Factors that Affect Academic Performance and Retention Status:
A Study of a Summer Bridge Program

by

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ABSTRACT

Summer Bridge Programs (SBP) have demonstrated success for underrepresented students in STEM fields. However, a review of published reports of these programs suggests mixed and some negative results with very few programs having been subjected to rigorous evaluations (Kallison & Stader, 2012; Sablan, 2014; Strayhorn, 2011). Utilizing a quantitative methodology, this study examined the relationship between participation in a SBP for students of color and persistence and academic performance. Controlling for background variables, findings reveal that SBPs promote student outcomes for student success and persistence and reduces student attrition in STEM related majors at a large predominately White land grant university in the Southeastern United States.

Analysis included utilizing logistic regression and multiple regression with a sample size of 500. This study found that the SBP participants (n=140) persisted differently from their freshman to sophomore year of college than non-program participants with similar student background characteristics. Students who participated in the SBP had higher grade point averages and retention rates than non-participants. Implications of this study provide insights for faculty, staff, administrators and program developers of SBPs to explore student retention and its solutions.

DEDICATION

“But seek first the kingdom of God and His righteousness, and all these things shall be added to you.” Matthew 6:33 (NKJV)

This doctoral dissertation is dedicated to the two strongest women I have known in life. To my grandmother, the late Lille P. Lankford, you taught me the importance of high morals and values. You showed me that how you treat a person impacts others. I am so thankful to have had you in my life. Heaven definitely gained an angel when we lost you. To my mother, Teresa L. Evans, you were always there to guide me in the right direction. I appreciate the hard work ethic that was planted as a seed when I was just a child. This degree, I dedicate to you for your guidance and the love you have given me. Thank you for the woman, I am today.

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"Trust in the Lord with all your heart, and lean not on your own understanding; in all your ways acknowledge Him, and He shall direct your paths." Proverbs 3:5-6 (NKJV)

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CHAPTER ONE: INTRODUCTION

Educational disparities are highlighted in the enrollment, persistence, and completion rates of students of color and those from disadvantaged backgrounds in higher education (Swail, Redd, & Perna, 2003). Students from underrepresented backgrounds in the fields of science and engineering include African American, Hispanic, and American Indian in the United States (Astin, 1982). Despite some gains made in access, academic achievement, and retention, gaps still exist among first generation, low-income, and students of color students particularly in science and engineering fields (Avery & Kane, 2004; Swail et al., 2003).

Current enrollment and degree completion rates provide some insight into the current state of educational disparities research. Recent statistics indicate, the enrollment rates for all higher education institutions were as follows: White (58%); Asian or Pacific Islander (6%); African American (14%); Hispanic (13%); American Indian or Alaska Native (1%); and Other or unknown race/ethnicity (8%). However, these enrollment rates do not translate into higher completion rates in science and engineering. Bachelor's degrees awarded in 2010 were as follows White (64%); Asian or Pacific Islander (10%); African American (9%), Hispanic (10%), American Indian or Alaska Native (1%), and other or unknown race/ethnicity (7%) (Minner, Levy, & Century, 2010) These rates for African Americans, Hispanics, and American Indians are low in comparison to their enrollment demographics.

With these educational disparities, an increase in intervention programs such as SBPs has occurred (Domina, 2009). These educational programs are designed to make the transition seamless to higher education by increasing academic achievement and retention rates. Despite many efforts to improve academic achievement and retention rates; the diversity of the scientific community fails to reflect the broader US population (Minner et al., 2010)

A Chronology of Events Affecting Minority Students in Higher Education Access

A history of oppression and disenfranchisement has led to disenfranchised education and limited career opportunities which explain some of the reasons why minorities are underrepresented (Brubacher & Rudy, 1997). In the early 1800s, student from underrepresented backgrounds or students of color did not have access to higher education. A number of landmark acts focused on alleviating these educational barriers, such as, the Morrill Land-Grant Colleges Act which occurred in the late 1800s following the outbreak of the Civil War. Enactment of the Morrill Act (1862) reflected a growing demand for agricultural and technical education in the United States. The act helped place a "college in every State upon a sure and perpetual foundation, accessible to all, but especially to the sons of toil," as Morrill memorably put it (Brubacher & Rudy, 1997). The second Morrill Act (1890) sought to extend access to African Americans in higher education by providing additional endowments in each of the then-segregated Southern states and came to be known as “the 1890 land-grants.”

