personal dreams to provide me with skills and academic preparation for school. Likewise, I thank my Dad for recognizing the importance of fatherhood and encouraging me to be a contributing member of society. I thank my sisters for providing a path to follow in terms of having a holistic life experience.

Attending Georgia State University exposed me to global engagement, citizenship, scholarship, diversity, and intercultural relations. While an undergraduate, I participated in a two-year fellowship with NASPA that was transformational; student affairs professionals provided mentorship in regards to academic and career development. I was exposed to other students with similar career interests and values (e.g., wellness, diversity, leadership), and was provided opportunities to develop an intentional plan to reach my academic and career goals. The experience, in addition to connecting with Dr. Kimberly Shannon, Dr. Hazel Scott, and Dr. Richard Heller, offered me a positive and rewarding glimpse into working in student affairs and higher education that was positive and rewarding. While a Minority Undergraduate Fellow with NASPA, I met friends Zduy Chu and Erika Delgado whom where instrumental in me choosing to continue my education by attaining a Master’s degree in Higher Education Administration at the University of Arkansas. Kareem Yearwood was also a shoulder to lean on and I truly value our close friendship and brotherly Bond.

While in graduate school, I developed ongoing friendships with colleagues such as Chamika Ellis, Travis Martin, Melissa Shultz, and Jeannie Simpson. These friends
continue to check on me personally and offered encouragement throughout the doctoral experience. It is highly unlikely I would have considered a doctoral program had it not been for the leadership development and support gained at Georgia State University and the University of Arkansas and professional experience at the University of California, Santa Barbara (UCSB).

Finally, this dissertation would not be complete without the dedication of my committee. Each member contributed to this manuscript and challenged me to produce my best work. Their guidance provided great solace during each stage of graduate school and conducting this study. I want to express my gratitude to my committee Chair, Dr. Cynthia Tomovic, for understanding the value of this study and my interdisciplinary career path. She is student-centered and provided exceptional personal, scholarly, and professional advice. I also thank committee members Drs. Patro Katsioloudis, Dana Burnett, and Tisha Paredes for their continued support and guidance. Your recommendations, mentorship and tutelage greatly enhanced the breath and depth of this dissertation. I want to give a special thanks to Dr. Tisha Paredes for providing weekly meetings and guidance regarding the statistical analysis and Deidre “Dawn” Hall for providing exemplary administrative support. Furthermore, I sincerely appreciate all of the faculty, staff, and students that made this experience worthwhile.
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CHAPTER I
INTRODUCTION

Based on the projected labor needs for the next two decades, the workforce in the United States will require less low-skilled labor in industries such as agriculture, forestry, and hunting and require more high-skilled (i.e., knowledge-intensive) labor in professional and technical services such as computer and information technology, education, engineering, mathematics, science, and training (U.S. Department of Labor, 2012). With the changes in desired skilled labor and the future outlooks of the labor force, the United States will increasingly favor advanced credentials beyond a high school diploma, such as professional certifications or advanced degrees. In order to remain globally competitive and increase preparedness for the American labor force, the U.S. Department of Education set a strategic goal to have the highest percentage of college graduates in the world by 2020 (U.S. Department of Education, 2011b). One of these strategic goals is to increase the number of students with STEM degrees by one million (Executive Office of the President, President’s Council of Advisor on Science and Technology, 2012; U.S. Department of Commerce, 2012).

Total enrollment in postsecondary education in the United States increased by approximately 26% between 1985 and 2010 (National Center of Education Statistics, 2011a). According to ACT (2014), college persistence from the first to second year for students pursuing a bachelor’s degree was 49.6 within four years and 58.4 within six years. However, according to the U.S. Department of Labor, national trends indicate that 23.4% of young women held a bachelor’s degree or higher in 2011, in contrast to 14.3% of young men (U.S. Department of Education, 2011b). Although increasing degree
completion for both men and women is a priority, greater attention is needed regarding male academic success in order to close the aforementioned gender gap in higher education. With more focus devoted to male academic success and retention rates, the United States could exceed this most recent gain between 1985 and 2010 and meet the 2020 goal of having the highest proportion of college graduates in the world (2011b).

In the Commonwealth of Virginia, recognition and investment in higher education is considered a priority among lawmakers. According to the State Council of Higher Education for Virginia (SCHEV), overall undergraduate enrollment in Virginia increased by 12% between 1992 and 2004 (SCHEV, 2007). In 2010, Governor McDonnell established the Governor’s Commission on Higher Education Reform, Innovation, and Investment with the purpose of identifying ways to reform higher education throughout the state and to improve education attainment, skills development, and workforce development (Office of the Governor, 2010). A study commissioned by SCHEV in 2011 found that of the working adults aged 24-64, only 36% had attained a bachelor’s degree or higher. Within this sampled population, 23% had not attained a bachelor’s degree at all, while 36% of the men had attained a bachelor’s degree in comparison to 41% of the women. Coinciding with the state’s interest in higher education and moving more students toward degree completion, university administrators are also exploring methods to ensure increased graduation rates of both men and women.

Various methods of student engagement are cited as means of improving student retention and graduation rates (American Association of Colleges and Universities, 2012; Astin, 1983; Kuh, 2008; Pascarella & Terenzini, 2005; Tinto, 1987). Colleges and universities are increasingly using student engagement as a means for preparing students
to effectively enter the workforce and meet both the SCHEV’s and Governor’s Commission’s goals. These goals include: (a) enhancing the quality of higher education in Virginia, (b) developing innovative instruction, and (c) increasing graduation of students in STEM related majors in Virginia (Commonwealth of Virginia, Office of the Governor, 2010; State Council of Higher Education for Virginia, 2013). Engaging students through both formal and informal experiences are considered high-performing practices of postsecondary institutions that contribute to academic success and degree attainment (Association of American College and Universities, 2012; Astin, 1984; Kuh, 2008; Tinto, 1975).

While higher education institutions recognize the need for all students to meet academic standards and matriculate to degree completion; reducing the gender disparities in graduation rates is one of the means to increase the percentage of bachelor degree-holders. One related factor that is correlated with graduation rates is college grade point average (GPA) (Association of American College & Universities, 2012; Astin 1975; Pascarella & Terenzini, 2005; Tinto, 1987). Compared to men, women earn higher GPAs (Conger & Long, 2010; Ewert, 2012). For example, at one Florida institution, men earned a 2.7 GPA compared to women who earned a 2.9 GPA (Conger & Long, 2010). Using data collected from the National Education Longitudinal Study, Ewert (2012) found college men on average earned a 2.5 compared to 2.7 GPA earned by women. Lower college GPAs are associated with lower retention rates and fewer men who complete college degrees, which means there are less men able to compete for professional positions that require advanced credentials. Men without college degrees are also likely to live in poverty, engage in delinquent behavior (e.g., theft, violence, alcohol,
drugs), and be incarcerated (Hardaway & McLoyd, 2009; Holzer, 2007; Stevens, 2009; Wakefield & Uggen, 2010).

All such conditions have a negative impact on the U.S. economy, workforce, and society. One specific sign of vulnerability for the U.S. economy and higher education institutions is more students from other countries are receiving bachelor’s degrees, particularly in the STEM (science, technology, engineering, and math) fields, than American students (Martin & Samels, 2009), which is another cause for the U.S. decline in global competitiveness. As noted by the Science and Engineering Indicators 2012 report, countries like China and India have increased their spending in these majors and the U.S. is lagging. For example, Asia accounts for 56% of the world’s engineering degrees and 44% of U.S. doctorates in natural sciences and engineering were attained by non-citizens of the United States (Roller, 2012). STEM occupations are expected to grow at a rate 1.7 times faster than non-STEM occupations between 2008-2018 and U.S. cannot currently meet this demand (U.S. Department of Commerce, 2012). Although, public interest remains in the STEM fields and STEM degrees account for a third of the total bachelor’s degrees awarded in the US and a little more than 5% over of the workforce, only 40% of undergraduates that select STEM majors graduate with a STEM degree (CollegeBoard Advocacy & Policy Center, 2013; Langdon, McKittrick, Beede, & Doms, 2011; Lemnios, 2009). This is troublesome because a majority of undergraduates who select STEM majors are men and over 50% of STEM major switch to non-STEM majors or leave college contributing to high attrition among STEM majors (Chen, 2009; Christie, 2013; U.S. Department of Education, National Center for Education Statistics, 2014). As a result, the U.S. Department of Education is encouraging colleges and
universities to increase their enrollment, retention, and graduation rates of all undergraduate students, particularly in STEM majors, and create proactive strategies to encourage all students, both men and women, to complete degrees in these fields (State Council of High Education for Virginia, 2011; 2013; U.S. Department of Education, 2009).

Therefore, using data collected from the institutional database of a large, public, research-intensive mid-Atlantic university, this research explored the relationship between student engagement and the retention of male, full-time undergraduate students, comparing STEM majors in comparison to non-STEM majors as measured by first to second year retention. After reporting the results of this study, the researcher provided recommendations designed to improve services and programs that may lead to increased academic performance and the retention of male, full-time undergraduate students.

**Statement of Purpose**

The purpose of this study was to investigate the relationship between student engagement and the retention of male undergraduate students by comparing male, full-time undergraduate students in science, technology, engineering, and math (STEM) majors to male, full-time undergraduate students in non-STEM majors to identify best practices that improve retention and increase degree completion among men in STEM fields.

**Research Questions**

To guide this study, the following questions were developed:

RQ1: Does the influence of student-faculty interaction on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?
RQ2: Does the influence of level of academic challenge on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

RQ3: Does the influence of enriching educational experiences on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

RQ4: Does the influence of active and collaborative learning on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

RQ5: Does the influence of a supportive campus environment on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

**Background and Significance**

Authors of published research indicate a positive relationship between academic success and positive outcomes during college, such as retention, high academic achievement, positive behaviors, and overall sense of belonging to the campus community (Astin, 1993; Bean, 2005; Berger & Milem, 1999; Pascarella & Terenzini, 2005; Tinto, 1993). In relation to academic success, student retention is a salient concern among university administrators because policymakers use it to determine funding for public institutions of higher education (Braxton, 2009; Pascarella & Terenzini, 2005; State Council of Higher Education for Virginia, 2013). Institutions that are unable to retain students are forced to use additional resources on student recruitment, which ultimately becomes more expensive than actually retaining students (Braxton, 2009). According to the Association of American Colleges and Universities, rather than
spending money to recruit students, institutions should develop campus environments that engage students so they progress from one year to the next (Kuh, 2008).

Research related to student engagement is also based on developmental theories related to student retention (Tinto, 1975, 1987). Tinto (1975) suggests student departure from higher education institutions is a result of the lack of students’ integration both formally and informally into the organizational culture. Students require both quality academic and social environments to prosper and achieve in higher education (Tinto, 1987). Tinto’s (1975) departure theory recognizes the need for students to experience college through quality formal and informal experiences, such as student-faculty interactions, staff support, peer collaboration, and campus events to foster institutional commitment, and this institutional commitment encourages students to remain in college from one year to the next (Tinto, 1987). Tinto’s research suggests an institutional experience must be sufficiently transformational for a student to remain in college and gain something that cannot be replaced or replicated at another institution or if the student leaves higher education altogether. Such experiences can only be developed through intentional student engagement (Kuh, 2006; Pascarella & Terenzini, 2005).

Similar to Tinto, Astin (1984) suggested student involvement was predictive of student success. He proposed involvement requires effort from both students and institutions in order to effectively influence students’ success. In order for the involvement to occur, students must invest both time on tasks and mental effort to be fully involved (committed) to the institution. The more students are mentally and physically involved in the experience (e.g., study, read, discuss), the more they will be engaged in and develop from the experience (e.g., critically think, problem-solve,
construct arguments), which will encourage them to be active members in the experience (e.g., lead, organize, innovate) and, as a result, remain at the institution. Furthermore, institutions must develop quality academic and social experiences that promote student engagement, decrease student departure, and increase student commitment to degree completion through both formal and informal opportunities for students to interact with their environment.

This study was significant because most of the research related to student engagement and academic success are dated and compare students based on race and gender (Anderson, 2005; Chang, 2005; Ferssizidis et al., 2010, Harper, Carini, Bridges, Hayek, 2004; Hopkin & Garrett, 2010). Few studies examined the role of engagement related to the success of male, full-time undergraduate students as a single group, comparing academically successful to non-academically successful male, full-time undergraduate students in STEM and non-STEM majors (Astin & Oseguera, 2005; Conger & Long, 2010; Good, 1995; Marrs, 2012). Much of the research related to retention of undergraduate students focused primarily on retaining female and minorities in STEM related majors (Gilmer, 2007). While such research is relevant to retaining women and minorities, there are significant dropout rates among men in STEM fields that have yet to be explored (Zafar, 2012).

There is currently a gap in the literature associated with the impact of retaining college men on the U.S. workforce and society (Conger et al., 2010; Good & Wood, 1995; Jacob, 2002; McDowell, 2001; Sax & Harper, 2007). Researchers suggest that male undergraduate students’ academic success and retention have both a positive and negative impact on the U.S. workforce and society (Autor, 2010; Holzer, 2007, Juhn &
Potter, 2006, Kochan, 2013; Mead, 2012; Western, Kling, & Weiman, 2001). For example, men who do not attain a degree will increasingly find it difficult to obtain jobs in businesses and industries that no longer need low-level skill workers (Slater, 2008). Because men generally command higher salaries, such households that rely on the earnings of less educated men, are at greater risk of experiencing financial difficulty (Marsiglio, Amato, Day, & Lamb, 2000).

Based on the results of this study, the researcher provided suggestions regarding how student engagement can influence academic success, as measured by the retention and GPAs of male, full-time undergraduate students in STEM majors, thereby offering strategies to increase the number of men who select STEM majors and overall college retention rates. This study provided university administrators and faculty with insight into strengths and weaknesses related to institutional practices that encourage student engagement and the academic success among male full-time undergraduate students in STEM majors. Further, the results can guide recommendations for services and programs that may assist in retaining male, full-time undergraduate students in STEM majors. Results were coded to create groups by college units (e.g., Engineering, Science, Education, Business) within the selected institution. Results from this study casted light on how institutions can better meet industry needs and labor demands for STEM majors in the United States. Male undergraduate students may be interested in the results of this study if they are concerned with how colleges and universities engage them as it relates to their academic success in STEM majors.
Limitations

The limitations for this study were as follows:

1. Academic success was measured by retention and GPA. There are other ways to define academic success but for the purpose of this study, the definition was limited to retention and GPA.

2. Findings from this study cannot be generalized to male undergraduate students in STEM majors and non-STEM majors at other institutions because the data was collected at one large, public, research-intensive mid-Atlantic university.

3. Participants were classified as male, first-year full-time undergraduate students in STEM majors and non-STEM majors.

4. Participants were enrolled during the 2005-2006 and 2009-2010 academic school years at a large, public, research-intensive mid-Atlantic university. Because this study combines data collected from 2006 and 2010 National Survey of Student Engagement (NSSE), six-year graduate rates cannot be analyzed.

5. Self-supported data – the data collected and used in this study were the results of self reported responses by 2006 and 2010 NSSE participants to questions related to student perception of institutional engagement practices.

Assumptions

The assumptions for this study were as follows:

1. Academic success was measured by retention and grade point average (GPA) (Association of American College and Universities, 2010, Astin, 1984, Tinto, 1987). Both at the state and federal level, political leaders seek to increase student GPA and reduce time to graduation. State and federal governments factor in student retention
and GPA when determining institutional funding due to limited financial resources. Institutions use retention as a measure of success because a majority of full-time undergraduate students complete their degree programs if retained from their first to second year (Association of American College and Universities, 2010). Thus, retention and GPA were appropriate means of measuring academic success.

2. Male, full-time undergraduates in STEM majors desire to persist and succeed in their selected STEM major.

3. The five benchmarks (i.e., student-faculty interaction, level of academic challenge, active and collaborative learning, enriching educational experiences, and supportive campus environment) are characteristics of student engagement. Research suggests the five benchmarks are best practices that positively influence student retention, GPA, and graduation rates (Cotton & Wilson, 2006; Kuh 2008; Pascarella & Terenzini, 2005).

4. The retention of male, full-time undergraduate students in STEM majors need to increase graduation rates and meet both industry needs and workforce demands in the United States.

**Methodology and Procedures**

A descriptive research design was used for this study to explore the relationship between student engagement and the retention of male, full-time undergraduate students in STEM majors. The study was conducted at a large, public, research-intensive, mid-Atlantic university that participated in the National Survey of Student Engagement (NSSE) during the 2005-2006 and 2009-2010 academic years. Historically, the selected research university used for this study administered the NSSE every three to four years.
The 2005-2006 and 2009-2010 NSSE data allowed the researcher to calculate one-year retention rates (first to second year). Students were invited to participate in the NSSE’s College Student Report during the spring semester. All students were e-mailed to their university e-mail accounts with electronic log-in access that provided immediate participation in the survey (National Survey of Student Engagement, 2013h). Students received three customized e-mail reminders and one final reminder to ensure a large sample size (2013h). Questionnaire results from the NSSE 2006 and 2010 College Student Report, along with the participants’ corresponding gender, classification, retention, GPA, and major was collected and analyzed by the researcher. The Office of Assessment at the institution selected for the study provided all of the data from institutional databases with all personal identifying information, such as names, social security numbers, and university identification numbers, removed to ensure the anonymity of the participants.

The survey results were analyzed to identify the influence of five benchmarks of student engagement (independent variables) on retention as the dependent variable, with GPA, serving as the mediator variable for male, full-time undergraduate students in select STEM majors, as compared to male, full-time undergraduates in non-STEM majors. While social sciences are sometimes included in STEM, for the purpose of this study, STEM was narrowly defined as science, technology, engineering, and math majors as described by the Carnegie Classification (Carnegie Foundation for the Advancement of Teaching, 2014). From the data, the researcher gathered a sample of male first-year, full-time undergraduate students from both STEM and non-STEM majors who participated in the 2006 and 2010 College Student Report provided by the NSSE. Participants who did
not self-report as male, first-year, or full-time undergraduate students during the 2005-2006 and 2009-2010 academic year were excluded from this study. The participants were divided into STEM and non-STEM majors. ANOVA and ANCOVA analyses were used to explore the effects of the five benchmarks of student engagement, which included: (a) student-faculty interaction, (b) level of academic challenge, (c) educational enrichment experiences, (d) active and collaborative learning, and (e) supportive campus environments, as described by the National Survey of Student Engagement (National Survey of Student Engagement, 2012a). Participant information was kept confidential, and all data was password-protected in a secure computer and filing system.

**Definition of Key Terms**

The following definitions explain key terms used to design this study:

1. **Academic Success**: Retention from one year to the next and a GPA at or above 2.0 (American College & Universities, 2010). At minimum, students are required to maintain a 2.0 to continue pursuing their degree program at the selected large, public, research-intensive mid-Atlantic institution.

2. **Active and Collaborative Learning**: Occurs when “they [students] are intensely involved in their education and are asked to think about and apply what they are learning in different settings” (National Survey of Student Engagement, 2012, para 2). Students demonstrate active and collaborative behaviors when they interact with peers and faculty through activities, such as class presentations, working with class peers outside the classroom, discussing assigned readings, ideas, and class assignments (Kuh, 2008; National Survey of Student Engagement, 2012; Smith & Stitts, 2013; Umback & Wawrzynski, 2005).
3. **College Student Report:** The instrument used by the National Survey of Student Engagement (NSSE) to collect data related to five benchmarks of student engagement. The instrument is a questionnaire containing 28 questions.

4. **Enriching Educational Experiences:** Are “complementary learning opportunities inside and outside the classroom [that] augment the academic program” (National Survey of Student Engagement, 2012, para 4). Enriching educational experiences expose students to events or activities, such as internships, assistive learning technology, learning communities, community service, and research assistantships that encourage students to synthesize and apply learned information (Astin et al., 1998; Ibrahim, 2010; National Survey of Student Engagement, 2012; Parrot & Cherry, 2011; Pike, Kuh, & McCormick, 2010).

5. **First-year:** A student enrolled as a freshman for the first time during the 2005-2006 and 2009-2010 academic years.

6. **Full-time:** An undergraduate student who is enrolled in a minimum of 12 semester hours in fall and spring terms (Office of the University Registrar, 2013a).

7. **Grade Point Average:** The total grade points achieved divided by the total credit hours attempted (Office of the University Registrar, 2013b).

8. **Level of Academic Challenge:** The institutional promotion of “high levels of student achievement by emphasizing the importance of academic effort and setting high expectations for student performance” through “challenging intellectual and creative work” (National Survey of Student Engagement, 2012, para 1). Level of academic challenge is demonstrated by students through activities such as time dedicated to class preparation (e.g., studying, reading, page length of written
assignments), coursework emphasis on analysis, synthesizing, and judging ideas, concepts, arguments, and experiences, and application of the aforementioned learned knowledge in life experiences (2012). In addition, students demonstrate a desire to meet standards and expectations set by faculty (Kim & Sax, 2009; Kuh, 2001; National Survey of Student Engagement, 2012).


10. NSSE: An acronym that stands for the National Survey of Student Engagement [College Student Report].

11. Non-STEM major: Degree program with less emphasis on courses requiring upper-level science and mathematics (Chen, 2009; Kuenz, Mathews, & Mangan, 2006; Langdon et al., 2011; National Governor Association 2007).

12. Retention: Student persistence from one academic year to the next at a research-intensive mid-Atlantic institution.


14. STEM major: Degree program consisting of a majority of courses in science, technology, engineering, and/or mathematics that require upper-level science and mathematics (Carnegie Foundation for the Advancement of Teaching, 2014; Chen, 2009; Kuenz, Mathews, & Mangan, 2006; Langdon et al., 2011; National Governor Association, 2007).
15. **Student Engagement**: The time and commitment of students to pursue goals and the institutional effort that encourages participation in the formal and informal activities in the academic and social system (Astin, 1994; Kuh, 2003; 2009, Pascarella & Terenzini, 2005; Tinto, 1993).

16. **Student-Faculty Interaction**: Experience(s) that enables students to attain expertise in critical thinking and problem solving through interactions both inside and outside the classroom (Kim et al., 2009; Kuh & Hu, 2001; National Survey of Student Engagement, 2012). For example, student-faculty interaction can occur formally through academic advising (e.g., grades, course topics, assignments, course selection, career plans) or informally through out of class experiences, such as meeting for coffee or student organization involvement. Each quality experience between students and faculty help foster positive perceptions of faculty by students that lead to mentorship, role-modeling, and likelihood of students to continue to seek guidance regarding both academic and life experiences (National Survey of Student Engagement, 2012).

17. **Student Involvement**: A student’s commitment to a postsecondary institution demonstrated by the quality and quantity of interactions, both physically and mentally to the institution (Astin, 1984).

18. **Supportive Campus Environment**: The cultivation of “positive working and social relations among different groups on campus” (National Survey of Student Engagement, 2012, para 4). Supportive campus environments are demonstrated by the institution through physical, social, emotional, and instructional conditions that promote student success resulting in higher student satisfaction with their institution
(Bjorklund, Parente, & Sathianathan, 2004; Davis, 2002; National Survey of Student Engagement, 2012; Ku & Hu, 2001; Tomkiewicz & Bass, 2008; Vianden, 2009).

**Undergraduate Student(s):** Individual(s) pursuing a baccalaureate degree at a four-year university.

**Summary**

There is a current focus among elected officials to encourage the academic success of undergraduate students, and the Obama administration has set a national goal of having the highest percentage of college graduates in the world by 2020 (U.S. Department of Education, 2011b). At the state level, public officials are reviewing funding formulas of colleges and universities as they relate funding increases to the retention of undergraduate students. As a result, university administrators are focusing on student retention as it connects to student enrollment to better predict funding (Braxton, 2009). Retention requires undergraduate students to meet minimum academic standards and persist through degree completion.

While a majority of first-year students in STEM majors are male, nearly 40% of such majors will not be retained to their second year of college (CollegeBoard Advocacy & Policy Center, 2013; U.S. Department of Education, 2012). Although resources and services specifically focused on student engagement are increasingly being developed, there has been a decline in the percentage of male college graduates, both in STEM and non-STEM fields (Charles & Luoh, 200; Conlin, 2003; Marrs & Sigler, 2012; Skelton, 2010). Therefore, the purpose of this study is to investigate the relationship between student engagement and retention by comparing male, full-time undergraduate students in STEM majors to male, full-time undergraduate students in non-STEM majors to identify
best practices for improving retention and increasing degree completion among men in STEM fields.

Chapter II provide a review of the literature to offer an overview of student engagement related to the academic success of male, full-time undergraduate students in STEM and non-STEM majors. This review includes an overview of trends and issues associated with college men, such as GPA, retention, motivational factors, years to graduation, and five benchmarks of student engagement. In addition, the influence of poor academic success of male undergraduates students in STEM and non-STEM majors on the U.S. workforce and society is also discussed.

Chapter III provides an overview of the methodology that will be used to conduct this study, including: the research questions, instrument design, data collection, characteristics of the sample, validity and reliability of the measures, and an overview of the statistical analysis. Chapter IV provides an overview of the results, and Chapter V discusses the results and provides conclusions, and recommendations for future research.
CHAPTER II

REVIEW OF LITERATURE

Since the 1970s, campus administrators, professors, and educational researchers have examined factors that influence academic success among undergraduate students. Gender, socioeconomic status, parenting style, major selection, and academic ability are among the many factors used to predict student retention and persistence to college graduation (Astin, 1993; Ficano, 2012; Pascarella & Terenzini, 2005). For example, why do men attain 42% of bachelor's degrees, while 58% of bachelor's degrees are completed by women (Marrs & Sigler, 2012)? We know institutions that intentionally engage students can greatly improve college student satisfaction, retention, academic performance, and degree attainment (Astin, 1993; Kuh, 2005; Pascarella & Terenzini, 2005; Tinto, 1993). Moreover, understanding how academic success is influenced by student engagement of male, full-time undergraduate students in STEM and non-STEM majors may aid administrators, professors, and educational researchers in creating environments that encourage male undergraduate students' retention and persistence to graduation in STEM fields, which will increase the U.S.'s global competitiveness in the workforce and industries. The purpose of this study was to investigate the relationship between student engagement and the retention of male, full-time undergraduate students in STEM majors by comparing male, full-time undergraduate students in select science, technology, engineering, and math (STEM) majors to male, full-time undergraduate students in non-STEM majors to identify best practices to improve retention and increase degree completion among men in STEM fields. This chapter provides an overview of men in college, discuss student engagement factors related to STEM and non-STEM
majors, explore conditions that influence the academic success of male undergraduate students, present a theoretical and conceptual foundation of student engagement, and review research findings related to benchmarks of student engagement. In the process, this chapter will present literature related to the impact of academic success of men on the U.S. workforce and society.

Men in College

Attrition

Since 1947, the enrollment of men in college has fallen from 71% to 43% in 2005, resulting in lower degree completion among men than women (Conger & Long, 2010; Crisman-Isher, 2005). Despite the declining percentages, research related to the attrition of men in college is limited. High school grade-point average (GPA) is among the best indicators of male, full-time undergraduate attrition (Astin, 1993). Male college students with higher high school GPAs are less likely to be at risk of attrition (Astin, 1993; Pascarella & Terenzini, 2005).

Socioeconomic status is another predictor of attrition in college. Walpole (2003) suggested an individual’s societal and financial origins “affect their college experience and outcomes” (p. 63). Similarly, Lareau (2002) conducted a qualitative study that included families from both middle-class (high socioeconomic status) and working or poor (lower socioeconomic status) strata. Middle-class parents restricted their children’s use of television, increased verbal interactions between the parents and the children, and increased the children’s participation in music, art, and athletics. Parents from lower socioeconomic statuses were more willing to permit their children to be more self-directed (e.g., choose when to study, read, class preparation), have unstructured time, and
engage in experiences that exposed them to adult activity (e.g., drinking, sex, responsibility for younger siblings) earlier than wealthy counterparts. Both studies found parents from higher socioeconomic statuses were more likely to guide, direct, and advocate for their children, which results in students having more financial and psychological support while in college and an increased likelihood of persistence to degree completion. On the other hand, parents from lower socioeconomic statuses were less likely to be aware of or have resources to properly guide, direct, and advocate for their children, which leads to less parental support when their children enter higher education and increased risk of these students dropping out of college (Lareau, 2002; Walpole, 2003).

African-Americans from economically challenged communities experience the highest high school and college attrition (Holzer, 2007). African-American men, who are exposed to positive family or peer role models are more likely to increase connections between career interest and academic achievement. This leads them to pursue college and persist to graduation (Holzer, 2007). Latino/Hispanic Americans are the second largest group that experience attrition due to socioeconomic and legal status (e.g., immigrant, undocumented), low high school test scores, and poor pre-college preparation. These barriers to academic success are commonly experienced by Latino/Hispanic Americans from economically challenged communities (Perna, 2000; Sum et al., 2007). Latino/Hispanic American high school students with high educational aspiration were more likely to enroll in college than their African-American counterparts.

While socioeconomic status has been a predictor of attrition and academic success for minorities in college, ethnic minorities from economically challenged communities
are outperforming their White male counterparts from similar communities (McDowell, 2001; Paton, 2008; Paulsen & St. John, 2002). McDowell’s (2001) findings suggested White adolescent boys exposed to delinquent behavior (e.g., drinking, drug use, physical abuse, pre-marital sex, skipping school) respond both positively and negatively to their campus community based on institutional environment and campus connectedness. Such findings suggest more research is needed regarding academic success of all racial and ethnic groups, not just students from minority populations.

Regardless of race and socioeconomic status, a lack of structure at an early age can increase attrition among college men. Those who lacked structure in adolescence were also more likely to engage in delinquent behavior (e.g., drinking, drugs, sex, physical abuse), which correlates with less academic success in college (Ehrnmann, 2007; Harper, Harris, & Mmeje, 2005). College men also account for a majority of student conduct issues in higher education (Harper et al., 2005). Poor behavior results in university sanctions that further increase attrition among college men. However, when connected to institutional support services and faculty, male students are more likely to adhere to university expectations for student behavior, resulting in decreased attrition rates (Good & Wood, 1995; Harper & Harris, 2005).

**Peer Influence**

After a student’s first semester in college, institutional environment becomes more predictive of academic success than high school GPA, high school test scores, and parental style, (Astin & Oseguera, 2005; Tinto, 1975). Acceptance by peers is among the important institutional environmental factors that increase male persistence (Harper, 2006). Academic success, retention, and persistence are all highly influenced by peers
Researchers have found that peers influence male, full-time undergraduate students, both positively and negatively, during college (Connell, 1998; Davis, 2003; De Paola & Scoppa, 2010; Ficano, 2012; Harper, 2006; Lin, 2010; Ryan, 2001; Stinebrickner & Stinebrickner, 2006). College men who surround themselves with peers who fail to participate academically and prepare for class (e.g., reading, studying, writing), are more likely to not persist to degree completion.

Peers encourage or discourage intellectual development, communication skills, and confidence, and students are more likely to associate themselves with individuals with similar characteristics based on their upbringing and parented styles (Lareau, 2002). Lareau found men who grew up in lower socioeconomic status households were more likely to associate with other men who grew up in similar environments, which reinforces delinquent behaviors such as drinking, drug use, and gang activity. Similar activities continue if he goes to college, which makes the nature of a student’s engagement profoundly important (Astin, 1993; Kuh, 2006; Pascarella & Terenzini, 2005, Tinto, 1993. In comparison to lower socioeconomic peers, young men from upper socioeconomic statuses are more likely to engage with other males who promote studying, reading, and reasoning (Lareau, 2002).

Academic peer groups have significant impact on academic success, both prior to and during college. For example, in high school, career clusters help guide students in identifying programs of study with similar career interests, fostering the motivation to remain academically engaged (Carnevale, et al., 2011; Stipanovic, Lewis, & Stringfield, 2012). Similarly, academic peer groups in college have a stronger effect on academic
achievement because academic peers share similar subject interests and course requirements (Casey & Beadnell, 2010; De Paola & Scoppa, 2010; Lin, 2010). Academic peer groups include residential learning programs that bring students together who share academic, career, or interests. Researchers have found students benefit from participation in residential learning communities with peers sharing similar academic interest (Shushok & Shiram, 2010; Soldner, Rowan-Kenyon, Inkelas, Garvey & Robbins, 2012). Men reported greater engagement with faculty outside the classroom, which is salient to student success (Soldner et al., 2012). However, while much of the research supports residential learning communities, Whalen and Shelly found learning communities had more significant impact on retention and graduation rates among non-STEM than STEM majors (2010). Despite conflicting findings, researchers agree the interaction within peer groups seems to foster discussion and deeper understanding of academic readings, subjects, and related assignments. Participating in an academically-based peer group with higher collective abilities encourages students to strive for higher academic performance and persist to degree completion (Casey & Beadnell, 2010).

Men seek acceptance from their male counterparts (Bandura, Barbaranelli, Caparara, & Pastorelli, 1996; Lareau, 2002). When accepted into a peer group, the relationships within the group develop over time becoming more homogeneous (similar), complex, deeper, and important in the development of one’s perspective on one’s life purpose, values, religion, and social interest (Ryan, 2001). If homogeneity within the group is not achieved, peers will reject the individual, both socially and academically (Bandura, et al., 1996). For example, men who are rejected by their peers as children may experience bullying and mental health issues, which can lead to experimentation
with drugs and alcohol. Consequently, men who model delinquent behaviors will encourage others to accept, participate, and act similarly (1996). On the other hand, male peers who are more accepting and model behaviors that encourage academic achievement are more likely to encourage peers to develop and maintain high academic expectations. These peer group influences can either aid or impede the academic success of male students (Bandura, et al., 1996; Ficano, 2012; Ryan, 2001).

Davis (2003) and Harper (2006) found male peers associate reading and doing homework with femininity. Various ethnic groups (e.g., African American, White/European, Latino/Hispanic American) deem that engaging in these “feminine-like” behavior is not widely accepted among men (Davis, 2003; Harper, 2006; McDowell, 2001). Moreover, men from lower socioeconomic groups strongly discourage such behaviors among their male peers (Davis, 2003; Harper, 2006; McDowell, 2001). Heyder and Kessels (2013) found men from urban schools, families with low educational attainment, and minority groups perceived certain aspects of school as feminine (Heyder & Kessels, 2013).

Harper (2006), using results from a qualitative study on the influence of peer groups in college, found that both female and male peer groups encourage academic success among African-American males. Dennis, Phinney, and Chuateco (2005) conducted a study at a minority-serving postsecondary institution and found peer support among minorities was a stronger predictor of college outcomes (e.g., GPA, grades, college adjustment, degree completion) than family support. First-generation college students relied more on peer groups because their parents lacked first-hand knowledge of college experience and how to complete a college degree.
Despite some findings that support positive results from peer influence, there is also research that suggests negative influences such as risky behavior, drug use, and alcohol abuse (Casey & Beadnell, 2010; Pascarella & Terenzinni, 2005; Stienebrikner, T. R. & Stinebrinkner, R., 2006). Pascarella and Terenzinni (2005) found students who are not focused on academic success contribute to the negative academic performance of their peers. Peer groups can also encourage delinquent behaviors and a general acceptance of increasingly more risky behaviors, such as mistreatment of self, peers, partners (Casey & Beadnell, 2010). Casey and Beadnell (2010) noted small peer groups are more likely to engage in risky behaviors than their larger peer groups, particularly when small groups are less diverse and gender-balanced. Using data collected from the Berea Panel Study (BPS) Stienebrikner, T. R. and Stinebrinkner, R. (2006) found that peers may not play a significant role in higher education. Their study indicated peer influence on academic performance and completion of academic activities is only short term; students may conform to the behaviors of their peers for a short time period, but these behaviors will dissipate if long-term benefits do not occur (Stienebrikner et al., 2006). Casey and Beadnell (2010) found peer groups have various degrees of influence based on the strength and weakness of the group’s social network. Risky behaviors within a peer group are more likely to occur when a small male group reaches a critical mass of individuals that engage or accept delinquent behaviors (2010). The strengths and weaknesses of the peer group influence may be controlled by the amount of peer group participation; and the number of peer group affiliations, which can weaken the amount of influence any one particular group has on the individual student (Ryan, 2001). Casey and
Beadnell (2010) suggested more research is needed regarding the types of peer groups that pose the most influence on individual students.

**Academic Achievement**

Research findings indicate the average GPA of men is lower than women both in high school and in college (Conger & Long, 2010; Ewert, 2012). While students who are academically successful study more, Brunborg, Palesen, Diseth, and Larsen (2010) found no connection between hours of study and GPA. These results suggested the academic performance of men may have more to do with the quality of time devoted to study over quantity of time studying (Brunborg et al., 2010; Gurung, 2005). While it is not fully understood why men are falling behind their female counterparts academically, researchers suggest a correlation with non-cognitive skills (Farkas, 2003; Jacob, 2001; Struthers, Menec, & Schonwe, 1996). Before college, more boys are held back one or more grade levels, due in-part to lower ability to pay attention in the classroom, which results in disciplinary action (Jacob, 2001). A lack of non-cognitive skill development continues to challenge boys as they transition into college (Struthers et al., 1996).

Students, regardless of their pre-college abilities, do better (e.g., financial, career placement, job retention) when they attend and complete college (Credé, Roach, Kieszczynka, 2010). Indirectly related to academic achievement, class absenteeism by men in college is higher than women (Ewert, 2012). Lower class attendance in college by men may also contribute to poor academic preparation and lower graduation rates as compared to women (Marrs & Sigler, 2012).
Parental Influence

Characteristics of parenting may also influence academic achievement, both during young adulthood and college (Auerbach, 2007; Dennis, Phinney, & Chuateco, 2005; Holzer, 2007; Hoover-Dempsey et al., 2005; Lareau, 2002; McDowell, 2001; Turner, Chandler, & Heffer, 2009). A recent study conducted by Harris Interactive for the Microsoft Corporation reported that a third of college STEM majors were influenced by their parents (Microsoft Corporation, 2013). Parents actively encouraged their children to pursue careers in STEM because of the financial opportunities afforded to adults working in STEM fields (2013).

Much of the published literature has focused primarily on differences in parenting styles between White American and African-American parents and its influence on grade point average (GPA) and education attainment (Davis-Kean, 2005). Both Auerbach (2007) and Lareau (2002) found published research dismisses the involvement of minority parents and those from lower socio-economic status when literature uses White middle-class as the benchmark for all members of society in the United States. Auerbach (2007) found parents from lower socioeconomic statuses value education and want a better life experience for their children (Auerbach, 2007). Their support is often demonstrated indirectly, such as through explaining to their children their experience of hardship because a lack of education, and by quickly intervening when negative behavioral and academic issues occur at school (Aurbach, 2007). Parents from lower socioeconomic statuses also help navigate educational barriers that may prevent their children from reaching their academic goals.
There is a positive relationship between parents' level of education and child educational expectations, regardless of ethnicity (Davis-Kean, 2005; Lareau, 2002; Turner et al., 2009). The more education a parent has, the greater the emphasis the parent will place on educational attainment, including the development of strong cognitive skills and self-efficacy, which are skills needed while in college (Dennis et al., 2005; Lareau, 2002; Padget et al., 2009). Turner, Chandler, and Heffer (2009) found students are more likely to experience successes when they are encouraged by their parents to feel confident in their academic abilities. Using 1993 data collected from the National Center for Statistics, Davis (2003) surmised “Black boys are more likely to lack confidence about their abilities in schools compared to Black girls (23.5% vs. 9.7%)” (p. 524). Such results may support why African-American male undergraduate students are the most at risk for college degree completion.

According to Dennis et al. (2005), parents who did not go to college lack the understanding and knowledge to prepare their children for the academic rigor necessary for college admissions and continuance. As a result, such students lack personal and social support from their families necessary for academic success (2005). Children from lower-socioeconomic statuses were also more likely to demonstrate disruptive classroom behaviors, not advocate for themselves, and not complete homework (Jeludar, Jeludar, Shayan, & Ahmadi-Gatab, 2012; Lareau, 2002; Paulsen & St. John, 2002). Parents from lower socioeconomic statuses are also more likely to see high school graduation as acceptable and sufficient, while those from higher socioeconomic status expect to engage in further education such as college or professional certification (Walpol, 2003). This thinking may put lower socioeconomic children in situations that underprepare them for
furthering their education and future careers. Lareau (2002) found parenting styles used by parents from low socioeconomic statuses often resisted discussions related to student-learning issues with education authority and did not foster communication skills, which can impact how these children communicate as adults, particularly in the classroom with faculty and peers. For example, when discussing classes with their children, parents from low socioeconomic backgrounds did not solicit specific information about their child’s school day beyond the general question, how was school (2002)?

A father’s income is a strong indicator of socioeconomic status and correlates with a child’s GPA, involvement in social activities, and college preparedness (Marsiglio, Amato, Day, & Lamb, 2000). Marsiglio et al. (2000), found the “quality and quantity” (p. 1184) of involvement by fathers in their children’s lives decreased when the parents were divorced and decreases even more if the father was never married to the mother. This also influences how children perform academically, whether they attend college and persist to degree completion, and how they engage with faculty, peers, and in college life. Similarly, Lin (2010) and De Paola & Scoppa (2010) suggested male undergraduate students are more likely to attain higher GPAs and have higher academic expectations when they grow-up in a two parent household, particularly when the mother attained more than a high school diploma. Skills learned from childhood prepared the men to perform more positively while in college. Not all researchers agree parents have an influence on college students’ academic success. Strange and Brandt (1999) found parental influence begins to have little influence on academic achievement of college students as they progress through college, regardless of parental expectations, values, and importance.
STEM Education

Persistence in STEM Majors

While 23% of first-year students declare a STEM major, only 40% actually attain a STEM degree (U.S. Department of Education, 2012). Men make up 33% of declared STEM majors, but less than 8% actually attain a degree in STEM (CollegeBoard, 2012). Economic and social issues experienced by men from lower socioeconomic status may also contribute to their inability to persist in STEM fields (Chen, 2009; Moor, 2006; Perna, 2000; Sum et al., 2007). Most often men from lower socioeconomic status lack proper pre-college preparation in science and math that would allow them to complete higher-level courses in STEM majors, particularly courses that rely on advanced knowledge of trigonometry, precalculus, calculus, chemistry and/or physics (Chen, 2009; Moor, 2006; Perna, 2000; Sum et al., 2007). Given these identified challenges, educational leaders seek to understand what motivational factors contribute to student persistence in STEM programs (Executive Office of the President, President’s Council of Advisor on Science and Technology, 2012; U.S. Department of Commerce, 2012). Recently the National Survey of Student Engagement (2013) published a report indicating:

Those majoring in science, technology, engineering, and mathematics (STEM) were more influenced by their concerns for finding a job after graduation. Of all the racial groups, Asian seniors (74%) majoring in STEM fields were the most likely to cite job security as a key influence. A similar percentage of African American (73%) and Latino (69%) STEM majors shared the same concern. Even among non-STEM majors, a sizable percentage of minority students (61%) agreed
the ability to find a job was a substantial influence on their decision the largest disparity was among Whites. About two-thirds of White students majoring in a STEM field agreed securing a job was a key factor while less than half of their non-STEM counterparts agreed. Compared to minority students, White non-STEM majors appeared to be the least affected by the concern for finding a job.
(p. 16)

Organizations, such as the National Aeronautic and Space Administration (NASA), U.S. Department of Defense (DOD), U.S. Department of Education (DOE), and National Science Foundation (NSF) have granted millions of dollars in federal funding to develop programs to recruit, retain, and develop individuals to persist through STEM majors (Kueinzi, 2008). However, degree attainment has remained stagnant for the past several decades, causing industry and political leaders to seek initiatives to address labor shortages in STEM fields (2008). Such circumstances require colleges and universities to intentionally develop campus conditions that aid in student persistence in attaining STEM degrees (Executive Office of the President, Present’s Council of Advisor for Science and Technology, 2012; Laanan, 2010). Persistence strategies identified by the President’s Council of Advisors for Science and Technology (PCAST) include: (a) developing innovative teaching practices targeting STEM students, (b) collaborative initiative between stakeholders (e.g., education, government, business), (c) innovative labs, and (d) national experimental mathematic courses to assist math preparation (2012).