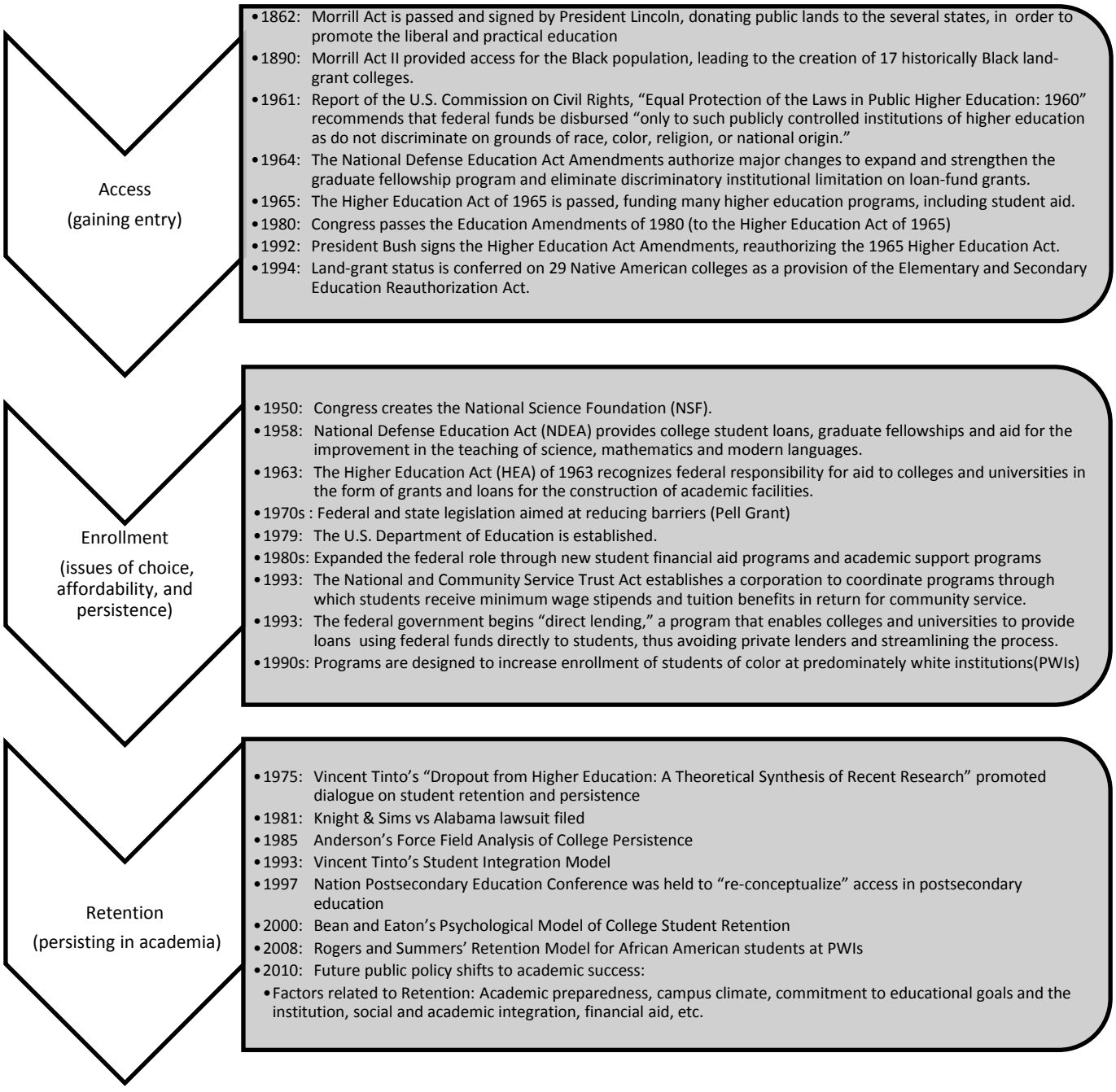

Figure 1. A Chronology of Events Affecting Minority Students in Higher Education

After nearly seventy years, the US Commission on Civil Rights recommended federal funds be dispersed only to institutions that do not discriminate (Thelin, 2011). Following these acts, the National Defense Education Act of 1964 enacted the government into the student-loan business and eliminated discrimination based on race; the Civil Rights Act of 1965 ended segregation in public places and banned employment discrimination on the basis of race, color, religion, sex or national origin; and the Higher Education Act of 1965 and its later amendments extended the loan program and added work-study and federal grants to the mix of aid options. By the 1970s college had become a reachable goal for millions of Americans, including underserved populations who flocked to land-grant institutions (Thelin, 2011). With the addition of expanded programs including academic support, financial aid, and Pell grant, educational access became a reality for many students.

Enrollment

After nearly one hundred years focused on gaining access to higher education, research has shifted toward enrollment and persistence (Tinto, 2012a). During this period of enrollment, organizations such as the National Science Foundation and US Department of Education were created. To increase enrollment, students have access to student support programs, financial aid, and student loans. Several programs such as such as the TRIO programs (Upward Bound, Student Support Services, and Talent Search) were introduced to alleviate enrollment barriers for first generation, documented disability, and low income students. Additionally, a number of programs designed to increase enrollment of students of color at majority White institutions began in the 1990s. Although many federal and state initiatives have focused on alleviating the barriers

related to students of color students attending and completing a degree in the sciences and engineering disciplines, more research is needed (Ackermann, 1991).