While some politicians, educators, and researchers are concerned with the retention and graduation of STEM majors, others question the current sense of urgency being directed at STEM. For example, Teitelbaum (2003) suggested college and political
leaders have wrongly sought to increase foreign student enrollment to meet demand for scientists and engineers in the U.S. labor market. He cautions increasing foreign enrollment contributes to the oversupply of graduates that later cannot find employment resulting in lower wages. Salzman, Juehn, and Lowell (2013) built on Teitelbaum’s research and found that U.S. colleges graduate “50% more [STEM] students than are hired” and only one out two STEM graduates are hired in a STEM job (p. 2). Benderly stated a “desire for cheap, skilled labor, within the business world and academia, has fueled assertions—based on flimsy and distorted evidence” (2012, p. 19). These views by researchers are representative of those political leaders and researchers who raise concerns regarding increasing STEM graduates (Commonwealth of Virginia, Office of the Governor, 2010; Executive Office of the President, President’s Council of Advisor on Science and Technology, 2012; Hummel & Cheetham, 2012; State Council of Higher Education for Virginia, 2013). While it is reasonable to consider the influence of foreign students’ college enrollment and subsequent graduation on the U.S. workforce, public policy, and academia; concerns raised by such researchers represent scholars who have found increasing retention and STEM graduation rates in the U.S. are in the political, economic, and military strategic interest of the United States (Executive Office of the President, President’s Council of Advisor on Science and Technology, 2012; Kuenzi, 2008; Hummel & Cheetham, 2012; Langdon et al., 2011; U.S. Department of Commerce, 2012; U.S. Department of Labor, Bureau of Labor Statistics, 2012). This research study aims to investigate the relationship between student engagement and the academic success of male undergraduate students by comparing male, full-time undergraduate students in science, technology, engineering, and math (STEM) majors to male, full-time
undergraduate students in non-STEM majors to identify best practices that improve retention and increase degree completion among men in STEM fields.

**STEM Majors**

STEM majors consist of degree programs offering courses in science, technology, engineering, and/or mathematics that require upper-level science and mathematics (Carnegie Foundation for the Advancement of Teaching, 2014; Chen, 2009; Kuenz, Mathews, & Mangan, 2006; National Governor Association 2007). Examples of STEM majors include: Biological Sciences, Computer Sciences, Engineering, Information Technology, and Physical Science. Monitoring the academic success of STEM majors is challenging because of a lack of consensus on how to define STEM. While social sciences are sometimes included in STEM, for the purpose of this study, STEM is narrowly defined as science, technology, engineering, and math in accordance with the Carnegie Classification (Carnegie Foundation for the Advancement of Teaching, 2014).

STEM education is salient to the goal of the United States retaining global economic competitiveness (Chen, 2009). The goal of increasing STEM majors and degree attainment is actively promoted by the U.S. Department of Education, National Academy of Science, and National Academy of Engineering (Chen, 2009). According to the U.S. Department of Defense, there are concerns the United States is becoming too dependent on foreign students to fill critical position related to national defense (Hummel & Cheetham, 2012). Having enough domestic applicants is seen as a priority by the U.S. Department of Defense (2012). While 2.5 million degrees were awarded in 2002-2003, only 16% (399,465) accounted for STEM degrees (Kueinzi, 2008). Using data collected
from 12,000 surveyed first-year student participants, the U.S. Department of Education, National Center of Statistics, reported that 23% declared STEM majors entering their first-year as undergraduate students 19 years old or younger, 33% were men, and 14% women (Chen, 2009). Asian/Pacific islanders were 47% of this group, compared to 19-23% of students whom identified as American Indian/Alaska Native, Black/African American, White, and Hispanic/Latino American (Chen, 2009).

After the first year, about 55% of STEM majors either switched to non-STEM majors (27%) or left higher education (28%) without degree attainment (Chen, 2009). A high percentage of international students enrolled in STEM (34% international vs. 22% U.S. citizen). According the U.S. Department of Commerce, STEM graduates are essential to ensuring that United States business remains innovative and globally competitive (Langdon et al., 2011). STEM is also critical to the success of the U.S. Department of Defense, which expects a shortage of individuals with expertise in STEM to carry out the department's foreign and domestic objectives, due in part to an aging workforce (57.8% over the age of 45) (Hummel & Cheetham, 2012; Lemnios, 2009).

Given the high percentage of students changing from STEM to non-STEM fields and student departure from college, political leaders and educational researchers have conducted studies to ascertain reasons for student departure (Christe, 2013; National Academy of Science, 2005; Soldner et al., 2012; Whalen & Shelly, 2010). A recent federal study found:

High performing students frequently cite uninspiring introductory courses as a factor in their choice to switch majors and low performing students with a high interest and aptitude in STEM careers often have difficulty with the math required
in introductory STEM courses with little help provided by their universities. Moreover, many students, and particularly members of groups underrepresented in STEM fields, cite an unwelcoming atmosphere from faculty in STEM courses as a reason for their departure. (Executive Office of the President, President’s Council of Advisors for Science and Technology, 2012, para 3)

Using data collected from 39 colleges and universities Shaw and Barbuitti (2010) found fewer students switched from STEM to non-STEM majors if their degree was in engineering and technology. Results from their study indicate students in the mathematic and statistics subset of STEM majors had a 79% chance of switching compared to a 39% chance of switching of those students majoring in engineering and technology (2010). These results confirm earlier studies that suggest students who did switch from a STEM major appeared to have lower math scores and challenges in college level mathematics. While we know women are least represented in STEM fields, it appears STEM degree programs may have trouble retaining both genders until degree completion due in part to difficulty in mathematics (President’s Council of Advisor on Science and Technology, 2012; Shaw & Barbuti, 2010; U.S. Department of Education, 2012).

**Non-STEM majors**

Non-STEM majors are degree programs that do not require upper-level science and mathematics (Shaw & Barbuitti, 2010). Examples of non-STEM majors include arts and humanities, business, education, and social sciences. Using a NSSE sample from Midwestern institutions in the U.S., Laanan (2011) found one of the academic programs sought by non-STEM students was business. Men who switch from STEM majors select
business as an alternate major to avoid higher math, but are not advised their new major still requires upper-level mathematics to take required courses in accounting and economics (Zafar, 2012). Such decisions cause further academic hardship (e.g., lack of connectedness, poor GPA), which contributes to college withdrawal among students.

Using data collected from a mid-western research university, Whalen and Shelly found that 92% of non-STEM academic departments retain their students in non-STEM majors (2010). Despite high retention, non-STEM majors expressed greater dissatisfaction with their university than their STEM counterparts (Laanan, 2011). Non-STEM majors, when compared to STEM majors, were less likely to complete their degrees within six years (Chen, 2009). Non-STEM majors take fewer credit hours than STEM majors, which results in needing more time to graduate (Lee, Kot, & Lee, 2012). Employees with non-STEM majors in non-STEM occupations tend to earn 20% less than their counterparts who were STEM majors and are pursuing STEM careers (Langdon et al., 2011). Non-STEM majors are projected to enter a future U.S. workforce where non-STEM occupation growth is 9.8%, as compared to 17% in STEM occupations (2011).

Seminal Studies Related to Student Engagement

Student Departure Theory

Vincent Tinto’s research regarding student departure is considered foundational to the concept of student engagement (Pascarella & Terenzini, 2005). Tinto’s (1992) departure model includes six phases of commitment or departure: (a) pre-entry attributes, (b) goals and commitments, (c) institutional experiences, (d) personal/normative integrations, (e) goals and commitments, and (f) outcomes. Figure 1 illustrates Tinto’s conceptual model of student departure.
The likelihood of an undergraduate student departing from college either increases or decreases their progresses through each phase. During the *pre-entry attributes* phase, issues, such as socioeconomic status, first-generation status, parental involvement, high school test score, high school AP courses, and quality of the college or university, influence an undergraduate student's likelihood of departure. During the first *goals and commitments* phase, departure from college is influenced by the desired major, career interest, academic commitment, institutional commitment, graduation, and off-campus employment. While in college, the *institutional experience* phase is shaped by both the formal and informal aspects within the academic and social systems of the university. For example, formal experiences in academic and social system include GPA, years to
graduation, involvement in academic clubs, and intentional quality encounters, both inside and outside of the classroom, with faculty and staff. Men are less likely to seek help, conform to institution expectations, and participate in activities provided both academically and socially (Good & Wood, 1995; Laker, 2003; McDowell, 2001). Informal experiences include unstructured conversations and social activities with peers. Overall quality of institutional experiences influence the next phase of the departure model where students adjust their personal and normative integration within an institution. In the *personal and normative integration* phase, students demonstrate behaviors and participate in activities that either support or inhibit academic and social commitment to the institution. For example, men who associate with other men who engage in delinquent behavior are more likely to demonstrate similar behaviors (Harper et al., 2005). During the *second goals and commitment* phase, student behaviors, attitudes, and choices continue or change based on their level of satisfaction with their institutional experiences. As a result, students determine whether they will remain at or depart from the institution. Students can continue satisfied or unsatisfied at the institution, or choose to withdraw from the institution altogether.

This study focused on formal and informal institutional experiences in the third phase of Tinto’s departure model. Specifically, the review of benchmarks of student engagement in this chapter provided insight into how institutional experiences, such as faculty relations, academic preparation, learning communities, campus support resources, and relationships with peers within the academic and social system, influenced the academic success of male, full-time undergraduate students in STEM majors. The more students are satisfied with the formal and informal aspects of both the academic and
social systems, the more they will remain committed to the institution and persist to
degree completion despite any internal (e.g., transition to college, institutional
bureaucracy, academic standards) and external institutional challenges (e.g., family
dynamics, financial hardship).

Student Involvement Theory

Astin (1984) studied students’ participation in formal and informal institutional experiences. Student involvement is defined as the degree of commitment demonstrated by both the quantity and quality of interactions with institutional experiences (1984). The higher a student’s commitment to an institution, the more likely he or she will remain at that institution until degree completion. Academically successful or unsuccessful students can be described on a continuum of involvement in certain activities, such as time spent on course preparation, working collaboratively with others, educational attainment, and levels of involvement in the college experience. Level of involvement contributes to academic success (Astin, 1993). According to Tanaka (2002), Astin’s theory is a robust means of predicting outcomes, such as student departure, GPA, and years to graduation. Astin’s 1984 involvement theory includes five principles:

1. “Involvement refers to the investment of physical and psychological energy in various objects. The objects may be highly generalized (the student experience) or highly specific (preparing for a chemistry examination).” (Astin, 1999, p. 519). A committed STEM or non-STEM major dedicates time to academically prepare (e.g., reading, studying, writing) for class while a less committed student may lack the discipline to meet academic expectations.
2. "Regardless of its object, involvement occurs along a continuum; that is, different students manifest different degrees of involvement in a given object, and the same student manifests different degrees of involvement in different objects at different times" (Astin, 1999, p. 519). Likewise, the five benchmarks of student engagement will be experienced to different degrees of intensity and time.

3. "Involvement has both quantitative and qualitative features. The extent of a student's involvement in academic work, for instance, can be measured quantitatively (how many hours the student spends studying) and qualitatively (whether the student reviews and comprehends reading assignments or simply stares at the textbook and daydreams)" (Astin, 1999, p. 519). STEM majors on average will spend more time studying than their non-STEM counterparts due to higher level of science and mathematics required for degree completion (National Survey of Student Engagement, 2013b).

4. "The amount of student learning and personal development associated with any educational program is directly proportional to the quality and quantity of student involvement in that program" (Astin, 1999, p. 519). An undergraduate student who seeks development through opportunities, such as faculty mentorship, internships, and academic civic learning, is more likely to understand the academic requirements of selecting a particular major (Astin & Sax, 1998; Reed, Jernstedt, Hawley, Reber, & DuBois, 2005) and is
more likely to know, based on these experiences, whether they want to pursue a particular major.

5. "The effectiveness of any educational policy or practice is directly related to the capacity of that policy or practice to increase student involvement" (Astin, 1999 p. 519). Utilizing data collected by the NSSE, administrators, faculty, and educational researchers are better able to identify best practices associated with student engagement in order to retain and graduate students (Kuh, 2008).

**Student Engagement**

Features of both Tinto's (1985) and Astin's (1984) models have evolved into what is now known as student engagement, which suggests both students and institutions are equal players in facilitating an environment where students can be successful. Student engagement is demonstrated by the quality of time and commitment students put forth to pursue goals and the institution's effort to encourage participation in the formal and informal activities that facilitate student learning (Astin, 1994; Berger & Milem, 1999; Kuh, 1999; Kuh, 2008; Kuh, 2009; National Survey of Student Engagement, 2011; Pascarella & Terenzini, 2005; Tinto, 1993). In addition to what students contribute to their learning through their involvement, institutions of higher education develop quality academic and social environments that promote student engagement in order to help students become successful while in college and reach degree completion. For example, campus environments offer courses that challenge students to actively participate in the learning process and encourage course preparation, to engage with peers, and to solicit support from campus administrators. Increasing quality involvement from students,
faculty, and administrators helps improve connectedness, thereby increasing institutional commitment and degree completion. Creating environments that promote student engagement is an essential responsibility of administrators, faculty, and educational researchers (Kuh, 2008; Tinto, 1975; Astin, 1993).

Student engagement has five benchmarks that ensure student learning, known as educationally effective practices: (1) student-faculty interaction (e.g., discussing grades, course participation, career plans, working with faculty), (2) level of academic challenge (e.g., time preparing for courses, critical thinking, application of learned knowledge), (3) enrichment educational experiences (e.g., participation in internships, community service, learning communities, co-curricular activities), (4) active and collaborative learning (e.g., discussion of readings and class assignments, working with peers outside of class, participation in class), and (5) supportive campus environments (e.g., quality of interactions with peers, faculty, and administrators, assistive services) (National Survey of Student Engagement, 2012a).

**Student-faculty interactions** are quality interactions or relationships that develop inside and outside the classroom that stimulate critical thinking through active learning (Kim & Sax, 2009; Ku & Hu, 2001; Nelson-Laird, Garver, & Niskodé-Dossett, 2010; Sax, Bryant, & Harper, 2005). **Level of academic challenge** is institutional promotion of high expectations and student demonstration of high academic standards and performance that encourages intellectual creativity and intentional participation in learning activities (Cole & Korkmaz, 2010; Jacob, 2002; Laird, Chen, & Ku, 2008). **Enriching educational experiences** occur through co-curricular activities that promote practical application, integrative learning, and exposure to different values, political
views, race, ethnic, and economic backgrounds (Astin & Sax, 1998; Ibrahim, 2010; Parrot & Cherry, 2011). **Active and collaborative learning** occurs when students assist each other through creating challenging, but supportive social and group dynamics and collaboratively solve problems (Umbach & Wawrzynki, 2005; Zhao & Kuh, 2004).

Finally, a **supportive campus environment** is where institutions provide support services to stimulate positive academic and social conditions that contribute to student satisfaction and commitment to the institution (Karabenick, 2004; Pike & Kuh, 2006).

**National Survey of Student Engagement**

The National Survey of Student Engagement (NSSE) is a widely used research instrument that explores and assesses the five benchmarks of student engagement (Kuh, 2008; National Survey of Student Engagement, 2012a). The origin of the NSSE occurred in 1986 when educational researchers Alexander Astin, Arthur Chickering, Nevitt Standford, and others leading scholars gathered to discuss conditions that promote college student learning (Kuh, 2001). Later in 1998, Alexander Astin, Gary Barnes, Arthur Chickering, Peter Ewell, John Gardner, George Kuh, Richard Light, and Ted Marchese met to develop a survey instrument to assess educational practices to promote certain aspects of student learning that were critical to academic success (Kuh, 2001). The finished NSSE survey included several questionnaires that collect self-reported information regarding students' experiences while in college and institutional characteristics that promote student engagement. The questionnaire the researcher used for this study is the College Student Report, which is offered to first-year/freshman and seniors (fourth-year and beyond) students at four-year higher education institutions.

Since 2000, the NSSE has collected information from 364,000 first-year and seniors from
1,500 participating college and universities (Bureau, Ryan, Ahren, Shoup, & Torres, 2011; National Survey of Student Engagement, 2013b). The questionnaires can be completed by paper or web-based format and responses are grouped into categories that reflect the five benchmarks of student engagement (Hayek & Kuh, 2002; Kuh, 2001). The questions and five benchmarks are written in common language to provide a framework from which college administrators, faculty, and educational researchers can discuss effective educational practices, institutional performance, and develop action plans to improve institutional conditions that promote student success (Hayek & Kuh, 2002). The following sections explain the context and experiences from which the five benchmarks of student engagement facilitate the success of full-time undergraduate students.

**Student-Faculty Interaction**

One characteristic of effective student engagement is quality student-faculty interactions (Astin, 1993, Kim & Sax, 2009, Kuh, 2008; Pascarella & Terenzini, 1995; Tinto, 1975; 1993; Umbach & Wawrzynski, 2005). Quality student-faculty relationships are experience(s) between students and faculty that cause students to critically think and solve problems while participating in institutional activities, such as academic advising, career exploration, class activities, and class discussions (Kim & Sax, 2009; Kuh & Hu, 2001; National Survey of Student Engagement, 2012). Critically thinking about academic and non-academic issues and topics discussed with faculty contribute to students achieving higher rates of degree completion and higher GPAs (Kim & Sax, 2009). Student-faculty interactions allow students to focus greater attention and effort on
activities aligned with educational interests, institutional values, and career preparedness as it relates to their majors (Erkut & Mokros, 1984; Ku et al., 2001; Umback et al., 2005).

Laanan (2011) found STEM students experience less quality interaction with faculty than non-STEM students. Gasiewski, Eagan, Garcia, Hurtado, and Chang (2011), using data collected from 2,873 students in STEM introductory courses from 15 colleges and universities, found introductory STEM courses where students received less quality student-faculty interaction (e.g., discussion, classroom recognition, presentation) also were less likely to have academic success and positive retention rates.

Students with less quality interaction with faculty describe their courses as being majority lecture style and used as a gateway to higher-level STEM courses (2011). Using survey data collected from 6,026 STEM faculty from 205 institution that participated in the UCLA Higher Education Research Institute, Eagan, Sharkness, Hurtado, Mosqueda, and Chang (2010) found faculty at large research institution are 13% less likely than liberal arts colleges to include undergraduate student in research. However, faculty mentorships are a way to develop intentional quality relationship with faculty by offering students coaching related to their major and career paths (Erkut et al., 1984; Kim & Sax, 2009; Laird, Chen, & Kuh, 2008; National Survey of Student Engagement, 2012). When serving as academic advisors, faculty members developed quality connections by assisting students with course selection, academic commitment (e.g., time management, study strategy, scholarship), career planning, and degree completion. Mentoring, academic advising, working with student organizations, and instructing courses are examples that also reflect the formal student experiences in the academic system of Tinto’s student departure model (Tinto, 1975). Examples of informal experiences
between student and faculty include faculty attendance of student events and having
causal conversation in the social system of Tinto's student departure model (Tinto, 1975).

Umback and Wawrzynski (2005) used self-reported survey data collected from
14,336 faculty members from 137 institutions that participated in Faculty Survey of
Student Engagement (FSSE). Institutions where faculty reported frequent interactions
with students, students responded positively in terms of personal growth, social
development, and knowledge attainment (Umback & Wawrzynski, 2005). According to
Sax, Bryant, and Harper (2005), student-faculty interactions had an effect on multiple
outcomes (e.g., academic achievement, attitudinal difference according to gender,
academic and career goals). Data were collected from a previously administered
longitudinal study that included participants in the 1994 Cooperative Institutional
Research Program (CIRP) Freshman Survey and 1998 follow-up through the College
Student Survey (CSS). The results demonstrated differences between male and female
student levels of interaction with faculty (Sax, Brayan, & Harper, 2005). Male
undergraduate students interacted less frequently with faculty than their female
counterparts. In contrast, successful male students interacted more with faculty through
formal and informal interactions, which resulted in higher levels of academic
commitment and competition. Male students who interacted with faculty reported greater
satisfaction with their overall relationships and experiences. Greater satisfaction with
relationships and experiences with faculty members contributed to all students becoming
more committed to their academics and the institution as a whole. These results
suggested that faculty positively shape students' perception of support and social
perspective (e.g., critical thinking skills, political engagement, cultural awareness, racial
understanding, life philosophy, liberalism) (Kuh, 2008; Sax et al., 2005; Umback & Wawrzynski, 2005).

Despite positive findings related to student-faculty interaction, others suggested students' negative perceptions of course difficulty, faculty, and commitment to academic preparedness (e.g., study skills, GPA, awareness of learning style) by men also contribute to poor retention rates (Tomkiewicz & Bass, 2008; Vianden, 2009). Tomkiewicz and Bass (2008) conducted a study with 242 student participants using a 92-question instrument. Results indicated that male undergraduate students perceive male faculty more negatively than female undergraduate students. Such perceptions of males may be more pronounced at research universities because of institutional and classroom size (Kuh et al., 2001; Viaden, 2009). The large school environment tends to limit time for male students to fully know their faculty beyond the classroom experience. Vianden (2009) built on the work by Tomkiewicz and Bass (2008), suggesting male students withdraw from the college experience both emotionally and academically when they receive critical feedback from faculty, and when the relationship is infrequent and underdeveloped. Results from this study indicated male students express less interest in developing relationships with faculty members who present negative behaviors (e.g., dismissive of questions, rude remarks, belittling) and uninviting behaviors (e.g., nonresponsive to e-mail, lack availability for meetings), in comparison to faculty members who demonstrated welcoming and empathetic behaviors (e.g., responsive to questions, available for student advising). Vianden's (2009) research also suggested limited interactions between male students and faculty members cause male students not to proactively seek out these relationships with faculty until they are experiencing
academic difficulties such as failing assignments, falling behind in class, and not understanding course expectations. As a result, quality interactions between students and faculty occur even more infrequently (Hu et al., 2007; Kuh et al., 2001). More information is needed regarding STEM students because limited research exists related to the academic and social behaviors of male academic success, and the influence of faculty engagement (e.g., mentorship, academic advising, instructional methods) on male undergraduate students (Jacob, 2002; Kim & Sax, 2009; Kuh, 2001; Laanan, 2011; Tomkiewicz & Bass, 2008; Vianden, 2009).

**Level of Academic Challenge**

The second benchmark of student engagement is level of academic challenge. Level of academic challenge describes a student’s perception of intellectual stimulation, expectations of student performance, and emphasis on achievement promoted at the student’s institution (Kim & Sax, 2009; Kuh, 2001; National Survey of Student Engagement, 2012a). Institutions that set rigorous academic standards through challenging coursework (e.g., written assignments, number of books, and length of readings) create an academic environment that causes students to increase level of institutional commitment because they feel academically challenged by the institution. Student behaviors, whether they choose to academically engage or disengage, will also reflect institutional expectations of high academic standards. For example, full-time undergraduate students will dedicate appropriate time on assignments, course preparation (e.g., study, reading, writing), and application of learned material, if faculty provide appropriately challenging coursework and encourage students to fully engage in their academic work.
Research reported by other investigators provides insight for understanding how male, full-time undergraduate students are either academically successful or unsuccessful as it relates to level of academic challenge (Jacob, 2002; Sax et al., 2005; Tomkiewicz & Bass, 2008; Umbach & Wawrzynski, 2005; Vianden, 2009). Several studies used samples from institutions that administered the NSSE College Student Report to study the influence level of academic challenge on undergraduate students' academic success (Laird, Chen, & Kuh, 2008; Umback & Wawrzynski, 2005). Laird et al. (2008) found students' academic persistence was higher among institutions where faculty members focused on promoting curricula that stimulated intellectual development, practical skills, and social responsibility.

Chambers (2010) also explored student perception of level of academic challenge using NSSE data collected 2645 participants from a 74,000 student urban research institution and found students overall described their level of academic challenge as low. Students reported coursework with too much emphasis on memorization caused students to develop a perception that assignments lacked substance, course preparedness, or program development. These findings suggested that raising the level of academic challenge might contribute to students' academic success. While men have higher enrollment in math and science courses which are among the most challenging courses in college, male students experienced higher proportions of course dropout and program failure than their female counterparts, contributing to higher male withdrawal and dropout rates (Jacob, 2002). Institutions could better match individual students to programs of study that appropriately challenge their academic and career interests, regardless of whether they are a STEM or non-STEM major. Campuses must
intentionally develop institutional environments where students feel academically challenged and supported by faculty members. Environments where students feel challenged increases the likelihood of these students meeting their academic expectations by devoting more time and dedication to study and activities that reinforce learning (Sax et al., 2005; Umbach et al., 2005; Vianden, 2009). Faculty members must also recognize how their behaviors, actions, and comments influence students' engagement in level of academic challenge (Sax et al., 2005; Umbach et al., 2005; Vianden, 2009) and consequently, their academic success.

**Enriching Educational Experiences**

The third benchmark of student engagement is enriching educational experiences. Enriching educational experiences are activities that enhance learning both within and outside of the classroom (Astin & Sax, 1998; Ibrahim, 2010; Parrot & Cherry, 2011; Pike, Kuh, & McCormick, 2010). These experiences educate students about themselves through participating in active engagement with faculty and peers and exposure to diverse values systems, religious views, and political beliefs through intentional interactions, such as internships, field experiences, service learning, and study abroad. Enriching educational experiences also offer a means for improving interaction between male undergraduate students and faculty and raising the level of academic challenge for student from all majors (e.g., Kuh, 2008; Pascarella, 2006; Pascarella & Terenzini, 2005).

Educational environments (e.g., learning communities, peer groups, service learning, study abroad, student-faculty research, internships, service learning, senior culminating experiences) can provide supportive enriching educational experiences that positively contribute to student academic success (Bjorklund, Parante, & Sathianathan,
For the purpose of this literature review, enriching educational experiences are limited to student participation in service learning, faculty research, internships, and co-curricular activities.

When structured within academic courses, service-learning opportunities provide students with practical experiences that enhance selection of degree programs and career fields (Chapman & Ferrari, 1999; Reed et al., 2005). Astin and Sax (1998) explored the impact of enrichment educational experiences on students from 1990-1994 using the Cooperative Institutional Research Program (CIRP) Freshman Survey and a follow-up survey that was administered in 1995. Student participation in volunteer services positively contributed to academic development, civic responsibility, and life skills. Volunteer activities connected to academic courses and career interest resulted in increased grade point averages (GPAs), general knowledge and understanding of academic disciplines, and commitment to degree completion (Astin & Sax, 1998; Bjorklund, Parante, & Sathianathan, 2004; Campman & Ferrari, 1999; Chang, 2005; Kuh, 2008; Pike, Schroeder, & Berry, 1997; Reed et al., 2005).

Reed, Jernstedt, Reber, and Dubois (2005) found gains for male undergraduate students who participated in service learning opportunities were greater than for female students. Using participants divided into experimental and control groups based on gender, GPA, major, and class year, the researchers administered three surveys over the course of one semester. The first survey, the Core Survey, asked questions related to perceptions of the college environment, attitude, beliefs, and values. The Social Responsibility Scale, the second survey, measured students' perception of social responsibility. Lastly, the meaning of college life was measured using a scale developed
by the researchers. Findings suggested students who participated in the service learning activities were more likely to select careers in the degree field in which the service learning activity occurred. Student participants were more prepared to execute skills gained from the service learning activities in their desired field of study compared to students who did not participate in service learning activities. All students gained from participation in service learning, but gains were more significant for males than those found among their female counterparts. This likely reflects the idea that male students generally need more structured consultation with faculty (Reed et al., 2005). Structured consultations helped men understand the value, time, and benefit of reflecting on learned experiences and drawing connections to academic majors and career paths (Ibrahim, 2010; Parrot & Cherry, 2010; Reed et al., 2005).

Participating in service learning opportunities allows students to demonstrate interpersonal, intrapersonal, diversity, and social growth and development (Ibrahim, 2010; Reed et al., 2005). Ibrahim suggests participation in service learning experiences causes students to develop a greater appreciation for diversity and intercultural relations (Ibrahim, 2010). Ibrahim's study found one significant benefit of student participation in service learning was the reduction of violent behaviors towards others, such as hate crimes and sexual harassment. These types of behaviors are leading causes of male students' dismissals from college for violations of college rules and codes of conduct (Harper, Harris, & Mmeje, 2005). Students exposed to other ethnic and racial groups better appreciate the value of diversity, improve communication, and increase collaboration with peers from other cultures (Harper et al., 2005). Students also developed an appreciation for working with fellow students who shared both
commonalities (e.g., degree program, career interest) and differences (e.g., religious or racial and ethnic background, sexuality) through enriching educational experiences.

In addition to service learning, students gain from enriching educational experiences by participating in faculty research. According to Hu, Kuh, and Gayles (2007), participating in faculty research led to students building more meaningful relationships with faculty members, which contributed to their academic success (e.g., student retention, degree achievement, higher GPA). Their study investigated the impact of participation in faculty research and utilized data collected from the College Student Experiences Questionnaire (CSEQ). Results from the questionnaire indicated a positive relationship between participating in research projects and academic success, but due to institutional size, undergraduate students at research institutions are less likely to conduct research with faculty than at small liberal arts institutions (2007). The researchers concluded, “if research universities wish to provide enriching educational opportunities, consistent with their distinctive research mission, they need to create more inquiry-oriented, educational opportunities for their students” (p. 175). An inquiry-oriented educational system encourages students to participate in class and interact with peers and faculty.

Enriching educational experiences help students become more academically successful, however, there are limitations related to the specific impact of these opportunities on male and STEM undergraduate students (Lichtenstein, McCormick, Sheppard, & Puma, 2010; Vianden, 2009; Webber, Nelson Laird, & BrckaLorenz, 2012; Whalen & Shelley, 2010). Vianden (2009) found working on research projects improve academic performance and retention among men in college but male undergraduate
students are resistant to working with faculty as they perceived faculty as unapproachable. Webber et al. (2012) built on research regarding undergraduate research conducted by Hu et al. (2007) and Vianden (2009) to understand how student demographics influence participation in undergraduate research by collecting data from both the NSSE and Faculty Survey of Student Engagement (FSSE). Webber et al. (2012) used a NSSE sample consisting of 111,077 seniors from 455 institutions from across the United States. The FSSE sample consisted of 39,699 faculty members from the same institutions where NSSE student samples were taken. Results indicated male students tended to participate in more undergraduate research than their female counterparts. One-third of the students were in STEM-related fields, which may account for why male participation was higher than female participation in undergraduate research. The research, however, did not specify academic gains of males in terms of GPA and graduation rates. Male students are more likely than their female counterparts to participate in undergraduate research (2012). More research is needed as it relates to developing relationships with faculty and structured experiences; such as service learning and faculty research projects influence overall GPA and graduation rates (Hu et al., 2007; Ibrahim, 2010; Parrot & Cherry, 2010; Reed et al., 2005; Webber et al., 2012, Vianden, 2009).

**Active and Collaborative Learning**

The fourth benchmark of student engagement is active and collaborative learning. Active and collaborative learning is behavior in which students engage with peers and faculty to collectively solve problems, master academic coursework, and apply knowledge to various life scenarios during and after college (Kuh, 2008; Smith & Stitts,
Students demonstrate active and collaborative learning when they engage in classroom discussion, articulate new knowledge with others, prepare for class with peers, and actively solve problems (Jacob, 2002; Kuh, 2008; Umback & Wawrzynski, 2005). Active and collaborative learning is essential to developing academic skills needed to meet the interconnected world of the 21st century (Association of American College & Universities, 2013; State Council of Higher Education, 2013). For example, once students enter the workforce, they must be able to work with other colleagues, both within and outside of their work environments. Having opportunities to engage in active and collaborative learning will help students develop the skills needed to engage in the workplace once they graduate from college.

Jacob (2002) found the highest dropout rates among men majoring in business, computer science, physics, and engineering, were attributed to a lack of non-cognitive skills and the inability to emotionally connect and interact with faculty and peers. Umbach and Wawrzynski (2005) built on Jacob’s (2002) findings and suggested institutions that promote active and collaborative learning environments help undergraduate students develop non-cognitive practical competencies that contribute to gains in social and academic development such as working with others, collectively solving conflict, aiding peers in tutoring. Umback and Wawrzynski drew their conclusions by sampling 20,226 seniors across 137 institutions that participated in the National Survey of Student Engagement (NSSE) and found students developed interpersonal and communication skills through active and collaborative learning. According to the Association of American College and Universities, students who participated in learning communities are among the highest to report active and
collaborative learning (Kuh, 2008). Male undergraduate students, who were academically successful, demonstrated the ability to collaborate civilly with others, regardless of race, gender, sexuality, and economic status, and critically think and solve problems through opportunities to engage actively and collaboratively with their peers (Jessup-Anger, Johnson, & Wawrzynski, 2012; Pike & Ku, 2006; Pike, Kuh, & McCormick, 2010; Umbach & Wawrzynski, 2005). Yao and Wawrzynski (2013), found non-cognitive skills related to diversity appreciation and communication are limited to the duration of time involved in academic or residential learning communities. They suggested male students will not change their behaviors or perceptions regarding diversity without structured conversations facilitated by campus administrators and faculty (2013). For male students, active and collaborative learning experiences must be ongoing and structured to provide reinforcement of new learned behavior.

Like Umbach and Wawrzynski (2005), Pike, Kuh, and McCormick (2010) utilized the National Survey of Student Engagement to collect data about learning communities and levels of student engagement. They sampled 76,587 students including 37,041 seniors who attended 277 colleges and universities. The results of this study demonstrated participation in learning communities resulted in positive academic growth in a variety of majors. Pike et al. (2010) recommended campus leaders utilize learning communities as a means to encourage increased commitment to higher academic standards and collaborative learning while providing support through interaction with faculty, staff, and peers.

Learning communities, particularly as they relate to reading groups, caused students to hold themselves and others accountable for their learning (Parrot & Cherry,
To determine the value of learning communities, the researchers used a mixed methods study. A convenience sample was comprised of students taken from several courses (e.g., sociology, social movement, race and ethnicity) and institutional types (e.g., large public, midsize private, small private). Observations and student surveys were administered from 13-15 weeks to 13-30 students in each course. Parrot and Cherry found working with academically motivated peers caused students to develop bonds both within and outside of the classroom, which led to ongoing relationships that positively reinforced learning. For example, bonding with peers related to academic accountability increased the likelihood of retention from one year to the next, and increased connection to the institution (Astin, 1984; Parrott & Cherry, 2011; Tinto, 1987).

Supportive Campus Environment

The fifth benchmark of student engagement is supportive campus environment. In order to provide a supportive campus environment, higher education institutions should proactively develop physical, social, emotional, and instructional campus environments to support and promote academic success (Bjorklund, Parente, & Sathianathan, 2004; Davis, 2002; Ku & Hu, 2001; Tomkiewicz & Bass, 2008; Vianden, 2009). Findings from the National Survey of Student Engagement (NSSE) (2012a) indicated that academic performance is positively related to student satisfaction with institutional commitment and support of student success. The NSSE outlines several conditions that reflect good institutional practices related to establishing a supportive campus environment (e.g., resources to support coping with non-academic experiences; quality relations with students, faculty, and administrators; academic and social support services).
Evidence of supportive campus environments includes how faculty, administrators, and peer behaviors encourage students to seek help and support, develop quality relationships, and feel supported from their institutions as a whole. Bjorklund, Parente, and Sathianathan (2004) explored the relationship between faculty feedback and student gains in academic skills. They collected data from classroom activities using a questionnaire. The findings demonstrated positive responses from the participants to constructive feedback from and interactions with faculty and administrators.

Karabenick (2004) found when and from whom students choose to seek help is dictated by reasons determined by an individual's unique personal characteristics. His findings demonstrated that low achievers resist obtaining help when they need it, resulting in an increased likelihood of not being academically successful. In contrast, high achievers were more likely to seek explanation and support from others, rather than direct answers to problems (Karabenick, 2004). Future research should explore how levels of student engagement influence help-seeking behaviors as they relate to academic success (Karabenick, 2004). For example, do engaged students recognize willing peers who may be able to share knowledge and skills needed to increase success (Karabenick, 2004)? Karabenick concludes, "how teachers and peers respond is an essential determinant to whether students seek help" (Karabenick, 2004, p. 599). He believes as experiences in college increase among underprepared students, more research is needed to understand how levels of support from both inside and outside the classroom influence academic success (Karabenick, 2004).

In addition to support received from faculty, administrators, and peers, institutions provide helping services to assist students academically, such as counseling services,
tutoring, and academic advising; however, how students engage in these services varies by gender. According to Good and Wood (1995), male students were least likely to seek counseling and psychological services because men assume they are not supposed to ask for help. The researchers conducted a study with 397 male college students that assessed male perceptions of gender role behavior. Results from the study indicated male students were more likely than female students to demonstrate signs of depression and resist seeking counseling because of the perception that men do not express themselves through emotions or conversation. Such perceptions can lead to a lack of academic success. Male students are also more likely to continue not to seek assistance if they encounter negative or unconstructive interactions from faculty, staff, and peers (1995).

Finding quality relationships among male undergraduate students that contribute to academic success can be challenging. Davis (2002) conducted a qualitative study to understand the nature of the relationships between male undergraduate students. Out of a population of 6,000, a sample of 10 males with ages ranging from 19-21 was selected to participate in interviews at a public research institution (Davis, 2002). Male students were more challenged by having “face-to-face conversations” verses “side-by-side” conversations (Davis, 2002, p. 515). Side-by-side conversation was the preferred method of communication to avoid the demonstration of true emotional connection with other male peers. Male students who avoided eye contact also avoided being held accountable by other male peers or downgraded the conversation by making jokes or engaging in horseplay (Davis, 2002). Engaging in genuine face-to-face conversations evokes emotions expressed and judged as feminine by men. Despite negative perceptions of face-to-face communication, successful male students were able to overcome these
perceptions to find male peer groups with which to develop a sense of kinship or brotherhood (Davis, 2002). Vianden (2009) built on findings by Astin (1993) and Pascarella and Terenzini (2005) and suggested peer groups have considerable influence in either encouraging or discouraging academic success. Men express difficulty completing academic tasks if their peers lack supportive behaviors and attitudes (Vianden, 2009). Ku and Hu (2001) found quality relationships within various groups, such as with peers, faculty, and administrators, cause positive or negative influences on future relationships sought by students within the same groups. These findings suggest male students who encounter other male peers, faculty, or administrators who do not take their academic interest seriously are likely to adopt similar behaviors towards other students. Negative behaviors from peers, faculty, and administrators can cause male students to become emotionally depressed, discouraged, and can ultimately cause them to leave their institutions of study (Astin, 1993; Pascarella & Terenzini, 2005; Tinto, 1993). This research study contributed to existing literature by identifying the influence of institutional support through the five benchmarks of student engagement on male undergraduate students in STEM majors.

**Male Undergraduate Students' Academic Success and Workforce and Society Historical Implications**

Research related to the factors that influence male undergraduate students’ academic success and the impact of this success on society and labor is limited, and several researchers suggest more data collection is needed to ascertain policy and program changes needed to improve male academic achievement in college and universities (Holzer, 2007, Morgan, Leenman, Todd, & Weeden, 2012; Raphael, 2008).
Many of the studies related to the impact of male students' academic success on the workforce and society is provided as an historical perspective. Literature contains reports of studies that investigated the differences in male students' academic success based on race, strengths and challenges placed on family, gender roles, and role of men in industrial societies. Historically, an effort has been made for the United States to become more educationally and economically inclusive of all members of society. For example, the women's rights movement has advanced women's causes related to reproductive rights, equal pay, access to education, and the right to vote (Brah & Phoenix, 2004; Skelton, 2010; Weaver-Hightower, 2003). Likewise, the civil rights movement continues to promote equal rights, education equality, access to education, and overall treatment of racial-ethnic minorities and the traditionally disenfranchised (Hamilton, 2013; Hopkins & Garrett, 2010). Such social movements highlight various injustices and inequalities between the various socioeconomic, gender, and racial/ethnic groups. The results of a study by Charles and Luoh (2003) suggest those who were responsible for oppressing the aforementioned groups – those generally with the greatest wealth and education – were White men. However, as changes in social policies gave women and racial/ethnic minorities economic and educational access, these societal changes may have inadvertently caused a disinterest in men in terms of social experiences, learning needs, and educational attainment (Charles & Luoh, 2003). Laws and policies expanded college services and access to women, racial/ethnic minorities, and people with disabilities, but few policies were put in place to focus on the needs of all men. New research calls for society to focus on the academic performance and academic preparation of men in colleges and universities (Conger & Long, 2010; Holzer, 2007; Kent et al., 2011, Slater,
Due to labor demands in the United States for individuals with degrees in STEM fields, administrators, professors, and educational researchers are seeking ways to improve the retention and graduation rates of STEM majors, of which the largest proportion of undergraduates identify as men (Hummel & Cheetham, 2010; Kuenzi, 2008; U.S. Department of Labor, 2011; 2012).