Retention

Many programs are designed to increase enrollment for students of color at predominately White institutions (PWIs); however, some observers are now beginning to question the programs' ability to retain these students toward degree completion (Allen & Bir, 2011; Astin, 1993; Chism, Baker, Hansen, and Williams, 2008). Several studies investigate student persistence and suggest reasons why students are unsuccessful in sciences including under preparation and lack of support systems (Ackermann, 1991; Friedman & Mandel, 2011; Garcia, 1991; Lohfink & Paulsen, 2005). Many scholars believe that a significant number of incoming freshmen lack the academic preparedness necessary for collegiate success (Michael, Dickson, Ryan, & Koefer, 2010). African Americans at PWIs are more likely than those at HBCUs to experience high levels of social isolation, alienation, personal dissatisfaction, and overt racism. (Cabrera, Nora, Terenzini, Pascarella, & Hagedorn, 1999).

Because of these factors, it is possible that students of color students at PWIs may be at greater risk of leaving their institutions before completing their degree programs. Additionally, institutional and social support for at-risk students is often lacking, making retention even more difficult (Lundberg, McIntire, & Creasman, 2008). These barriers result in significant student attrition.

Others such as Tinto (1993; 2012b) and Argote, Beckman, and Epple (1990) suggest we must understand the role of student characteristics and the college environment which influence retention. Additional studies discussed the influence of the

psychological aspects of the environment on student retention (Kluepfel, 1994; Milem & Berger, 1997; Rodgers & Summers, 2008; Thayer, 2000). These research models have shifted attention to academic success and retention rather than just access and enrollment. Recent studies show that only 50% of those who enroll in a four-year college or university graduate within six years (Weddle-West & Bingham, 2010). Students from low socioeconomic backgrounds, ethnic students of color students, and students who were the first in their family to attend college were particularly vulnerable to this attrition. (Braxton & Hirschy, 2005)

The issue of educational disparities is highlighted in several landmark cases from *Brown v. Board of Education* in 1954 to the case of *Knight and Sims v. Alabama* filed in 1981. These lawsuits were concerned with "eliminating vestiges of historical, state enforced, racial segregation and other forms of official racial discrimination against African Americans in systems of education" (Warren, 1954). The court's principal decrees mandated a wide variety of reforms affecting all the historically white and historically black universities. With these mandates in place, many universities introduced systems to close the ethnicity gap in higher education.

The focus shifts to student development, engagement, and involvement. A number of universities are promoting institutional commitment, both academically and socially, to prevent student dropout (Tinto, 1975). The addition of an intervention such as a SBP, designed to provide extra academic support while introducing students to their peers, and socially integrating the students into the university, are used to increase rates of retention. Typically, students from underrepresented groups particularly students from

disadvantages backgrounds and students of color attend SBPs the summer prior to the beginning of freshmen year.

Purpose of the Study

The purpose of this study was to evaluate the effects of a pre-freshmen SBP on selected participants compared to non-participants. This study examined the potential effects of participation in the SBP on first-year persistence and academic performance as measured by first-year college grade point average (GPA). In this study, the researcher used a quantitative approach to examined whether students who participated in summer bridge persist differently from their freshman to sophomore year of college than non-program participants with similar student background characteristics. Further, in order to examine the potential effects of a summer program on first-year persistence and GPA, comparisons were made among two groups of students who were enrolled as college freshman in the academic years of 2007 – 2012.

The treatment group consisted of college freshman who participated in the SBP. The control group consisted of college freshman with similar background characteristics who never participated in the SBP but applied to the program. Participation in the SBP was used as a sampling frame to have students of color students be examined.

Research Questions

The research questions examine the relationship between a program participation, academic performance, and first-year persistence. The general research question addressed by this study was: Does participation in a SBP have any effect on academic performance and persistence for first-time, minority freshman college students?
The study investigated the following research questions:

1. Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA1) in sciences after the first semester, after controlling for precollege characteristics*?
2. Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA2) after the first year, after controlling for precollege characteristics*?
3. Is attendance of a Summer Bridge Program a significant predictor of retention after the first year of college for minority students enrolled, after controlling for precollege characteristics?

*Pre-college characteristics include high school GPA, ACT score, gender, socioeconomic status (SES), taken chemistry, taken calculus, major, and pre-health concentration

Hypotheses

The study will investigate the following hypothesis:

H_1: Attendance of a Summer Bridge Program is a significant predictor of academic performance (GPA1) after the first semester after controlling high school GPA, ACT score, gender, SES, taken chemistry, taken calculus, major, and pre-health concentration.

H_2: Attendance of a Summer Bridge Program is a significant predictor of academic performance (GPA2) after the first year of college after controlling high school GPA, ACT score, gender, SES, taken chemistry, taken calculus, major, and pre-health concentration.

H_3: Attendance of a Summer Bridge Program is a significant predictor of retention after the first year of college for minority students enrolled, after controlling for high school GPA, ACT score, gender, SES, taken chemistry, taken calculus, major, and pre-health concentration, first semester GPA, and first year GPA.

Significance of the Study

National Context

President Obama has challenged colleges and universities to increase their retention rates in his 2020 College Completion Initiative and 2020 American Graduation Initiative (AGI). These initiatives are urging states to use performance-based funding and other measures based on retention outcomes (Kotamraju & Blackman, 2011). A clear priority for STEM education within a decade is American students must "move from the middle to the top of the pack in science and math" (Sablan, 2014).