**Labor Market and Societal Impact**

The U.S. labor market has changed dramatically during the past few decades, as the U.S. economy has shifted from manufacturing-based to a more knowledge-based economy (Raphael, 2008). The U.S. has a critical need for STEM majors to sustain its economic, political, and military advantage (Hummel & Cheetham, 2010; Kuenzi, 2008). STEM occupations are reflecting the skills and information representative of a knowledge-based economy, while low-skill farming jobs reflect the old manufacturing-based economy. In a manufacturing-based economy, job seekers are able to obtain positions that require lower skills, manual labor, and task repetition (Autor, 2010; Dishion, 1984; Kochan, 2013; Schiliro, 2012). However, such industries are becoming more dependent on automated technology, information-gathering, and services, thereby eliminating the need for jobs that require low skills (e.g., task repetition, manual labor) while rapidly demanding individuals with higher levels of advanced technical skills (Ezell, 2012, Green, 2012). For example, according to the Department of Labor, low-skill manufacturing and farming are declining due to overseas outsourcing, while growth is projected in knowledge-based jobs in STEM fields, business, and education (Autor, 2010; U.S., Department of Labor, The Urban Institute, 1999). According to Conlin (2003), 70% of careers in manufacturing are held by men, while women are employed in
14% of these occupations. In contrast, women make up approximately 60% of the employees in the knowledge-based service sector, which has expanded 260% over the last four decades. Jobs in knowledge-based service industries require higher cognitive skills, as well as the ability to work collaboratively, synthesize information, solve problems, and make decisions. Bianchi (1995) found men and women differ in their values as they relate to labor. Men place “higher value on status,” “power,” “money,” “freedom from supervision,” and have a “willingness to take risk” (p. 123); while women value jobs that provide them with an opportunity to “work with people, help others,” and demonstrate “creativity” (1995, p. 123). Creativity and collaboration are traits attractive to employers, especially when coupled with degree attainment, making women competitive in the workforce. As a result, men, regardless of level of education, are less likely to enter career fields that require cognitive skills and that value skills perceived as feminine by men (Weaver-Hightower, 2003).

The decline of men in the workforce, particularly among knowledge-based industries, such as in the STEM fields (e.g. highly computer-based manufacturing in technology and engineering), may be the result of fewer men matriculating from high school to college and the lower retention of men in college (Hoynes, Miller, & Schaller, 2012; Juhn & Potter, 2006; Mead, 2012; Morgan, Leenman, Todd, & Weeden, 2013). According to Raphael (2008), economic uncertainty in the workforce most negatively impacts individuals who are underprepared and poorly educated because they are most likely to seek low-skill manufacturing, farming, and construction jobs. In the past, men who dropped out of high school or college were able to find well-paying “low-technology industry and basic manufacturing” jobs while women obtained jobs geared towards
services (e.g., healthcare, education) requiring advanced degrees and certifications (Bianchi, 1995, p. 132). Today, the workforce favors high non-cognitive skills found in highly skilled and more college-educated workers (Nixon, 2009; Raphael, 2008; Roberts, 2012). Men between 25-54 years of age have experienced a decline in the rate of employment from 96% in 1969 to 90% in 2004 (Juhn & Potter, 2006). This decline is attributed to changes in the workforce from a low-skill manufacturing to a knowledge-based economy and the decline of male educational attainment (Juhn & Potter, 2006). Less educated men are more likely than their more educated male counterparts to experience a decline in their participation in the workforce due to a lack of training and education, which leads to lower wages, higher underemployment, and underpreparedness for an increasingly knowledge-based economy that relies on the ability of individuals to synthesize data, solve problems, and make decisions based on information (Holzer, 2007; Juhn & Potter, 2006; McDowell, 2001; Thompson, 2003). African-American men without proper educational preparedness experience the greatest challenges in securing jobs and achieving economic security when they lack a college degree; however, regardless of racial/ethnic identity, men with a bachelor’s degree are more likely than those without the degree to obtain and maintain employment (Autor, 2010; Hoynes, Miller, & Schaller, 2012; Stevans, 2009). Men who do not obtain an education that is appropriate for the new knowledge-based and highly skilled economy are forced into a cycle of workforce under-preparedness, unemployment, and workforce withdrawal.

Individuals who do not complete a high school degree or obtain a college degree negatively influence the U.S. economy (Bianchi, 1995, Mortensen, 2003; Schwartz & Mare, 2005). Those without a high school diploma contribute fewer tax dollars than their
college-educated peers (Sum, Khatiwada, McLaughlin, & Tobar, 2007). High school dropouts are less likely to own their own home, thus resulting in less property taxes being collected through homeownership to support local government expenditures, such as public schools (2007). Men who do not obtain a college degree are more likely to live in poverty, have limited job opportunities, are less likely to be financially able to support themselves and their families, and are more likely to engage in delinquent behaviors that potentially lead to incarceration (Holzer, 2007; Hoynes, Miller, & Schaller, 2012; Nixon, 2009; Pascarella & Terenzini, 2005; Payton, 2008; Paulson & St. John, 2002; Raphael, 2008; Robets, 2012; Walpole, 2003). According to Sum et al. (2007), after economic recessions, wage recovery for men between 16 and 24 years of age is less robust and such findings are especially true among men who did not complete college.

Men who attain bachelor’s degrees experience greater happiness, job quality, job retention, and higher earnings within their careers than their male counterparts who do not attain bachelor’s degrees (Autor, 2010; Green, 2012; Kochan, 2013; Mead, 2012; Sum, Khatiwada, McLaughlin, & Tobar, 2007). The average earnings of men with less than a high school diploma were $11,000 compared to $29,000 earned by those with a bachelor’s degree (Sum et al., 2007). Hoynes, Miller, and Schaller (2012) found men with higher education (i.e., college degrees) also experienced less employment decline and less unemployment during economic recessions as compared to men with less education.

One of the most affected ethnic groups by economic recessions is African Americans. According to Sum et al., (2007), “African-American men who do not finish high school will receive $190,000 in government assistance, which is more than what
they financially contribute to the U.S. economy” (p. 17). In the same study, the authors also found “the average Black male with a Bachelor’s degree will pay $500,000 more in taxes than what he receives in cash and in-kind benefits, while those with a Master’s or higher degree will pay $1.35 million more in taxes than what they receive in cash and in-kind benefits” (Sum et al, p. 17). While it is generally acknowledged that racial and ethnic minorities make up a larger proportion of least educated and skilled workers, White men are also underreported in this regard (Raphael, 2008). Raphael (2008) indicated less educated White men (those without a college degree) experienced a 22% decline in wages from 1980-2000. These findings suggest the inability of men to secure work and better pay has more to do with education than race. Poor job attainment and retention can cause already economically challenged living situations to become worse because men tend to make more than women in lower socioeconomic households (Mortensen, 2003; Schwartz & Mare, 2005).

Women have increased their attainment of postsecondary education while men have experienced a decline in their postsecondary education attainment (Diprete & Buchmann, 2006; Gose, 1999; Jacob, 2002). Although women are exceeding men in attaining undergraduate degrees, women are less likely to seek partnerships or marriage with men who do not have an equal educational level or earning potential (Schwartz & Mare, 2005). Because women are attaining degrees and access to the workforce at a faster rate than men, it is likely the workforce and traditional family and gender roles will change over time. Bianchi (1995) predicted as women increase their participation in the workforce, men are more likely to take on a greater share of domestic household responsibilities, such as cooking, laundry, childcare, and cleaning. More educated men
and men married to college-educated spouses contributed more to household chores (Blossfeld & Buchholz, 2009; Borland & Pitt, 2008; Chesters, 2012). Schwartz and Mare (2005) also found men are just as likely as women to seek partnerships and spousal relationships that have equal levels of education and earning potential. Mortensen (2003) predicted women will become increasingly challenged in finding male partners with similar or higher education. The inability of women to find male life partners with similar or higher education is influenced by the high school dropout rate and lack of retention rates and college degree attainment rate among men (Charles & Luoh, 2010; Isen & Stevenson, 2011; Shafer & Zhenchao, 2010).

Political leaders seek ways to retain male students while in college in order to create a highly educated workforce and improve society by reducing crime. The relationship between level of education attained among men and the likelihood of incarceration is well established (Conlin, 2004; Holzer, 2007; Raphael, 2008; Sum, et al., 2007; Thomson, 2004). Men without a college degree are less likely to gain higher-wage employment and update skills needed for the workforce, causing them to disconnect from the workforce and engage in delinquent behaviors (Holzer, 2007; Paulsen & St. John, 2002). Men make up the majority of individuals incarcerated, most of whom have less than a high school diploma (Freeman, 2008; Haney, 2010; Raphael, 2008; Thomson 2003).

**Summary**

Chapter II presented a review of literature related to the factors that influence the retention of male, full-time undergraduate students in STEM and non-STEM majors. Men in college experience challenges, such as low levels of academic preparation,
remaining enrolled, and graduating from higher education institutions (Chen, 2009; Conger & Long, 2010; Crisman-Isher, 2005; Moor, 2006, Perna, 2000; Sum et al., 2007). Less than 8% of men will attain a degree in STEM. A lack of pre-college preparation in science and mathematics are a contributing factor to why men are not retained in STEM majors (Chen, 2009; Moor, 2006; Sum et al., 2007).

The five benchmarks of student engagement are institutional best practices that positively influence academic success of full-time undergraduate students, both in STEM and non-STEM majors. Quality interactions with faculty positively influence academic commitment of students (e.g., Anderson, 2005; Erkut & Mikros, 1984; Kim & Sax, 2009; Sax, Bryant, & Harper, 2005). Higher commitment to studies and course preparation demonstrate students understanding of level of academic challenge set by higher institutional expectations (e.g., academic scholarship, leadership, social responsibility) (Laker, 2003; Tinto, 1997; Viaden, 2009). Enriching educational experiences provide students with structured reflection and interaction with faculty, administrators, and peers, which leads to sustained leaning and academic success (Astin & Sax, 1998; Parrott & Cherry, 2011; Pike et al., 2010). Active and collaborative learning connect students to peers with mutual academic interests and encourage participation in academic and social activities that support high academic performance (Ibrahim, 2010; Kuh, 2008; Smith & Stitts, 2013; Umback & Wawrzynski, 2005). Finally, supportive campus environments provide students with a welcoming and inclusive atmosphere that encourages quality interactions with faculty, peers, and administrators (e.g., Bjorklund, Parente, & Sathianathan, 2004; Davis, 2002; Ku & Hu, 2001; Tomkiewicz & Bass, 2008).
Although research exists regarding the relationship between student engagement and the academic success of male, full-time undergraduate students, further research regarding how student engagement influences the academic success of full-time undergraduate students needs to be explored (Kuh, 2009; Tinto, 1993; Umbach & Wawrzynski, 2005). This study expands knowledge related to how student engagement influences academic success of male, full-time undergraduates in STEM majors by looking at how student engagement differences between STEM and non-STEM majors.

The U.S. workforce is increasingly reliant on individuals with an academic background in STEM related fields. Industries rely more heavily on technology, information system, and science, resulting in fewer well-paying jobs that do not require postsecondary credentials (e.g., certification, 2-year degree, 4-year degree). The rate of employment declined from 96% to 60% for men in the last twenty years between 25-54 years of age. With fewer men employed, less tax dollars are collected, resulting in negative effects on the U.S. economy. U.S. society is changing and men who do not complete college will be increasingly challenged. Men who do not complete college increase their odds of incarceration and low socioeconomic status (Cox, 2010; Raphael, 2008; Wakefield & Uggen, 2010, Western, Kling, & Weiman, 2001).

Chapter III provides an overview of the methodology and instrument used in this study. One-way analysis of variance (ANOVA) and one-way analysis of covariance (ANCOVA) were utilized to determine the influence of student engagement on retention of male, full-time undergraduate students in both STEM and non-STEM majors using data collected from the College Student Report administered by the National Survey of
Student Engagement. A description the study population, sample selection, and statistical tool are included.
CHAPTER III
METHODOLOGY

This study used a descriptive survey research design to investigate the relationship between student engagement and retention by comparing male, full-time undergraduate students in select science, technology, engineering, and math (STEM) majors to male, full-time undergraduate students in non-STEM majors to identify best practices to improve retention among men in STEM fields. The survey technique was selected as the best method to collect data for analysis, as survey research uses questions to collect information, such as attitude, perspective, and experiences, from one or more groups. Chapter III describes the population, variables, measures, procedures, and data analyses for this study.

Population

This study used male first-year, full-time undergraduate students at a large, public, mid-Atlantic research-intensive university during the 2005-2006 and 2009-2010 academic years. The total population of students at the start of the 2012-2013 academic year was 24,400 students, including 18,900 undergraduate students and 5,500 graduate students (ODU, 2013). Out of 18,900 students identified by the university as undergraduate students, 2,875 were in their first-year of college enrollment (Institutional Research & Assessment, 2013). The population of students utilized for this study were classified as admitted full-time undergraduate students during the 2005-2006 and 2009-2010 academic years (Institutional Research & Assessment, 2013).

Combining 2005-2006 and 2009-2010 fulltime undergraduate students who participated in the NSSE, there were 1753 total respondents who responded to the survey.
and of the total respondents, 692 were male full-time students. Based on the total male participants, this study required a sample of 249 male respondents, however, all 692 male participants were included to reduce the margin of error and provide the most representative sample of the male student population at the selected institution (Leedy and Ormrod, 2010). This study investigated how each benchmark of student engagement influenced the retention of male, full-time undergraduate student STEM majors by comparing the responses of male full-time undergraduate student STEM majors to the responses of male full-time undergraduate student non-STEM majors. Retention was defined as whether the participants were retained from their first-year to their second year from Fall to Fall semesters. According to Sullivan, student retention is salient to academic success (2010). At the institution selected for the study, students must maintain at least a 2.0 GPA in order to remain in good academic standing and be retained from one year to the next (ODU, 2013).

**Questionnaire**

The National Survey of Student Engagement (NSSE) uses the College Student Report to assess the effectiveness of the five benchmarks of student engagement in influencing college student success: (a) student-faculty interaction, (b) level of academic challenge, (c) enriching educational experiences, (d) active and collaborative learning, (e) supportive campus environment (Kuh, 2008; National Survey of Student Engagement, 2012). The NSSE:

documents the dimensions of quality in undergraduate education and provides information and assistance to colleges, universities, and other organizations to improve student learning. Its primary activity is annually surveying college
students to assess the extent to which they engage in educational practices associated with high levels of learning and development (National Survey of Student Engagement, 2011a, p. 2).

The College Student Report, the NSSE questionnaire that is sent to first-year and senior students at four-year colleges and universities, was used to measure student engagement in this study. The participants received the College Student Report at the end of the Fall semester during their first-year of study. The report consists of 28 questions categorized into sets based on each of the five benchmarks (see Appendix). Within each set of questions, students rate a series of statements, 85 statements total, regarding characteristics of each benchmark using a Likert scale of very often, often, sometimes, and never. The first set of statements relate to educational activities that occur between students and faculty. Students offer perspectives on how they (students) interact with faculty through discussion of course topics, correspondence with faculty about career paths, and academic preparedness (e.g., grades, readings, studying). The second set of statements relate to level of academic challenge. These questions collect information regarding commitment to prepare for assignments, participate in classroom activities, and complete coursework. The third set of statements relate to supportive campus environment, which cover topics, such as student perception of personal, academic, and social support. The fourth set of statements collect information related to student demographic information (e.g., sex, age, race/ethnicity, enrollment, major, parental education). The fifth set of statements cover student perspectives, such as oral and written communication, general knowledge, and ethical development. For example, participants are asked about experiences related to time spent working with faculty on
various activities (e.g., committees, orientation, student activities, research projects), time spent preparing for class, studying, meeting course expectations, their ability to analyze synthesize and apply ideas, and their perceptions of enriching educational experiences. Of the 85 statements, 42 statements represent the five benchmarks (see Table 1).

Table 1

*Topical Areas that Represent the Benchmarks of Student Engagement*

<table>
<thead>
<tr>
<th>Benchmarks of Student Engagement</th>
<th>Number of Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Faculty Interaction</td>
<td>6</td>
</tr>
<tr>
<td>Level of Academic Challenge</td>
<td>11</td>
</tr>
<tr>
<td>Enriching Educational Experiences</td>
<td>12</td>
</tr>
<tr>
<td>Active and Collaborative Learning</td>
<td>7</td>
</tr>
<tr>
<td>Supportive Campus Environment</td>
<td>6</td>
</tr>
</tbody>
</table>

**Research Variables**

Academic success, as measured by retention of students from their first to second year, was used as the dependent variable mediated by grade point average (GPA). Using the aforementioned dependent variable, differences in retention between STEM and non-STEM majors were sought to determine if student engagement influences male academic success. The dependent variable was used as a means by which state and federal officials determine public institution funding (Braxton, 2009; Wall, Frost, Smith, & Keeling, 2008). As a result of using retention in funding formulas, campus administrators are particularly invested in using retention rates as a means of determining academic programs, campus environment, and policy effectiveness (Braxton, 2009; Kim, Newton, Downey, & Benton, 2010). Research results suggest nearly 40% of first-year students
will not be retained to their second year of college (Morrow & Ackermann, 2012; Tinto, 1993). Given the high drop out rate of first-year students, retention is an appropriate measure of academic success (Kim et al, 2010).

For the purpose of this study, grade point average (GPA) was used as a mediator variable related to retention. Using GPA as a mediator was appropriate because the Carnegie classification of research institutions use GPA to measure academic performance in individual courses (Carnegie Foundation for the Advancement of Teaching, 2014). Students must retain a GPA of 2.0 or higher to remain in good academic standing with the institution and progress from one year to the next; being in good academic standing at the institution permits students to continue taking coursework provided they meet departmental requirements (ODU, 2013). For the purpose of this study, participants were considered academically successful if the participants were retained from their first year to their second year.

The five benchmarks of student engagement, as measured by the National Survey of Student Engagement, served as the independent variables to examine their influence on retention. These variables included: (a) student-faculty interactions, (b) level of academic challenge, (c) enriching educational experiences, (d) active and collaborative learning, and (e) supportive campus environment. Participating in experiences reflective of the five benchmarks demonstrate active engagement in the formal and informal aspects of institutional academic and social systems, as described by Astin (1985) and Tinto (1975). Astin (1985) and Tinto (1975) suggested quality student engagement in these aspects of institutional systems is associated with academic success.
Reliability and Validity of Instrument

Reliability is the “consistency with which a measuring instrument yields a certain result when the entity being measured hasn’t changed” (Leedy and Ormrod, 2005, p. 29). Internal consistency and temporal stability were tested to ensure the reliability of the NSSE (National Survey of Student Engagement, 2013f; National Survey of Student Engagement, 2013g). Cronbach’s alpha was used to analyze the intercorrelations of the NSSE scales: higher-order learning, integrative learning, reflective learning, and deep learning, and gains in personal and social development, practical competence, and general education (National Survey of Student Engagement, 2013f). Random samples were used from institutions that participated in the National Survey of Student Engagement in 2011. The results indicated each one of the scales was reliable, as Cronbach’s alpha was reported at or above the required alpha of .70 (see Table 2).

Table 2

*Pearson’s r Correlation of NSSE Characteristics of Student Engagement*

<table>
<thead>
<tr>
<th>Student Class</th>
<th>Academic Challenge</th>
<th>Active and Collaborative Learning</th>
<th>Student-Faculty Interaction</th>
<th>Enriching Educational Experiences</th>
<th>Supportive Campus Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-Years</td>
<td>.786</td>
<td>.811</td>
<td>.749</td>
<td>.816</td>
<td>.754</td>
</tr>
</tbody>
</table>

*Note: Adapted from “Table 1 2010-2011 Benchmark Correlations by Class” by National Survey of Student Engagement, 2013g, p. 2.*

Students also had high gains in personal and social development, practical competence, and general education, as Cronbach’s alpha was also reported at or above the required alpha of .70 (see Table 3).
Table 3

*Required Cronbach’s Alpha Level*

<table>
<thead>
<tr>
<th>Scale</th>
<th>First-Year α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher-Order Learning</td>
<td>.818</td>
</tr>
<tr>
<td>Integrative Learning</td>
<td>.714</td>
</tr>
<tr>
<td>Reflective Learning</td>
<td>.796</td>
</tr>
<tr>
<td>Deep Learning</td>
<td>.856</td>
</tr>
</tbody>
</table>

*Note:* Adapted from “Table 9 Deep Learning Cronbach’s Alphas by First-Year by Gender” by National Survey of Student Engagement, 2013e, p. 2.

Pearson’s *r* was also used to test the temporal stability of the five characteristics of student engagement (National Survey of Student Engagement, 2013g). Results from the 231 institutions that participated in the NSSE in 2010 and 2011 were used to investigate stability. Table 2 indicates the overall stability of the scores, expressed as Pearson’s *r*, was at or above .70 for each characteristic, ranging from student-faculty interactions at .75 to enriching educational experiences at .82. Reliability of the instrument was enhanced using internal consistency. Internal consistency was established using Cronbach’s alphas. Table 4 indicates internal consistency was achieved and expressed as Cronbach’s alpha at or above .70.
Table 4

*Internal Consistency using Cronbach's Alpha for First-Year*

<table>
<thead>
<tr>
<th>Scale</th>
<th>First-Year α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher-Order Learning</td>
<td>.824</td>
</tr>
<tr>
<td>Integrative Learning</td>
<td>.699</td>
</tr>
<tr>
<td>Reflective Learning</td>
<td>.796</td>
</tr>
<tr>
<td>Deep Learning</td>
<td>.853</td>
</tr>
</tbody>
</table>

*Note:* Adapted from “Table 9 Deep Learning Cronbach's Alphas by First-Year and Senior” by National Survey of Student Engagement., 2013e, p. 2.

Validity is “the extent to which the instrument measures what it is intended to measure” (Leedy and Ormrod, 2005, p. 28). To enhance content validity of the NSSE, researchers developed a conceptual framework based on theories and research related to student engagement and rigorously tested the NSSE to ensure the trustworthiness and appropriateness of questions related to each of the five NSSE benchmarks (National Survey of Student Engagement, 2013d). Specifically, researchers organized individual interviews with 163 undergraduate students (50 men and 113 women) from both predominantly white institutions (PWI) and minority-serving institutions (MSI). The interviews were scheduled for 45 minutes with two interviewers and it was determined the participants consistently understood the survey items and processed the questions in similar ways, thus ensuring process validity.

In addition to the individual interviews, focus groups were conducted to ensure the survey questions were consistently interpreted across the participants (National Survey of Student Engagement, 2013e). Researchers hosted between three and six focus groups on each of the campuses used for the individual interviews and had 221 first-year
(i.e., freshmen) and senior participants. Overall, 35 focus group sessions occurred and each lasted no more than 90 minutes. Results from both the interviews and focus groups indicated students were able to read, understand, and easily complete the survey regardless of gender, year in school, racial and ethnic background, and institutional type (2013e).

**Research Questions**

To guide this study, the following questions were developed:

**RQ1:** Does the influence of student-faculty interaction on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

**RQ2:** Does the influence of level of academic challenge on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

**RQ3:** Does the influence of enriching educational experiences on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

**RQ4:** Does the influence of active and collaborative learning on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

**RQ5:** Does the influence of a supportive campus environment on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

**Procedure**

The study was conducted at a large, public, research-intensive, mid-Atlantic university that participated in the National Survey of Student Engagement (NSSE) during
the 2005-2006 and 2009-2010 academic years. Students were invited to participate in the NSSE’s College Student Report during the spring semester of the 2005-2006 and 2009-2010 academic years via their university e-mail addresses. Historically, the NSSE is administered every three to four years and the researcher used the 2005-2006 and 2009-2010 datasets to permit calculation of one-year retention (first to second year). All students were e-mailed with electronic log-in access that provided immediate participation in the questionnaire (National Survey of Student Engagement, 2013h). Students received three customized e-mail reminders and one final reminder to ensure a large sample size (2013h). Responses to questions were self-reported (National Survey of Student Engagement, 2013d; 2013e, 2013f; 2013g). The Office of Assessment provided questionnaire results from the 2006 and 2010 College Student Report, which were reviewed, cleaned, and coded by the researcher. The data included information related to the participants’ corresponding GPA, gender, major, retention, and academic year, which were analyzed by the researcher. Data collected did not include personal identifying information, such as names, social security numbers, and university identification numbers, to ensure the anonymity of the participants. Because this research focused on retention and the number of male participants is small, it was appropriate to combine 2006 and 2010 to have enough participants to draw appropriate conclusions and make recommendations.

A sample of the male first-year, full-time undergraduate students who participated in the 2005-2006 and 2009-2010 College Student Report provided by the NSSE was drawn from the dataset to analyze. Participants who did not self-report as male, first-year, or full-time undergraduate students during the 2005-2006 and 2009-2010 academic
year were excluded from the study. According to their classification, participants were
coded and divided based on major into STEM or non-STEM groups. One-way analysis of variance (ANOVA) and one-way analysis of covariance (ANCOVA) was used to analyze the data using Statistical Package for the Social Sciences (SPSS) software.

Researchers found analysis results produced by multiple regression and ANOVA are identical when the independent variables are categorical and eta-square is calculated (Nelson & Zaichkowsky, 1979). ANOVA was selected because it is considered a special form of multiple regression in which comparisons can be drawn both between STEM and non-STEM groups and within STEM and non-STEM groups. Significance and eta-square was calculated as part of ANOVA to ensure results were sound. In addition to ANOVA, ANCOVA was used to determine if GPA influenced the results as a mediator variable. Participant information was kept confidential and all data was password-protected in a secured computer and locked filing system.

**Statistical Analysis**

SPSS software was used to analyze the data in correspondence with the research questions. To increase the accuracy of the findings from the NSSE College Student Report, data cleaning was conducted to account for any missing scores, as accounting for missing scores decreases the likelihood of Type I and II errors (Field, 2009). Using SPSS, male, first-year, undergraduate student participants were separated into STEM and non-STEM groups according to major using dummy coding. Placements in STEM and non-STEM groups were determined according the Carnegie Classification (Carnegie Foundation for the Advancement of Teaching, 2014). To further investigate differences both between and within STEM and non-STEM, six groups were formed using the
overall score obtained using Likert scale responses of very often, often, sometimes, and never to the 85 statements in the College Student Report of the NSSE (see Appendix). After obtaining the overall score, the means and standard deviations were determined for each of the five benchmarks (i.e. independent variable) to determine the group ranges of high, medium, and low within each benchmark. To determine the low range, the standard deviation was subtracted from the mean. The high range was determined by adding the standard deviation to the mean. Finally, the medium range was the scores between the high and low ranges. Once the ranges were determined, each was recoded into different variables combining the high, medium, and low ranges of each benchmark resulting in six groups: STEM HIGH, STEM MEDIUM (MED), STEM LOW, non-STEM HIGH, non-STEM MED, and non-STEM LOW. These six groups allowed for comparisons both between and within STEM and non-STEM using statistical analysis.

ANOVA was conducted to investigate the relationship between the five independent variables and the dependent variable according to the six groups: STEM HIGH, STEM MED, STEM LOW, non-STEM HIGH, non-STEM MED, and non-STEM LOW. First, the five independent variables: (a) student-faculty interaction, (b) level of academic challenge, (c) active and collaborative learning, (d) enriching educational experiences, and (e) supportive campus environment, were analyzed separately to determine the level of significance between each of independent variables and the dependent variable. Second, after conducting ANOVA, Tukey's post-hoc test was conducted to control for Type I error and determine if there were differences between groups (Field, 2009). The effect sizes ($\eta^2$) was calculated to determine the strength in the relationship between each benchmark of student engagement and retention. An effect
size ($\eta^2$) less than .24 is small, between .25 and .50 is medium, and 1.0 or higher is considered large (Hinkle, Wiersma, & Jurs, 2003). Third, in follow-up to ANOVA, one-way analysis of covariance (ANCOVA) was conducted to determine the influence of the mediator variable GPA on the outcome. ANCOVA was an appropriate analysis to compare the mean scores of STEM and non-STEM major groups using GPA (mediator variable) as a covariant. The five independent variables were analyzed separately to determine level of significance of the each independent variable given GPA (mediator variable) as the covariant.

Prior to conducting the ANCOVA analysis, the assumption of homogeneity-of-slopes was tested to determine if ANCOVA could be conducted. Homogeneity-of-slopes test evaluated the relationship between GPA, as the covariate, and independent variables (benchmarks of student engagement). A significant relationship between the covariant and an independent variable suggests the differences on the dependent variable among groups vary because of the covariant (Field, 2009). According to Field (2009), if the interaction is significant, ANCOVA cannot be conducted. Conducting both ANOVA and ANCOVA analysis allowed for determination of whether the independent variables alone and the degree, if any, GPA influenced student retention. Findings both between and within STEM and non-STEM majors groups were compared and differences reported.

Summary

In summary, the purpose of this study was to investigate the relationship between student engagement and the retention of male, full-time undergraduate students by comparing male, full-time undergraduate students in select science, technology, engineering, and math (STEM) majors to male, full-time undergraduate students in non-
STEM majors to understand differences between STEM and non-STEM male students and identify best practices to improve retention among men in STEM fields. Retention was used as the dependent variable. The five independent variables, based on the five benchmarks of student engagement, were as follows: (a) student-faculty interaction, (b) level of academic challenge, (c) active and collaborative learning, (d) enriching educational experiences, and (e) supportive campus environment. The described procedures and statistical analysis were appropriate methods to analyze and answer research questions. Chapter IV provides a report of the findings for this study.
CHAPTER IV
FINDINGS

The purpose of this study was to investigate the relationship between student engagement and the retention of male undergraduate students by comparing male, full-time undergraduate students in STEM majors to male, full-time undergraduate students in non-STEM majors to identify best practices to improve retention and increase degree completion among men in STEM fields. A review of the literature suggested students must be actively involved and institutions need to proactively develop intentional methods to engage students both formally and informally, inside and outside of the classroom to positively influence college persistence (Astin, 1993, Tinto, 1987). Seminal research related to student retention and engagement indicated several factors (e.g., student involvement, faculty connection, peer relations) that contribute to academic success (Astin, 1993; Kuh et al., 2009; Tinto, 1987). These factors led to the development of the five benchmarks of student engagement as described by the National Survey of Student Engagement (NSSE) (National Survey of Student Engagement, 2012).

To conduct this study, one-way analysis of variance (ANOVA) technique was used to compare male STEM to non-STEM groups and draw connections between the five benchmarks of student engagement and retention. In addition to ANOVA, one-way analysis of covariance (ANCOVA) technique was used to investigate the influence of the five benchmarks of student engagement on retention with GPA as the mediator variable. The alpha level was set at .05 for all significance tests. This chapter provides an overview of data collected from the NSSE in 2006 and 2010 and findings from both
ANOVA and ANCOVA analyses. The results are reported according to each of the five research questions.

**Research Questions**

To guide this study, the following questions were developed:

RQ$_1$: Does the influence of student-faculty interaction on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

RQ$_2$: Does the influence of level of academic challenge on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

RQ$_3$: Does the influence of enriching educational experiences on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

RQ$_4$: Does the influence of active and collaborative learning on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

RQ$_5$: Does the influence of a supportive campus environment on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

**Population**

This study used male, full-time undergraduate students who participated in the NSSE during 2005-2006 and 2009-2010 academic years as first-year students. By combining both academic years, there were 1753 total respondents. Out of the total, 692 full-time men responded. Based on the male respondents, this study required a sample size of 249. While only 249 were required, all 692 male respondents were included in
this study to further reduce the margin of error and increase the power thus increasing the likelihood that all results will appear as significant.

Using SPSS, the participants were separated into STEM and non-STEM majors. To compare STEM and non-STEM majors using ANOVA, the participants were assigned to 6 groups: STEM HIGH, STEM MEDIUM (MED), STEM LOW, non-STEM HIGH, non-STEM MED, and non-STEM LOW based on their overall score. The overall score was obtained using Likert scale responses of very often, often, sometimes, and never to 85 statements associated with 28 questions in the College Student Report of the NSSE (see Appendix). The 85 statements associated with 28 questions presented aspects of the student college experience that were relevant to the benchmarks (e.g., academic, social, level of involvement, curricular, co-curricular).

Using the overall score, the means and standard deviations were determined for each of the five benchmarks (i.e. independent variable) to determine the group ranges of high, medium, and low within each benchmark. To determine the low range, the standard deviation was subtracted from the mean. The high range was determined by adding the standard deviation to the mean. Finally, the medium range was the scores between the high and low ranges. Once the ranges were determined, each was recoded into different variables combining the high, medium, and low ranges of each benchmark to both STEM and non-STEM majors. This process resulted in high, medium (med), and low for each benchmark for a total of six groups representing both STEM and non-STEM majors. Creating six groups (STEM HIGH, STEM MED, STEM LOW, non-STEM HIGH, non-STEM MED, non-STEM LOW) for each benchmark for both STEM and non-STEM majors provided a robust comparison of how student engagement influenced retention.
Table 5 provides an overview of the major breakdown, six groups (STEM HIGH, STEM MED, STEM LOW, non-STEM HIGH, non-STEM MED, non-STEM LOW) associated with each of the five benchmarks, and NSSE participant rate of each major within the selected mid-Atlantic research-intensive university.

Table 5

_Majors, Groups, and Participant Percentages_

<table>
<thead>
<tr>
<th>Major</th>
<th>Six Groups</th>
<th>Participant Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-STEM</td>
<td>non-STEM HIGH</td>
<td>61%</td>
</tr>
<tr>
<td></td>
<td>non-STEM MED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>non-STEM LOW</td>
<td></td>
</tr>
<tr>
<td>STEM</td>
<td>STEM HIGH</td>
<td>39%</td>
</tr>
<tr>
<td></td>
<td>STEM MED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STEM LOW</td>
<td></td>
</tr>
</tbody>
</table>

**Results**

**Research Question 1 (Student-Faculty Interaction)**

Does the influence of student-faculty interaction on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors? One-way analysis of variance (ANOVA) was conducted to evaluate the relationship between both STEM and non-STEM men ratings of student-faculty interaction and their retention from their first to second year of college. The independent variable, student-faculty interaction, was assigned to both STEM and non-STEM student participant groups according to their survey responses. The dependent variable, retention, determined if first-year students continued to their second year of college. The results were not significant, $F(5, 622) = .526, p = .76$. It cannot be determined how student-faculty
interactions influenced differences in retention between STEM and non-STEM groups. Because the results were not significant, post-hoc tests were not conducted.

To follow-up, ANCOVA was selected to determine if student-faculty interaction remained not significant with the mediator variable, GPA, as the covariant. To determine if ANCOVA could be conducted, the homogeneity of slopes was tested. Table 6 provides an overview of result from the homogeneity of slopes test of student-faculty interaction and GPA. The results of the homogeneity of slopes indicated the interaction between student-faculty interaction and GPA was significant $F(6, 621) = 17.54, p = .000$.

### Table 6

*Student-Faculty Results of Homogeneity of Slopes Test of Between-Subjects Effects*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>9.899*</td>
<td>6</td>
<td>1.650</td>
<td>17.539</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>128.510</td>
<td>1</td>
<td>128.510</td>
<td>1366.209</td>
<td>.000</td>
</tr>
<tr>
<td>StudentFacultyInteraction *</td>
<td>9.899</td>
<td>6</td>
<td>1.650</td>
<td>17.539</td>
<td>.000</td>
</tr>
<tr>
<td>sum_gpa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>58.413</td>
<td>621</td>
<td>.094</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2278.000</td>
<td>628</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>68.312</td>
<td>627</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* R Squared = .145 (Adjusted R Squared = .137)

The differences on the dependent variable among groups varied as a function of the covariant. Based on this finding, ANCOVA analysis was not conducted because the homogeneity of slopes assumption was violated.

**Research Question 2 (Level of Academic Challenge)**

Does the influence of level of academic challenge on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors? ANOVA was conducted to evaluate the relationship between both STEM and
non-STEM student’s rating of level of academic challenge and retention from their first to second year of college. The independent variable, level of academic challenge, was assigned to both STEM and non-STEM participant groups according to their survey responses. The dependent variable, retention, determined if first-year students continued to their second year of college. The results were not significant, $F(5, 621) = .61, p = .69$.

It cannot be determined how level of academic challenge influenced differences in retention between STEM and non-STEM groups. Post-hoc tests were not conducted because the results were not significant.

To follow-up, ANCOVA was selected to determine if level of academic challenge remained not significant with the mediator variable, GPA, as the covariant. To determine if ANCOVA could be conducted, the homogeneity of slopes was tested. Table 7 provides an overview of result from the homogeneity of slopes test of level of academic challenge and GPA.

Table 7

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>9.966(^a)</td>
<td>6</td>
<td>1.661</td>
<td>17.654</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>127.971</td>
<td>1</td>
<td>127.971</td>
<td>1360.204</td>
<td>.000</td>
</tr>
<tr>
<td>AcademicChallengeLevel * sum_gpa</td>
<td>9.966</td>
<td>6</td>
<td>1.661</td>
<td>17.654</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>58.331</td>
<td>620</td>
<td>.094</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2274.000</td>
<td>627</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>68.297</td>
<td>626</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. R Squared = .146 (Adjusted R Squared = .138)
The results of the homogeneity of slopes indicated the interaction between level of academic challenge and GPA was significant $F(6, 620) = 17.65, p = .000$. The differences on the dependent variable among groups varied as a function of the covariant. Based on this finding, ANCOVA analysis was not conducted because the homogeneity of slopes assumption was violated.

**Research Question 3 (Enriching Educational Experiences)**

Does the influence of enriching educational experience on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors? ANOVA was conducted to evaluate the relationship between both STEM and non-STEM students rating of enriching educational experience and their retention from their first to second year of college. The independent variable, enriching educational experience, was assigned to both STEM and non-STEM participant groups according to their survey responses. The dependent variable, retention, determined if first-year students continued to their second year of college. The results were not significant, $F(5, 622) = 1.59, p = .16$. It cannot be determined how enriching educational experiences influenced differences in retention between STEM and non-STEM groups. Post-hoc tests were not conducted because the results were not significant.

To follow-up, ANCOVA was selected to determine if enriching educational experiences remained not significant with the mediator variable, GPA, as the covariant. To determine if ANCOVA could be conducted, the homogeneity of slopes was tested. Table 8 provides an overview of result from the homogeneity of slopes test of enriching educational experiences and GPA. The results of the homogeneity of slopes indicated the interaction between level of academic challenge and GPA was significant $F(6, 621) =$
17.68, \( p = .000 \). The differences on the dependent variable among groups varied as a function of the covariant. Based on this finding, ANCOVA analysis was not conducted because the homogeneity of slopes assumption was violated.

Table 8

*Enriching Educational Results of Homogeneity of Slopes Test of Between-Subjects Effects*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>9.966^a</td>
<td>6</td>
<td>1.661</td>
<td>17.679</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>128.438</td>
<td>1</td>
<td>128.438</td>
<td>1367.0</td>
<td>.000</td>
</tr>
<tr>
<td>EnrichingEducational Experience * sum_gpa</td>
<td>9.966</td>
<td>6</td>
<td>1.661</td>
<td>17.679</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>58.346</td>
<td>621</td>
<td>.094</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2278.000</td>
<td>628</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>68.312</td>
<td>627</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* R Squared = .146 (Adjusted R Squared = .138)

**Research Question 4 (Active and Collaborative Learning)**

Does the influence of active and collaborative learning on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors? ANOVA was conducted to evaluate the relationship between both STEM and non-STEM student’s rating of active and collaborative learning and their retention from their first to second year of college. The independent variable, active and collaborative learning, was assigned to both STEM and non-STEM participant groups according to their survey responses. The dependent variable, retention, determined if first-year students continued to their second year of college. The results were not significant, \( F (5, 622) = 1.10 \ p = .36 \). It cannot be determined if active and collaborative learning influenced differences in
retention between STEM and non-STEM groups. Post-hoc tests were not conducted because the results were not significant.

To follow-up, ANCOVA was selected to determine if active and collaborative learning remained not significant with the mediator variable, GPA, as the covariant. To determine if ANCOVA could be conducted, the homogeneity of slopes was tested. Table 9 provides an overview of result from the homogeneity of slopes test. The results of the homogeneity of slopes indicated the interaction between level of academic challenge and GPA was significant $F(6, 621) = 17.69, p = .000$. The differences on the dependent variable among groups varied as a function of the covariant. Based on this finding, ANCOVA analysis was not conducted because the homogeneity of slopes assumption was violated.

Table 9

**Active Collaborative Result of Homogeneity of Slopes Test of Between-Subjects Effects**

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>9.973$^a$</td>
<td>6</td>
<td>1.662</td>
<td>17.692</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>128.478</td>
<td>1</td>
<td>128.478</td>
<td>1367.598</td>
<td>.000</td>
</tr>
<tr>
<td>Active and Collaborative</td>
<td>9.973</td>
<td>6</td>
<td>1.662</td>
<td>17.692</td>
<td>.000</td>
</tr>
<tr>
<td>Learning * sum_gpa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>58.340</td>
<td>621</td>
<td>.094</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2278.000</td>
<td>628</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>68.312</td>
<td>627</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* $R^2$ Squared $= .146$ (Adjusted $R^2$ Squared $= .138$)

**Research Question 5 (Supportive Campus Environments)**

Does the influence of supportive campus environments on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors? ANOVA was conducted to evaluate the relationship between both STEM and non-STEM
student's rating of supportive campus environment and their retention from their first to second year of college. The independent variable, supportive campus environment, was assigned to both STEM and non-STEM participant groups according to their survey responses. The dependent variable, retention, determined if first-year students continued to their second year of college. The results were significant, $F(5, 622) = 2.53, p = .03$.

Table 10 provides an overview of the descriptive statistics. Supportive campus environment influenced differences in retention between STEM and non-STEM groups. The strength of the relationship between supportive campus environment and student retention, as assessed by $\eta^2$, was weak with supportive campus environment accounting for 2% of the variance of the dependent variable.