When considering the leaking STEM pipeline, only 1-2% of African American students receive an undergraduate degree in a STEM field. The Committee on STEM Education will facilitate a cohesive national strategy to reorganize STEM education and increase the impact of federal investments in five areas: P-12 STEM instruction; public and youth engagement with STEM; the STEM experience of undergraduate students; better serving groups historically underrepresented in STEM fields; and graduate education for tomorrow's STEM workforce. Nationally, the focus is students in STEM competing in a global society. In this context, retention is considered such a serious and significant issue nationwide that conferences, resources and research are dedicated to this topic alone (Tinto, 2012a).

Local Context

Understanding this issue of educational disparities, many institutions have actively worked to promote diversity in programs ranging across educational levels with support from multiple organizations and agencies particularly among students of color (National Science Foundation, 2001). Typically, university strategic plans include goals, actions, and results for recruitment of students of color and faculty. The increase of campus diversity, access, and inclusion are important. One of the oldest strategies in science and engineering fields are SBPs designed to help bridge the gap between high school and college (Garcia, 1991). The Southeastern University of interest addressed this issue of diversity with the addition of a summer program in the sciences. This program targeted African American and other students of color students and was designed to ease the path to higher education for students who have traditionally been underrepresented in higher education.

This University's mission focuses on quality education, service, and access. The key areas for students of color student persistence are academic preparation, financial aid, and support networks in college. With the annual cost of attendance ranging from $10,000 to $25,000 depending on a student's status as a state resident and the availability of additional funds for housing, it is vital to the financial health of the University to retain as many students as possible. This study, therefore, helps gain insight into factors that affect retention and achievement in the sciences despite the challenges at-risk students face.

Personal Context

Gladieux and Perna (2005) suggest that a system that creates access without persistence fails both society and the very students it seeks to help. Another issue that students face is the financial impact of withdrawal before the completion of a degree. College students are accruing substantial amounts of debt (averaging $30,000), taking longer to graduate (averaging six years)—if they graduate at all (half do not), and then struggling to find a well-paying job (9 percent cannot) (Bound, Lovenheim, & Turner, 2010). Nearly 50% of those attending a postsecondary institution borrow money and more than 20% of those borrowers do not remain enrolled to graduation. Not only do these students not receive the financial gain that comes with degree attainment, but at the same time, they become saddled with additional debt.

With an increase in college access from 9 million students in 1980 to almost 20 million in 2011, overall retention rates have only slightly increased (Bound et al., 2010; Radford, Berkner, Wheeless, & Shepherd, 2010; Supiano, 2011). Barely more than one-half of all four year college students in the United States earn their bachelor's degrees within six years from their initial institution (Gurin & Nagda, 2006). African Americans, comprising just over 12 percent of the population earn just 9 percent of all baccalaureate STEM degrees and make up only 3.9 percent of scientists and engineers in the workforce according to the National Science Foundation. Yet, there is an emerging view that these problems can be solved through scaled investments in more effective teaching and learning in K-12, institutional infrastructure and student skills development support in college, and in a messaging effort that communicates the role of STEM in personal prosperity, community economic development and national competitiveness (Fletcher,

Newell, Newton, & Anderson-Rowland, 2001; Friedman & Mandel, 2011; National Science Foundation, 2010)

Having established the importance of persistence to the changing landscape of higher education, it is important to understand the reasons students choose to remain at an institution. Ultimately, SBPs aim to decrease the number of historically disadvantaged students who drop out of college each year. Although institutions can easily review their own graduation rates to determine if their summer programs are helping to retain students, they often do not understand the reasons behind these data, making it impossible to enhance or modify the program, or replicate the results in others types of programming.

This study provided an understanding of the reasons behind successful student retention and helps explain what types of programming to implement in the future, and demonstrates a need for a greater focus on academic achievement in the summer bridge experience. This knowledge is crucial to faculty, staff, and administrators and program developers. Understanding the reasons a SBP is successful provides an avenue to explore student retention and its solutions.

Summer Bridge Program Characteristics

The program of interest started in the 1990s with the goal of equipping entering students of color in sciences with the academic, social and financial support required to advance and excel in the sciences and pre-health courses of study. The specific aims are:

- to improve the student's ability to successfully navigate and complete foundational and gatekeeper courses such as chemistry and mathematics;
- to strengthen time management, critical thinking, analytical and test-taking skills;
- to facilitate the development of academic and social networks critical to achieving success;
- to acquire the financial and social capital to remain in school and earn the first postsecondary degree in a timely manner;
- to utilize service learning and outreach activities as vehicles for academic and leadership development;
- to explore a variety of career options in the sciences and related disciplines.

The program is held for admitted students during four weeks the summer prior to their freshmen year. Admittance to the program is selective and based on an application, essay, transcripts, and two letters of recommendation. Not all students accepted, enrolled, or decided to participate in the SBP. Additionally, a number of students were waitlisted due to limited funds available to the program. Students eligible for admission to the SBP have to meet the university's traditional admissions requirements. These may include,

high school courses completed, ACT or SAT scores, and high school GPA. In addition, each program participant must:

1. Be a member of a group traditionally underrepresented in STEM.
2. Graduating high school senior admitted to the University in Sciences for fall semester.
3. ACT score of 18-28 (Students with higher ACT scores are also encouraged to apply).
4. Attended freshmen orientation session.