Table 10

<table>
<thead>
<tr>
<th>Enriching Educational Experience</th>
<th>Mean</th>
<th>SD</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td>nonSTEM_HIGH</td>
<td>1.93</td>
<td>.253</td>
<td>.038</td>
<td>1.858</td>
</tr>
<tr>
<td>nonSTEM_MED</td>
<td>1.86</td>
<td>.344</td>
<td>.021</td>
<td>1.823</td>
</tr>
<tr>
<td>nonSTEM_LOW</td>
<td>1.78</td>
<td>.421</td>
<td>.043</td>
<td>1.691</td>
</tr>
<tr>
<td>STEM_HIGH</td>
<td>1.97</td>
<td>.167</td>
<td>.055</td>
<td>1.865</td>
</tr>
<tr>
<td>STEM_MED</td>
<td>1.90</td>
<td>.306</td>
<td>.026</td>
<td>1.846</td>
</tr>
<tr>
<td>STEM_LOW</td>
<td>1.83</td>
<td>.385</td>
<td>.052</td>
<td>1.723</td>
</tr>
</tbody>
</table>

Because the $F$ test was significant, a post-hoc test was conducted to determine the pairwise differences among the means. Tukey post-hoc test was selected to compare all possible pairwise comparisons among means. Table 11 provides an overview of Tukey post-hoc test as it relates to non-STEM groups high, med, and low.
Table 11

Tukey post-hoc related to non-STEM

<table>
<thead>
<tr>
<th>SupportiveCampus Environment (I)</th>
<th>SupportiveCampus Environment (J)</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval Lower Bound</th>
<th>95% Confidence Interval Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-STEM_MED</td>
<td>non-STEM_MED</td>
<td>.07</td>
<td>.043</td>
<td>.601</td>
<td>-.05</td>
<td>.19</td>
</tr>
<tr>
<td>non-STEM_LOW</td>
<td>non-STEM_LOW</td>
<td>.16</td>
<td>.058</td>
<td>.072</td>
<td>-.01</td>
<td>.32</td>
</tr>
<tr>
<td>STEM_HIGH</td>
<td>non-STEM_HIGH</td>
<td>-.04</td>
<td>.067</td>
<td>.991</td>
<td>-.23</td>
<td>.15</td>
</tr>
<tr>
<td>STEM_MED</td>
<td>non-STEM_MED</td>
<td>.04</td>
<td>.046</td>
<td>.970</td>
<td>-.10</td>
<td>.17</td>
</tr>
<tr>
<td>STEM_LOW</td>
<td>non-STEM_LOW</td>
<td>.11</td>
<td>.064</td>
<td>.553</td>
<td>-.08</td>
<td>.29</td>
</tr>
<tr>
<td>non-STEM_HIGH</td>
<td>non-STEM_HIGH</td>
<td>-.07</td>
<td>.043</td>
<td>.601</td>
<td>-.19</td>
<td>.05</td>
</tr>
<tr>
<td>non-STEM_LOW</td>
<td>non-STEM_LOW</td>
<td>.09</td>
<td>.048</td>
<td>.446</td>
<td>-.05</td>
<td>.22</td>
</tr>
<tr>
<td>STEM_HIGH</td>
<td>non-STEM_MED</td>
<td>-.11</td>
<td>.058</td>
<td>.425</td>
<td>-.28</td>
<td>.06</td>
</tr>
<tr>
<td>STEM_MED</td>
<td>non-STEM_MED</td>
<td>-.03</td>
<td>.033</td>
<td>.915</td>
<td>-.13</td>
<td>.06</td>
</tr>
<tr>
<td>STEM_LOW</td>
<td>non-STEM_LOW</td>
<td>.04</td>
<td>.056</td>
<td>.983</td>
<td>-.12</td>
<td>.20</td>
</tr>
<tr>
<td>non-STEM_HIGH</td>
<td>non-STEM_MED</td>
<td>-.16</td>
<td>.058</td>
<td>.072</td>
<td>-.32</td>
<td>.01</td>
</tr>
<tr>
<td>non-STEM_MED</td>
<td>non-STEM_LOW</td>
<td>-.09</td>
<td>.048</td>
<td>.446</td>
<td>-.22</td>
<td>.05</td>
</tr>
<tr>
<td>STEM_HIGH</td>
<td>non-STEM_MED</td>
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<td>.070</td>
<td>.056</td>
<td>-.40</td>
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<tr>
<td>STEM_MED</td>
<td>non-STEM_LOW</td>
<td>-.12</td>
<td>.050</td>
<td>.156</td>
<td>-.26</td>
<td>.02</td>
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<tr>
<td>STEM_LOW</td>
<td>non-STEM_LOW</td>
<td>-.05</td>
<td>.067</td>
<td>.978</td>
<td>-.24</td>
<td>.14</td>
</tr>
</tbody>
</table>

Tukey test indicated the mean score for the non-STEM HIGH (M = 1.93, SD = .25) was not significant when compared to non-STEM MED (M = 1.86, SD = .34), non-STEM LOW (M = 1.78, SD = .42), STEM HIGH (M = 1.97, SD = .17), STEM MED (M = 1.90, SD = .31), and STEM LOW (M = 1.83, SD = .39). Tukey test indicated the mean score for the non-STEM MED (M = 1.86, SD = .34) was not significant compared to non-STEM HIGH (M = 1.93, SD = .25), non-STEM LOW (M = 1.78, SD = .42), STEM HIGH (M = 1.97, SD = .17), STEM MED (M = 1.90, SD = .31), and STEM LOW (M =
Tukey test indicated the mean score for the non-STEM LOW (M = 1.78, SD = .42) was not significant when compared non-STEM HIGH (M = 1.93, SD = .25), non-STEM MED (M = 1.86, SD = .34), STEM HIGH (M = 1.97, SD = .17), STEM MED (M = 1.90, SD = .31), and STEM LOW (M = 1.83, SD = .39). While it was determined supportive campus environment influenced the retention of non-STEM majors. There was not a significant difference within non-STEM groups (high, medium, low) among the participants.

Table 12 provides an overview of Tukey post-hoc test as it relates to STEM groups high, medium, and low. Tukey post-hoc test indicated the mean score of STEM HIGH (M = 1.93, SD = .17) was not significant compared to non-STEM HIGH (M = 1.93, SD = .25), non-STEM MED (medium) (M = 1.86, SD = .34), non-STEM LOW (M = 1.78, SD = .42), STEM MED (M = 1.90, SD = .31), and STEM LOW (M = 1.83, SD = .39). Tukey post-hoc test indicated STEM MED (M = 1.90, SD = .31) was not significant compared to non-STEM HIGH (M = 1.93, SD = .25), non-STEM MED (M = 1.86, SD = .34), non-STEM LOW (M = 1.78, SD = .42), STEM HIGH (M = 1.93, SD = .17), and STEM LOW (M = 1.83, SD = .39). Tukey post-hoc test indicated STEM LOW (M = 1.83, SD = .39) was not significant compared to non-STEM HIGH (M = 1.93, SD = .25), non-STEM MED (M = 1.86, SD = .34), non-STEM LOW (M = 1.78, SD = .42), STEM HIGH (M = 1.93, SD = .17), and STEM MED (M = 1.90, SD = .31). While it was determined supportive campus environment influenced the retention of STEM majors, there was not a significant difference within STEM groups (high, medium, low) among the participants.
To follow-up, ANCOVA was selected to determine if supportive campus environment remained significant with the mediator variable, GPA, as the covariant. To determine if ANCOVA could be conducted, the homogeneity of slopes was tested. Table 13 provides an overview of result from the homogeneity of slopes test. The results of the homogeneity of slopes indicated the interaction between supportive campus environment and GPA was significant $F(6, 621) = 18.29, p = .000$. The differences on the dependent variable among groups varied as a function of the covariant. Based on this finding,
ANCOVA analysis was not conducted because the homogeneity of slopes assumption was violated.

Table 13

Supportive Campus Result of Homogeneity of Slopes Test of Between-Subjects Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>10.258</td>
<td>6</td>
<td>1.710</td>
<td>18.289</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>129.118</td>
<td>1</td>
<td>129.118</td>
<td>1381.177</td>
<td>.000</td>
</tr>
<tr>
<td>SupportiveCampus</td>
<td>10.258</td>
<td>6</td>
<td>1.710</td>
<td>18.289</td>
<td>.000</td>
</tr>
<tr>
<td>Environment * sum_gpa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>58.054</td>
<td>621</td>
<td>.093</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2278.000</td>
<td>628</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>68.312</td>
<td>627</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. R Squared = .150 (Adjusted R Squared = .142)

Summary

Using both ANOVA and ANCOVA statistical analyses allowed for comparison both between and within STEM and non-STEM majors in a robust way. ANOVA was used to investigate the relationship between student engagement and the retention of male undergraduate students by comparing male, full-time undergraduate students in STEM majors to male, full-time undergraduate students in non-STEM majors. Six groups were formed according to high, medium, and low scores related to STEM and non-STEM majors based on overall scores from the College Student Report provided by NSSE. Each of the five benchmarks of student engagement was analyzed separately to determine their influence on retention and compare group means. Of the five benchmarks of student engagement, supportive campus environment was identified as having a significant influence on the retention of men in both STEM and non-STEM majors.
However, there was no significant difference between the six groups. In follow-up to the ANOVA analysis, ANCOVA was attempted to determine if the outcome of the results changed with the addition of a mediator variable, GPA, as the covariant. The homogeneity of slopes assumption was violated resulting in ANCOVA not being an appropriate analysis for each of the five research questions. Chapter V provides a conclusion of this study, discussion of results, and limitations. Recommendations for implementation and suggestions for future studies are also offered.
CHAPTER V
SUMMARY, CONCLUSION, AND RECOMMENDATIONS

The purpose of this study was to investigate the relationship between student engagement and the retention of male undergraduate students by comparing male, full-time, undergraduate students in science, technology, engineering, and math (STEM) majors to male, full-time undergraduate students in non-STEM majors to identify best practices that improve retention and increase degree completion among men in STEM fields. The five benchmarks of student engagement (i.e., student-faculty interaction, level of academic challenge, enriching educational experiences, active and collaborative learning, and supportive campus environment) were used as independent variables with GPA as the mediator variable and retention as the dependent variable.

Research Questions

To guide this study, the following questions were developed:

RQ1: Does the influence of student-faculty interaction on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

RQ2: Does the influence of level of academic challenge on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

RQ3: Does the influence of enriching educational experiences on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

RQ4: Does the influence of active and collaborative learning on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?
RQ$_5$: Does the influence of a supportive campus environment on the retention of male, full-time undergraduate students differ between STEM majors and non-STEM majors?

Summary

To conduct this study, male, full-time undergraduate students were selected from a mid-Atlantic, research-intensive university that participated in the 2006 and 2010 National Survey of Student Engagement (NSSE). These men were grouped according to STEM and non-STEM majors. To investigate difference both between and within STEM and non-STEM majors, six groups (STEM HIGH, STEM MED, STEM LOW, non-STEM HIGH, non-STEM MED, non-STEM LOW) were formed in association with each of the five benchmarks of student engagement (i.e., student-faculty interactions, level of academic challenge, enriching educational experiences, active and collaborative learning, supportive campus environment).

This study utilized one-way analysis of variance (ANOVA) and one-way-analysis of covariance (ANCOVA) to analyze data collected using the 2006 and 2010 College Student Reports administered by the NSSE. Both ANOVA and ANCOVA were conducted separately for each of the five benchmarks of student engagement to determine the influence of each benchmark on retention. Using results from the ANOVA analysis, differences both between and within STEM and non-STEM majors were reported. Significance was tested at .05 alpha level. First, one-way analysis of variance (ANOVA) was conducted to investigate the relationship between retention and the five benchmarks of student engagement as it relates to STEM and non-STEM majors for each of five benchmarks. This relationship was investigated both between STEM and non-STEM
majors and within six STEM and non-STEM groups (STEM HIGH, STEM MED, STEM LOW, non-STEM HIGH, non-STEM MED, non-STEM LOW). Results indicated no differences between STEM and non-STEM majors for four of the benchmarks of student engagement (e.g., student-faculty interaction, level of academic challenge, enriching educational experiences, active & collaborative learning). However, supportive campus environment demonstrated differences between STEM and non-STEM majors. As assessed by $\eta^2$, the relationship between supportive campus environment and retention was weak, with supportive campus environment accounting for 2% of the variance of the dependent variable. Tukey post-hoc test was conducted to control for type I error. Results from the Tukey post-hoc test revealed no differences between group means of the six groups.

Second one-way analysis of covariance (ANCOVA) technique was used to determine a relationship between the retention of college men and each of the five benchmarks of student engagement with the mediator variable, GPA, as the covariant. Like ANOVA, ANCOVA tested significance at the .05 alpha level. Prior to conducting ANCOVA, homogeneity of slopes test was conducted separately for each of the five benchmarks of student engagement to determine the appropriateness of using ANCOVA. The homogeneity of slopes test was violated for each of the five benchmarks of student engagement. As a result of the violation of homogeneity of slopes test for each of the five benchmarks of student engagement, it could not be determined if the five benchmarks of engagement with GPA at the mediator variable had a significant influence on retention for men in STEM and non-STEM majors.
Conclusions

Previous studies suggested student-faculty interaction, level of academic challenge, enriching educational experiences, active and collaborative learning, and supportive campus environments are benchmarks of student engagement with a positive influence on the retention of undergraduate students (Cole & Korkmaz, 2010; Kuh et al., 2008; Pascarella & Terenzini, 1995). The aforementioned benchmarks of student engagement are reflective of both student and institutional responsibilities to ensure student success based on seminal research related to student departure and success (Astin, 1993; Tinto, 1993). While there is a plethora of research related to student engagement, more specific research is needed related to student engagement of undergraduate men in college (Jacob, 2002; Marrs & Sigler, 2012; Sax & Harper, 2007). Moreover, research related to undergraduate men in STEM majors is scant. This study contributes to the emerging research interest in retention and student success of undergraduate men among college researchers and administrators. Specifically, this study suggests no differences among undergraduate men in how student engagement influences retention between STEM and non-STEM majors among undergraduate men.

Student-Faculty Interaction

The results of this study suggest student-faculty interactions do not differ between STEM and non-STEM majors or within STEM and non-STEM groups in terms of influence on retention. Based on previous studies, results from this study suggest undergraduate men are challenged in developing quality relationships with faculty, especially at large research universities, such as the institution used for this study (Eagan et al., 2010; Pascarella & Terenzini, 1995; Laanan, 201; Vianden, 2009). Findings from
this study support past research that suggests large institutions are challenged in
developing intentional methods of fostering quality student-faculty interactions. Results
suggest limited opportunities for faculty to develop quality relationships with student
(e.g., faculty mentor programs, student-faculty mixers, more introductory courses led by
tenure-track faculty). The institution used for this may need to play a more active role in
initiating and facilitating the relationships between college men and faculty.

Pervious literature suggests non-STEM students may have higher retention rates
than STEM students because STEM students have less quality contact with their faculty
(Laanan, 2011). The findings from this study could not determine if whether faculty at
the select institution reached out to college men infrequently or liberally to encourage
engagement beyond basic classroom interaction. The infrequency and lack of depth in
the relationship between undergraduate men and faculty may cause undergraduate men to
perceive their faculty negatively when they receive undesired feedback on course
assignments and test scores (Umbach & Wawrzynski, 2005), and such feedback further
discourages college men to seek relationships with their faculty. Further, faculty may not
engage in constructive feedback that offers positive reinforcement, recommendations for
improvement, and referrals to campus resources, which encourages relationship between
students and faculty. Thus, faculty should avoid negative (e.g., criticism, degradation)
feedback as it causes men to resist seeking academic, social, and career advisement that
could contribute to their classroom performance and retention in STEM majors. Such
recommendations reflect previous research that suggests negative feedback and
interactions cause men to resist developing relationship with faculty (Vianden, 2009).

Given the national and state goals to increase student graduates in STEM fields,
constructive relationships with faculty are especially important for undergraduate men in STEM majors to maintain retention and enrollment demands (Executive Office of the President, President’s Council of Advisor on Science and Technology, 2012; Laanan, 2011; State Commission on Higher Education in Virginia, 2011; 2013).

**Level of Academic Challenge**

The results of this study suggest the level of academic challenge does not differ between STEM and non-STEM majors and within STEM and non-STEM groups in terms of influence on retention. Previous literature suggests greater attention is needed by faculty in setting high and clear expectations related to coursework, time required for study, and overall performance related to the curricula. Students must also recognize the challenges of college-level academic work and the need for greater attention to prepare for courses and meet the expectations necessary to persist to degree completion.

Moreover, current assignments may not stimulate students and connect classroom learning to practical problems aligned with career interest at the introductory level or men may not recognize the need to study in order to perform positively in the classroom. One of the attributes of level of academic challenge is the ability for students to solve practical problems through critical thinking. Findings from this study could determine if undergraduate men recognize the need to deepen their involvement in critical thinking, problem solving, or expectations related academic coursework at a level that encourages retention. The U.S. workforce increasingly seeks individuals with the interpersonal skills needed to collaborate and think critically. Institutions also may not have a developed mechanism to connect college men with resources to explore the critical thinking skills needed for career interests and development prior to the selection of major.
This study implies that institutions may need to improve their message regarding differences between high school and college academic preparation (e.g., study, reading, peer learning, homework) and the importance of being able to work collaboratively to solve problems. If faculty members do not set clear expectations and offer courses that incorporate more research, reflection assignments, and opportunities to participate in experiential learning activities that help stimulate, connect, and maintain interest in STEM majors, students are less likely to recognize the level of academic challenge needed to succeed. Courses with clear expectations, stress the development of appropriate study habits, and stimulate interest in the course materials encourage students to try harder to succeed and, as a result, are more focused on engagement in course study, preparation, and participation (Astin, 1993; Lard et al., 2008; Pascarella & Terenzini, 1995). The assertions made regarding level of academic challenge echoes previous research that suggests the more involved students are in their academics, the greater the likelihood of being retained (Astin, 1993; Pascarella & Terenzini, 1995; Tinto, 1993). One consideration for faculty and administrators is to recognize that while male undergraduate students are represented in STEM fields they also experience higher proportions of course dropout and failure when compared to their female counterparts (Jacob, 2002). Recognition that undergraduate men in STEM majors are not being retained should encourage educational researchers, faculty, and administrators to better identify and connect those in academic difficulty earlier to help-seeking services (e.g., tutoring, advising, counseling services) to reduce student departure by better aligning student career interests and academic strengths to majors in which students can succeed.
Enriching Educational Experiences

The influence of enriching educational experiences on retention did not differ between STEM and non-STEM majors and within STEM and non-STEM groups. Results from this study could not determine if college men are being exposed to enriching educational experiences (e.g., internship, service learning, community based learning) during the first year or are not recognizing these experiences as valuable to their college experience. To support the influence of enriching educational experiences on retention, faculty could offer first-year students opportunities to participate in more enriching educational experiences early in the curriculum. Waiting until after the first year to offer such experiences may be too late to encourage retention at the critical first and second years of college. For example, college men who participate in service and community-based learning are more likely to select career fields and persist academically (Reed, Reber, & Dubois, 2005). The success of service and community-based learning is due in part to the structured learning environment that higher education provides and the opportunities to apply classroom learning to practical problems. Undergraduate men excel in structured classroom environments that provide opportunities to use practical verse theoretical skills (Parrot & Cherry, 2011). Internships and undergraduate research are direct ways to provide structured learning experiences with a one-on-one attention from and interaction with faculty and engage students in enriching educational experiences.

Finally, the results of this study suggest a lack of integrated learning environments that promote collaborative interaction between faculty, staff, and students to create a seamless learning experience within and outside of the classroom. One way to
promote a seamless learning experience is the development of learning communities. Learning communities encourage faculty and staff to develop themes and programs that complement classroom learning and provide smaller learning environments within large research universities, offering students the ability to engage more closely with their peers, faculty, and staff (Zhao & Kuh, 2004). For example, learning communities provide students with an opportunity to develop a deeper understanding of course material, interrelation between courses and career interests, and connection to faculty, staff, and other students. Particularly related to this study, undergraduate men benefit from opportunities to engage with faculty and staff in structured settings that assist them in navigating higher education, self development, and academic pursuits related to their major which encourage retention.

Active and Collaborative Learning

Active and collaborative learning was not significant between STEM and non-STEM majors or within STEM and non-STEM groups in terms of influence on retention. The results suggest men are not developing the skills necessary to solve problems in an increasingly collaborative and interconnected world and, particularly, undergraduate men are not developing the non-cognitive and emotional skills needed effectively connect with faculty and their peers (Jacob, 2002; Umbach & Wawrzynski, 2005).

Undergraduate men need more opportunities to work with their peers and develop productive coping skills to aid them in working through difficult issues within academics, society, and the workforce. The results of this study could not determine if institutions offer strong or weak opportunities for active and collaborative learning to encourage the retention of male undergraduate students. For example, having college men tutor and
mentor other men would provide role models that exhibit desired behaviors (e.g., collaboration, communication, problem-solving skills, leadership, effective study habits) that could lead to increased retention rates. More emphasis on classroom presentations and group projects may provide students with opportunities to develop productive relationships with peers, communication skills, and research techniques related to assigned academic topics.

**Supportive Campus Environment**

The influence of supportive campus environment on retention was significant between STEM and non-STEM majors, but not within STEM and non-STEM groups. The results suggest college men perceive the institution used in the study as committed to providing supportive services that aid in retention. Further, the university provides male students with support structures through both academic and student affairs. Examples of these services include: academic advising, career services, counseling, leadership programs, health and recreation programs, tutoring, and opportunities for intercultural dialogue and relationship building. The aforementioned programs are structured with learning outcomes that provide students with developmental and coping skills related to personal growth, academics, and non-academic issues, which help students feel supported by their campus environment.

Specifically related to this study, having institutional structures and multiple points of contacts with undergraduate men are salient to their ability to recognize and act on their academic and social development. While this study determined supportive campus environment is significant in relationship to retaining college men, results were inconclusive regarding how STEM and non-STEM majors differ in their retention.
Because the first four benchmarks of student engagement are more faculty and peer focused, the findings related to supportive campus environments suggest more research is needed to foster quality relationships with faculty and peers through institutional support structures (e.g., student affairs, student support services, academic support services). Undergraduate men in STEM fields are especially in need of developing quality relationships with faculty and peers in order to feel supported by the campus environment. According to Laanan (2011), STEM students are less likely to have quality relationships with their faculty. Reviewing institutional support structures to encourage intentional relationships with faculty and peers would assist in developing a stronger supportive campus environment.

**Recommendations**

This study investigated the relationship between student engagement and retention among male, full-time undergraduate students in STEM and non-STEM fields. The findings revealed practices that support a positive relationship between student engagement and retention and areas that need improvement to increase the retention of undergraduate college men in STEM majors. Retaining college men in STEM is one factor that will contribute to meeting both economic and workforce needs of the 21st century in the United States. The following recommendations are submitted for consideration for education researchers, faculty, and administrators. These recommendations are based on the surveyed responses of undergraduate college men at one mid-Atlantic research institutions. Separate from the following recommendations, a university committee should be appointed to review issues related to the retention of college men. This committee should investigate issues, identify goals, and develop
action plans related to better retaining college men and have representation from academic affairs, student affairs, and the student body.