Importance of Summer Bridge Programs

With many SBPs implemented to increase retention rates, this study seeks to increase awareness of the effectiveness of a pre-freshman program in the sciences. Since this program occurs during a critical period just before entering the higher education setting, the program could play a vital role in first year retention (Tinto, 1993). Additionally, studies focusing on the relationship between SBPs and outcomes such as academic achievement and retention are needed (Shere, 1993).

The SBP provides students with an academic enrichment and stimulating learning experience. The intensive program includes: non-credit instruction of mathematics and chemistry courses; educational development of study skills, time management and financial literacy; and enhancement of social skills. The program concludes with an annual awards luncheon hosted by the Dean of the College. These activities are in line with Tinto (1975) student integration model focusing on academic and social integration to improve student retention.

For this reason, we examine the outcomes of a pre-freshmen SBP for students of color students at a four year institution with particular interest in patching this pipeline to science and engineering success by improving first year students of color achievement and persistence through intervention. Specifically, the study analyzed data of students, who entered a public, doctoral granting institution as first-time in college freshmen between 2007 and 2012 and who were considered underrepresented minorities in the sciences, to determine the extent to which participation in the summer program impacted retention and academic achievement.

Although Tinto's (1975) student integration model has been studied in a number of contexts (Pascarella & Terenzini, 1983; Suzuki, Amrein-Beardsley, & Perry, 2012; Swail et al., 2003), it has not yet been specifically applied to a SBP in a comparative manner. Therefore, the results of this study are useful for higher education faculty, staff, and administrators as they consider how to assess, evaluate, and modify SBPs as a tool to improve persistence and graduation rates. Closing these gaps are essential in sciences and engineering for the advancement of innovation, creativity, and novel discoveries in the scientific community.

Limited Rigorous Evaluations

Many institutions develop SBPs to combat these barriers to retention in order to increase retention rates, particularly among first generation, low-income, and students of color students in science and engineering fields. However, as institutions administer SBPs, they often fail to evaluate the reasons behind their success. Several reports indicate that program evaluation data in general are unreliable and therefore, fail to provide useful information about the impact of the programs (Bailis, Hahn, Aaron, Nahas, & Leavitt,

1995; Gándara, 2001; James & Jurich, 1999; Oesterreich, 2000).

There have been very few large-scale evaluations of pre-college programs. Of the studies conducted investigating SBPs, hardly any literature contains consistent results (Ackermann, 1991; Murphy, Gaughan, Hume, & Moore, 2010; Sablan, 2014; Tsui, 2007). Several studies indicate that SBPs improve academic performance (Murphy et al., 2010; Santa Rita & Bacote, 1996; Strayhorn, 2011; Walpole et al., 2008), whereas others indicate they have no impact (Fletcher et al., 2001; Kallison & Stader, 2012), and others show decreased academic performance (Ackermann, 1991).

This lack of consistent research means that administrators are unable to modify and enhance programming to better serve the targeted population. In today's climate, governmental granting agencies have higher expectations and levels of accountability. As a result of constricted budgets, pre-college programs have come under increased scrutiny and will be required to link program effectiveness and costs (Swail et al., 2003).Without an evaluation of the reasons behind bridge program success, institutions rely on anecdotal evidence pointing to the value of bridge programming. Despite those sobering statistics, a college education remains well worth the investment and additional research is vital to understanding SBPs.

Operational Terms

Throughout the existing literature on college students and degree attainment there are a number of terms that are pertinent to the foundations of this research, which require operational definitions. In order to empirically measure each variable in the data analysis and to provide clarity in the study, the following variables have been operationalized.

Academic Achievement: In this study, academic achievement will be measured using the first-semester and first-year of college grade point average (GPA).

First-Year Retention: In this study, first-year persistence is defined as continued matriculation of each entering freshman cohort from their freshman fall semester to their sophomore fall semester. The term first-year retention is used interchangeably with the term persistence. In this study, institutional persistence rather than system persistence will be examined.

Low-Income: An individual whose family taxable income did not exceed 150 % of the poverty level amount in the calendar year preceding the year in which the individual initially enrolled in the university. The poverty level amount is determined by using criteria of poverty established by the Bureau of the Census of the US Department of Commerce.

Persistence: Refers to the desire and action of a student to stay within the system of higher education from beginning year through degree completion (Seidman, 2005).

Summer Bridge Program: This high school to college bridge program is designed to help assist in making a seamless adjustment to college life and build a foundation for academic success (Domina, 2009).

Transition*:* Any event or non-event in an individual's life that alters one's ―roles, relationships, routines, and assumptions (Evans, 2010).

Summary

This introduction presented a brief history of educational access, enrollment, and retention for students of color students in higher education and provided the importance of retention on national, institutional, and personal areas. Given the importance of

understanding retention and academic achievement, a study such as this that compares participants and non-participants of a SBP is needed. The study is important to the field of higher education because it details the relationship between program participation and academic achievement and retention at a large, public land grant Southeastern University, which in turn, allows administrators to make more informed decisions regarding retention programming at the University. The next chapter will explore relevant literature on retention, transitional programs, students of color students in context, and provide a conceptual map for the study.

CHAPTER TWO: LITERATURE REVIEW

This literature review provides background information on student persistence in higher education in order to show the need for SBPs in STEM fields. In particular, emphasis in this chapter was placed on literature relevant to first-year underrepresented students and the impact of pre-college transitional SBPs on academic performance and persistence.

The first section contains information regarding the theoretical models of college student persistence followed by a review of the relationships between variables and student persistence. Emphasis in this section is placed on four persistence models: Tinto (1975, 1993) model of student integration, Astin's (1984)"I-E-O" (Input-Environment-Output) model, Bean Student Attrition model (1980, 1985) and Pascarella and Terenzini (1977; 1980). The next section contains a review of Schlossberg's transition theory, transitional programs, and the psychological aspects of retention. Finally, this chapter will examine literature on student characteristics, academic performance, and academic preparation. To date approximately 120 primary and secondary sources relevant to this study were identified and reviewed. This literature review does not exhaust the literature on the aforementioned subjects; however, a foundation for this study was found.

Theoretical Models of College Retention

The view of student retention and attrition has been shaped by several landmark studies by Astin (1975), Bean (1980; 1985), Cope and Hannah (1975), Cabrera Nora, and Castaneda (1993), Metzner and Bean (1985), Tierney and Hagedorn (2002), and Tinto (1975, 1993). This study is informed by models of persistence and prior research testing

the plans that make up those models. The primary underlying theoretical framework for the current research is the student departure models described by Tinto's model of student integration (1975, 1993), Astin's "I-E-O" (Input-Environment-Output) model (1984), and Bean's model of student attrition (1985). Prior to the development of the Tinto and Bean models, most attrition research had explored countless individual student variables in relation to persistence but did little to tie them together conceptually (Stage, 1989). According to these authors, research on persistence, degree completion, and educational attainment should focus on theories with interconnected constructs that affect enrollment and retention.

Tinto's Student Integration Model

Tinto (1975) discussed persistence as a function of the match between an individual's motivation and academic ability and the institution's academic and social characteristics that lead differing students to drop out of higher education. Although Tinto focused on students' attrition from higher education, his work has been instrumental in decades of research and dialogue on student retention and success in higher education. Although Tinto's work has been challenged and revised by some researchers, his work continues to be a dominant theory in navigating the pathway of college persistence (Swail et al., 2003).

Tinto argues that college integration, or the extent to which students involve themselves in the academic and social domains of college life, is the most important mediating variable between students' backgrounds and persistence. Tinto's theory takes into consideration the importance of student's integration into academic and social

systems of an institution (p. 388). Tinto focused on the first-year of a student's experience as this year has the tendency to shape subsequent years (Tinto, 1993).

Drawing from the work of Durkheim (1951) and Spady (1970), Tinto's student integration model (1975, 1993, 2012) theorized that the social integration of students increases their institutional commitment, ultimately reducing the likelihood of student attrition. The overarching idea behind Tinto's application of stages to retention at the college level was that retention was most likely to occur when students were able to transition successfully from their past associations (e.g., family home, high school, and neighborhood family networks) to full integration into a new social role or situation (college).

Tinto (1975, 1993, 2012b) asserted that academic dismissal represents only a small portion of the total leaving of students from higher education. Tinto (1993) argued that it might not only be impossible to expect full separation from the students' home lives, but that retaining such home ties may actually aid, rather than hinder, integration and consequent retention at the college level, especially for students of color students entering a PWI atmosphere.

Tinto's (1993) model of academic and social integration was designed to explain dropout from a particular institution of higher education and does not try to explain system-wide dropout. In this model, Tinto's theory of student integration supports the critical role of student characteristics in positive educational outcomes for college students. Moreover, he emphasized the need to better understand the relationship between student's pre-entry characteristics to both their goal (i.e. degree attainment) and the

institution they were going to attend with a particular interest in student persistence (Berger & Milem, 1999).

Tinto (1975) produced a theoretical model of attrition and persistence that included the following components: a) pre-entry attributes (prior schooling and family background); b) goals/commitment (student aspirations and institutional goals); c) institutional experiences (academics, faculty interaction, co-curricular involvement, and peer group interaction; d) integration (academic and social); and f) outcome (departure decision—graduate, transfer, dropout) (Metz, 2004).