**Academic Affairs**

Faculty engagement with students should weigh more heavily during the review for tenure, promotion, and salary. Additional compensation should be set aside for faculty who go beyond expectations to develop programs and lead initiatives that assist with retention. New faculty orientation programs should better emphasize student learning and advising techniques. This change would provide new faculty with insight into how students learn regardless of gender and at-risk populations. Faculty should be encouraged to utilize faculty and curriculum development programs offered at the institution or through professional associations to improve instruction, class management, and student interaction. Department chairs should express support to faculty who attend these workshops and incorporate teaching and learning techniques that target and better retain college men. In addition, faculty should review the curriculum design of introductory courses in STEM to ensure the curriculum promotes academic and career interests and encourage program persistence and degree completion by undergraduate men. For example, introductory courses may incorporate more opportunities for experiential learning (e.g., service learning, community based learning, internships).

In addition to introductory courses, faculty may design orientation courses to better help college men adjust to college, maintain career interests, help them understand the connection between introductory STEM courses and their chosen career paths, and self-determine their long-term major and career goals. Orientation courses could also incorporate a student mentor assigned to assist the course instructor in teaching and
leading discussion. The orientation course(s) could stand alone or connect to larger, faculty (tenured or tenured-tracked) led learning communities with a STEM themes. For example, STEM departments may develop academic learning communities sponsored by departments or colleges that comprise an exploratory orientation course and set introductory courses from which first-year students can choose to participate as a cohort. Students who participate in this academic learning community should have additional courses with the same set of students for all introductory STEM courses (e.g., science, math). Having the same students in class on a continual basis will help students develop better connections with peers and faculty.

In addition to academic learning communities, faculty may consider developing a STEM freshmen summer-start program that helps students transition to college during the summer prior to enrolling in the Fall term. STEM students could take their introductory math and science classes together, live together, and receive both a faculty and peer mentor. Such programs should emphasis student development in coping skills, understanding of learning styles, and career exploration prior to the start of college. Having such a program would specifically assist undergraduate men transition to the college environment and connect to positive role models on campus. A STEM freshmen summer-start program could be stand alone or an introduction into a STEM learning community for the upcoming academic year. At the conclusion of the summer program, both students and faculty should maintain connections with each other beyond the summer by establishing future meetings, workshops, and events or developing a web presence (e.g., Adobe, Facebook, webinars).
Finally, institutions may consider providing incentive programs to encourage students to interact with faculty. For example, academic affairs could provide STEM students with meal tickets that allow them and a faculty member to eat for free at campus dining facilities if they go together and discuss a course topic, research, or career interest. This type of program could encourage college men to take some ownership in developing ongoing quality relationships with their STEM faculty.

**Student Affairs**

To build on academic learning communities, in partnership with academic affairs, student affairs administrators could design residential learning communities that have both a faculty and professional staff advisor(s). Residential learning communities are similar to academic learning communities, but offer a residential component to the program, which allow students to connect beyond the classroom environment. Residential learning communities could stand alone or connect to academic learning communities or colleges. Residential programs could complement course curriculum and offer students opportunities participate in field trips, science fairs, and invite guest lectures. Student affairs staff for residential learning communities should provide preference to hiring live-in staff members who are familiar with or were declared STEM majors. A student staff member could offer the first-year students mentoring and direction into how the academic programs work related to STEM majors. In addition to residential learning communities, a faculty-in-residence program may also offer students opportunities to interact with STEM faculty who specifically reside in campus housing and maintain an active presence (e.g., office hours, programs, field-trips) in their assigned community. Learning communities (e.g., academic, residential) and faculty-in-residence
programs offer undergraduate students academic, social, and career development both in and outside of the classroom, which is advocated in previous studies (Sodner, Rowan-Kenyon, Inkelas, Garvey, & Robbins, 2012). Such programs could help foster institutional best practices of student engagement and encourage institutional commitment by college men.

This study revealed that male students connect with support services and programs that assist in their retention and institutions should continue to provide and encourage the use of those services and programs. For example, units within student affairs may consider better method of reaching out to college men. A career center could partner with academic advising centers to better target first-year undergraduate men in academic difficulty to assist them with developing a career plan (e.g., assessment of interest, resume, interview). Career specialists could assist in exploring career pathways and identifying careers early on in male student’s academic careers to better assist them with understanding the types of careers available through pursuing a STEM degree. Beyond selection of courses, academic advisors should encourage and facilitate student connections with faculty in STEM, tutoring services, and counseling.

Institutions could also consider redesigning the physical structure of campus offices to include academic advising, counseling services, and career services on the same floor or within a single office suite. Having everyone on the same floor or in one office suite may encourage collaboration among staff and ease the referral process of students who need these services, which removes the barrier of students having to search their campuses in order to take advantage of these services. For example, an academic
advisor could walk next door to a career specialist or counselor to aid students when they cannot continue in their desired major.

Finally, institutions should consider developing a Men’s Center within student affairs. Like a Women’s Center, such a center could focus on both academic (e.g., academic adjustment, college study skills, leadership) and social development (e.g., body image, sexuality, wellness). If a physical center is not permissible, the institution may consider developing a web-based program with online literature, workshops, and seminars specifically catered to the retention of male students. Such programs should focus on student development to help students better seek helping services (e.g., academic advising, counseling, tutoring)

**Suggestions for Future Research**

Results and recommendations of this study suggest opportunities for future research. First, the generalizability of this study would be increased if several other universities replicated this study. The institution at which this study occurred should consider comparing undergraduate men to women using NSSE data collected in 2006 and 2010. A comparative study could be conducted to analyze differences between undergraduate men and women as it relates to the influence of student engagement on retention among all students, not just one specific gender. Future researchers could also consider comparing faculty responses using the Faculty Survey of Student Engagement (FSSE) to undergraduate men responses on NSSE. Results could provide insight into how faculty and student differ in their assessment of engagement on campus. Future studies may consider the influence of student engagement on retention in relation to demographical data (e.g., race, first-generation, income). Another future study may use
the five benchmarks of student engagement as the dependent variable and use retention as
the independent variable. Reversing the variables may provide insight in how student
engagement changes overtime.

Qualitative research methods, such as focus groups, one-on-one interviews, and
categorized field notes, could also serve as a research method for a future study.
Conducting a qualitative study would allow for identifying patterns regarding most
impactful types of engagement on the retention of male students and lead to better
understanding of how male students engage with their environment beyond quantitative
observations. Researcher with a qualitative study could invite undergraduate men in
STEM degree programs, learning communities, and co-curricular involvement to
participate in this type of study. Additionally, groups with STEM alumni and
undergraduate men in STEM majors could be conducted to obtain a qualitative
perspective on how student engagement influences retention.
REFERENCES


doi:10.2190/CS.11.1.a


Ezell, S. (2012). Revitalizing U.S. manufacturing: The United States suffered a precipitous decline in manufacturing during the past decade key to a reversal will
be greatly expanded efforts to support the competitiveness of small- and medium-sized firms. *Issues in Science and Technology*, 28(2), 41-50.


doi:10.1353/csd.0.0099


Department of Commerce, Economic and Statistics Administration website:


doi:10.1037/a0022247


Office of Institutional Research and Assessment, Old Dominion University. (2013). *Old Dominion University demographics official, spring 2012.* Retrieved from http://ww2.odu.edu/ao/ira/Fall12Updates/demofilesprg12.html


Office of the University Registrar, Old Dominion University. (2013b). *Calculating cumulative grade point average.* Retrieved from http://www.odu.edu/academics/academic-records/grades/gpa-calculator


In your experience at your institution during the current school year, about how often have you done each of the following?

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<th>Activity</th>
<th>Very Often</th>
<th>Often</th>
<th>Sometimes</th>
<th>Never</th>
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<tr>
<td>Asked questions in class or contributed to class discussions</td>
<td></td>
<td></td>
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<tr>
<td>Made a class presentation</td>
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<tr>
<td>Prepared two or more drafts of a paper or assignment before turning it in</td>
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<tr>
<td>Worked on a paper or project that required integrating ideas or information from various sources</td>
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<tr>
<td>Included diverse perspectives (different races, religions, genders, political beliefs, etc.) in class discussions or writing assignments</td>
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<tr>
<td>Came to class without competing readings or assignments</td>
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<tr>
<td>Worked with other students on projects during class</td>
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<tr>
<td>Worked with classmates outside of class to prepare class assignments</td>
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</tbody>
</table>

Continue...
In your experience at your institution during the current school year, about how often have you done each of the following?

<table>
<thead>
<tr>
<th>Very Often</th>
<th>Often</th>
<th>Sometimes</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Put together ideas or concepts from different courses when completing assignments or during class discussions</td>
<td></td>
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<td></td>
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<tr>
<td>Tutored or taught other students (paid or voluntary)</td>
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<tr>
<td>Participated in a community-based project (e.g., service learning) as part of a regular course</td>
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<tr>
<td>Used an electronic medium (listserv, chat group, internet, instant messaging, etc.) to discuss or complete an assignment</td>
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<tr>
<td>Used e-mail to communicate with an instructor</td>
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</tr>
<tr>
<td>Discussed grades or assignments with an instructor</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Discussed ideas from your readings or classes with faculty members outside of class</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Continue
In your experience at your institution during the current school year, about how often have you done each of the following?

<table>
<thead>
<tr>
<th>Very Often</th>
<th>Often</th>
<th>Sometimes</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receives prompt written or oral feedback from faculty on your academic performance</td>
<td></td>
<td></td>
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<tr>
<td>Worked harder than you thought you could to meet an instructor's standards or expectations</td>
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<tr>
<td>Worked with faculty members on activities other than coursework (committees, orientation, student life activities, etc.)</td>
<td></td>
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<tr>
<td>Discussed ideas from your readings or classes with others outside of class (students, family members, co-workers, etc.)</td>
<td></td>
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<tr>
<td>Had serious conversations with students of a different race or ethnicity than your own</td>
<td></td>
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<tr>
<td>Had serious conversations with students who are very different from you in terms of their religious beliefs, political opinions, or personal values</td>
<td></td>
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</tr>
</tbody>
</table>

During the current school year, how much has your coursework emphasized the following mental activities?

<table>
<thead>
<tr>
<th>Very Much</th>
<th>Quite a Bit</th>
<th>Some</th>
<th>Very Little</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memorizing facts, ideas, or methods from your courses and readings so you can repeat them in pretty much the same form</td>
<td></td>
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</tr>
<tr>
<td>Analyzing the basic elements of an idea, experience, or theory, such as examining a particular case or situation in depth and considering its components</td>
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<tr>
<td>Synthesizing and organizing ideas, information, or experiences into new, more complex interpretations and relationships</td>
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<tr>
<td>Making judgments about the value of information, arguments, or methods, such as examining how others gathered and interpreted data and assessing the soundness of their conclusions</td>
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</tr>
<tr>
<td>Applying theories or concepts to practical problems or in new situations</td>
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</tbody>
</table>

Continue
During the current school year, about how much reading and writing have you done?

- **Number of assigned textbooks, books, or book-length packs of course readings**
  - None
  - 1-4
  - 5-10
  - 11-20
  - More than 20

- **Number of books read on your own (not assigned) for personal enjoyment or academic enrichment**
  - None
  - 1-4
  - 5-10
  - 11-20
  - More than 20

- **Number of written papers or reports of 20 pages or more**
  - None
  - 1-4
  - 5-10
  - 11-20
  - More than 20

- **Number of written papers or reports between 5 and 19 pages**
  - None
  - 1-4
  - 5-10
  - 11-20
  - More than 20

- **Number of written papers or reports of fewer than 5 pages**
  - None
  - 1-4
  - 5-10
  - 11-20
  - More than 20

In a typical week, how many homework problem sets do you complete?

- **Number of problem sets that take you more than an hour to complete**
  - None
  - 1-2
  - 3-4
  - 5-6
  - More than 6

- **Number of problem sets that take you less than an hour to complete**
  - None
  - 1-2
  - 3-4
  - 5-6
  - More than 6

Continue
Select the circle that best represents the extent to which your examinations during the current school year challenged you to do your best work.

Very little ▼  ►  Very much ▼

1  2  3  4  5  6  7

During the current school year, about how often have you done each of the following?

Very often ▼  Often ▼  Sometimes ▼  Never ▼

- Attended an art exhibit, gallery, play, dance, or other theater performance
- Exercised or participated in physical fitness activities
- Participated in activities to enhance your spirituality (worship, meditation, prayer, etc.)
- Examined the strengths and weaknesses of your own views on a topic or issue
- Tried to better understand someone else’s views by imagining how an issue looks from his or her perspective
- Learned something that changed the way you understand an issue or concept

Which of the following have you done or do you plan to do before you graduate from your institution?

<table>
<thead>
<tr>
<th></th>
<th>Done</th>
<th>Plan to do</th>
<th>Do not plan to do</th>
<th>Have not decided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practicum, internship, field experience, co-op experience, or clinical assignment</td>
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<tr>
<td>Community service or volunteer work</td>
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<tr>
<td>Participate in a learning community or some other formal program where groups of students take two or more classes together</td>
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<tr>
<td>Work on a research project with a faculty member outside of course or program requirements</td>
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<tr>
<td>Foreign language coursework</td>
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<tr>
<td>Study abroad</td>
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<tr>
<td>Independent study or self-designed major</td>
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<tr>
<td>Culminating senior experience (capstone course, senior project, or thesis, comprehensive exam, etc.)</td>
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</tbody>
</table>

Continue
Select the circle that best represents the quality of your relationships with people at your institution.

### Relationships with other students

<table>
<thead>
<tr>
<th>Sense of alienation</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsupportive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supportive</td>
<td></td>
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</tbody>
</table>

### Relationships with faculty members

<table>
<thead>
<tr>
<th>Sense of belonging</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unhelpful, unsympathetic</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Helpful, sympathetic</td>
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</table>

### Relationships with administrative personnel and offices

<table>
<thead>
<tr>
<th>Considerate, Flexible</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unhelpful, Inconsiderate, Rigid</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Helpful, Considerate, Flexible</td>
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</table>

About how many hours do you spend in a typical 7-day week doing each of the following?

- Preparing for class (studying, reading, writing, doing homework or lab work, analyzing data, rehearsing, and other academic activities)

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>0</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20</th>
<th>21-25</th>
<th>26-30</th>
<th>More than 30</th>
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</thead>
<tbody>
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</table>

- Working for pay on campus

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>0</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20</th>
<th>21-25</th>
<th>26-30</th>
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</table>

- Working for pay off campus

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>0</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20</th>
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<th>26-30</th>
<th>More than 30</th>
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</tbody>
</table>

- Participating in co-curricular activities (organizations, campus publications, student government, fraternity or sorority, intercollegiate or intramural sports, etc.)

<table>
<thead>
<tr>
<th>Hours per week</th>
<th>0</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
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<th>26-30</th>
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</tbody>
</table>

Continue
About how many hours do you spend in a typical 7-day week doing each of the following?

<table>
<thead>
<tr>
<th>Activity</th>
<th>0</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20</th>
<th>21-25</th>
<th>26-30</th>
<th>More than 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relaxing and socializing (watching TV, partying, etc.)</td>
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<tr>
<td>Providing care for dependents living with you (parents, children, spouse, etc.)</td>
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<tr>
<td>Commuting to class (driving, walking, etc.)</td>
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</table>

To what extent does your institution emphasize each of the following?

- Spending significant amounts of time studying and on academic work
- Providing the support you need to help you succeed academically
- Encouraging contact among students from different economic, social, and racial or ethnic backgrounds
- Helping you cope with your non-academic responsibilities (work, family, etc.)
- Providing the support you need to thrive socially
- Attending campus events and activities (special speakers, cultural performances, athletic events, etc.)
- Using computers in academic work

Continue →
To what extent has your experience at this institution contributed to your knowledge, skills, and personal development in the following areas?

<table>
<thead>
<tr>
<th>Area</th>
<th>Very Much</th>
<th>Quite a Bit</th>
<th>Some</th>
<th>Very Little</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquiring a broad general education</td>
<td></td>
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<tr>
<td>Acquiring job or work-related knowledge and skills</td>
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<td></td>
<td></td>
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<tr>
<td>Writing clearly and effectively</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Speaking clearly and effectively</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Learning critically and analytically</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyzing quantitative problems</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Using computing and information technology</td>
<td></td>
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<tr>
<td>Working effectively with others</td>
<td></td>
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</tbody>
</table>

To what extent has your experience at this institution contributed to your knowledge, skills, and personal development in the following areas?

<table>
<thead>
<tr>
<th>Area</th>
<th>Very Much</th>
<th>Quite a Bit</th>
<th>Some</th>
<th>Very Little</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voting in local, state, or national elections</td>
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<tr>
<td>Learning effectively on your own</td>
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<tr>
<td>Understanding yourself</td>
<td></td>
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</tr>
<tr>
<td>Understanding people of other racial and ethnic backgrounds</td>
<td></td>
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<td></td>
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<tr>
<td>Solving complex real-world problems</td>
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<tr>
<td>Developing a personal code of values and ethics</td>
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<tr>
<td>Contributing to the welfare of your community</td>
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<tr>
<td>Developing a deeper sense of spirituality</td>
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</tbody>
</table>

Continue
Overall, how would you evaluate the quality of academic advising you have received at your institution?
- Excellent
- Good
- Fair
- Poor

How would you evaluate your entire educational experience at this institution?
- Excellent
- Good
- Fair
- Poor

If you could start over again, would you go to the same institution you are now attending?
- Definitely yes
- Probably yes
- Probably no
- Definitely no

Select your year of birth:
- *988
- *987
- *986
- *985
- *984
- *983
- *982
If other year, enter here: 19

Your sex
- Male
- Female

Continue
Are you an international student or foreign national?
- Yes
- No

What is your racial or ethnic identification? (Select only one.)
- American Indian or other Native American
- Asian, Asian American, or Pacific Islander
- Black or African American
- White (non-Hispanic)
- Mexican or Mexican American
- Puerto Rican
- Other Hispanic or Latino
- Multiracial
- Other
- I prefer not to respond

What is your current classification in college?
- Freshman/first-year
- Sophomore
- Junior
- Senior
- Unclassified

Did you begin college at your current institution or elsewhere?
- Started here
- Started elsewhere

Since graduating from high school, which of the following types of schools have you attended other than the one you are attending now? (Select all that apply.)
- Vocational or technical school
- Community or junior college
- 4-year college other than this one
- None
- Other

Continue...
Thinking about this current academic term...

How would you characterize your enrollment?

- Full-time
- Less than full-time

Are you taking all courses entirely online?

- Yes
- No

Are you a member of a social fraternity or sorority?

- Yes
- No

Are you a student-athlete on a team sponsored by your institution's athletics department?

- Yes
- No

On what team(s) sponsored by your institution's athletics department are you an athlete? (Select all that apply.)

- Baseball
- Basketball
- Bowling
- Cross Country
- Fencing
- Field Hockey
- Football
- Golf
- Gymnastics
- Ice Hockey
- Track & Field
- Lacrosse
- Rifle
- Rowing
- Skiing
- Softball
- Swimming & Diving
- Tennis
- Volleyball
- Water Polo
- Wrestling
- Other, specify:

What have most of your grades been up to now at this institution?

- A
- B+
- C+
- A-
- B
- C
- B-
- C- or lower

Which of the following best describes where you are living now while attending college?

- Dormitory or other campus housing (not fraternity/sorority house)
- Residence (house, apartment, etc.) within walking distance of the institution
- Residence (house, apartment, etc.) within driving distance of the institution
- Fraternity or sorority house

Continue
What is the highest level of education that your father completed?
- Did not finish high school
- Graduated from high school
- Attended college but did not complete degree
- Completed an associate's degree (A.A., A.S., etc.)
- Completed a bachelor's degree (B.A., B.S., etc.)
- Completed a master's degree (M.A., M.S., etc.)
- Completed a doctoral degree (Ph.D., J.D., M.D., etc.)

What is the highest level of education that your mother completed?
- Did not finish high school
- Graduated from high school
- Attended college but did not complete degree
- Completed an associate's degree (A.A., A.S., etc.)
- Completed a bachelor's degree (B.A., B.S., etc.)
- Completed a master's degree (M.A., M.S., etc.)
- Completed a doctoral degree (Ph.D., J.D., M.D., etc.)

Please enter your major(s) or your expected major(s).
Primary major (Enter only one):

If applicable, second major (not minor, concentration, etc.).

If you have any additional comments or feedback that you'd like to share on the quality of your educational experience, please type them below.
VITA

Tourgee D. Simpson, Jr.
Darden College of Education, STEM Education & Professional Studies
Old Dominion University, Education Building, Room 228, Norfolk, VA 23529
tsimp009@odu.edu

Education
Old Dominion University – Norfolk, VA
Doctor of Education, Occupation and Technical Studies, August 2014
Dissertation: The Effects of Student Engagement on Retention: Comparing Male Undergraduate STEM Majors to Non-STEM Majors
Dissertation Chair: Dr. Cynthia Tomovic, STEM and Professional Studies

University of Arkansas – Fayetteville, AR
Master of Education, Higher Education Administration, May 2007

Georgia State University – Atlanta, GA
Bachelor of Science, Human Resource Policy and Development, May 2005

Teaching Experiences
Old Dominion University – Norfolk, VA August 2011-August 2013
STEM 110T – Introduction to Technology, Instructor

University of California, Santa Barbara – Santa Barbara, CA Spring 2008
INT 20 – Introduction to Colleges and Universities, Discussion Leader

Professional Experience
University of Kentucky – Lexington, KY February 2013-current
National Student Exchange Coordinator and Academic Advisor

Old Dominion University – Norfolk, VA June 2010-June 2011
Assistant Director, College of Business & Public Administration

University of California, Santa Barbara – Santa Barbara, CA August 2007-June 2010
Resident Director, Office of Residential Life

Certifications
Old Dominion University – Norfolk, VA
Peer Educator, August 2013
Future Faculty Fellows Program, April 2013
Master Advisor Program, April 2011

University of California, Santa Barbara – Santa Barbara, CA
Restorative Justice Facilitator, March 2010