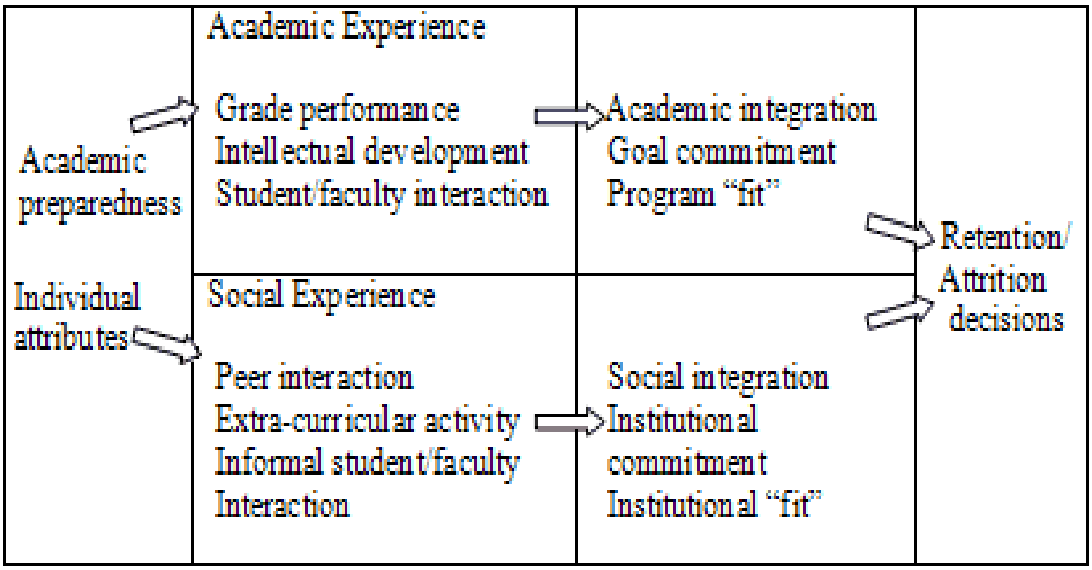

Figure 2 Simplified "Student Integration Model" (based on Tinto, 1975, 1993)

The characteristics that Tinto highlighted as being important in influencing the individual's goal and institutional commitment were their individual attributes, pre-college experiences and family background. As students enter college, they have certain individual attributes from personal and family beliefs and preconceived ideas regarding college attendance and personal goals (Tinto, 1993). Pre-college experiences cover social and academic experiences like school grade point average and academic and social

attainments. Family background covers factors like SES. Ultimately, Tinto's theory provided an explanation as to why students do not persist beyond their first-year. The theory also shows the importance of students' commitment to an educational goal and a commitment to remain in the institution. The higher the student's goal of completion and the level of institutional commitment; the greater the chance of persisting.

Tinto (1993, 2012b) refined his theory of student departure to more clearly address how the theory can be applied both to the experience of students of color, adult students, and to students at two-year colleges. In this regard, the revisions to the model clarified the role of multiple college communities in student retention and the ways in which external communities influence a student's college experience. Therefore, students must have the desire to attend college and embark on the transition to higher education. At the very outset, persistence in college requires individuals to adjust, both socially and academically, to the new and sometimes quite challenging environment of the college.

Astin's "I-E-O" (Input-Environment-Output) Model

Astin's I-E-O Model (1984) discusses that college outcomes are viewed as functions of (1) Inputs (demographics, student background, degree aspirations, career choice, major field of study, etc.); (2) Environment (educational experiences, curricula, programs, interventions, organizational affiliations); and (3) Outcomes (after college beliefs, grade point average, student retention, degree completion, etc.). Input differences are defined as "the characteristics of the student at the time of entry to the institution (including the student's pre-entry attributes)" (Astin, 1999). The educational environment includes "the various programs, policies, faculty, peers, and educational experiences to which the student is exposed." Student outcomes "refer to the student's characteristics

after exposure to the environment" (Astin, 1999).The applications of the I-E-O model are presumed to shape outcomes directly and indirectly within the institutional environment while controlling for input differences.

Astin's (1999) theory of involvement and I-E-O model considered factors that facilitate development (Evans, 2010). In all of these models, college student outcomes are affected jointly by students' background characteristics and their college experiences. More specifically, important factors influencing college persistence include the student's intention to persist, college GPA, and the institutional commitment to the student (Cabrera et al., 1993). This is particularly important for first-year students as academic and social involvement impact persistence. Peer relationships or social involvement appears to strengthen perceptions of institutional and social support and ultimately persistence (Berger & Milem, 1999). Therefore, summer programs are important to teach students the importance of balance between academics and social relationships. According Astin (1999), early involvement in the fall semester positively predicts spring involvement and has significant direct effects on social integration, academic integration, subsequent institutional commitment, and persistence (p. 659).

Bean's Student Attrition Model

Bean's initial model expanded on the previous work of Tinto (1975) and Astin (1975) by integrating four sets of variables: (1) academic variables (indicated by GPA); (2)student intent to leave (influenced by psychological outcomes such as satisfaction, goal commitment, and stress and academic variables such as study skills, academic advising, course availability, and major certainty); (3), background characteristics (include age, high school performance, ethnicity, and educational goals); and (4)

environmental variables (include finances, hours of employment, outside encouragement, family responsibility, and opportunity to transfer). The revised mode has direct effects on students' persistence. Bean's (1980) student attrition model and his subsequent conceptual model of nontraditional student attrition (Bean & Metzner, 1985) explain the attrition pattern of nontraditional students which include older students, part-time students, and commuting students and builds upon process models of organizational turnover and attitude behavior interactions (Cabrera et al., 1993).

Bean (1980) criticized Tinto (1975) for not citing similarities between leaving the world of work and leaving college and suggested there might be similarities between the two. Bean's 1990 model expanded on his earlier works and incorporated Astin's (1984) framework of student involvement to include student background, integration, and the external environment as influences on student departure. Additionally, Bean and Eaton (2002) attempted to revise Tinto's (1975, 1993) model to explain the psychological processes inherent in that model. This model fails to consider the role that cultural experiences may play in the retention of students of color students, particularly those attending PWIs. Rodgers and Summers (2008) proposed and tested revisions to Bean and Eaton's (2002) model. The authors suggested that, due to unique cultural experiences, the retention process (or those constructs deemed important for retention) likely looked different for students of color student populations.

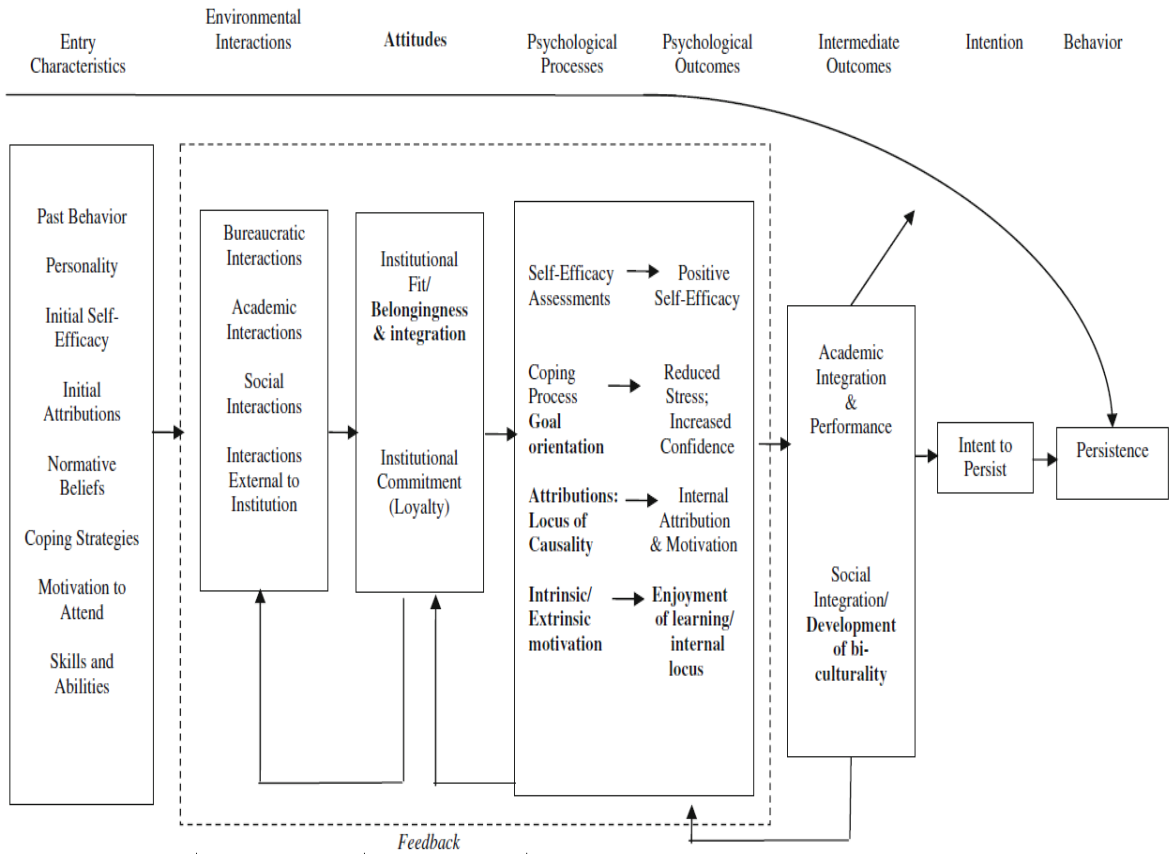

Figure 3 Retention Model for African Americans at PWIs (adapted from Bean & Eaton, 2000; Rodgers & Summers, 2008)

Pascarella and Terenzini

As previously stated, Tinto's (1975) student integration model has been subjected to a considerable amount of testing and other research studies (Cabrera et al., 1993; Pascarella, Pierson, Wolniak, & Terenzini, 2004; Pascarella & Terenzini, 1977). Pascarella and Terenzini (1977) tested the effect of the level of student-faculty interaction on student attrition in a traditional student population. This study focused on non-classroom interaction between academic staff and student with an interest in their attrition or retention. This non-classroom interaction with members of staff is potentially important as it raises not only the level of that individual's academic integration but also

their social integration. This experiment was important because it provided compelling evidence of the usefulness of some of the most important aspects of Tinto's model in predicting student attrition in a traditional student body. It also offered an interactive longitudinal look at student attrition. Whereas most studies measure the students' characteristics once and assess dropout at a later date, Pascarella and Terenzini (1977) assessed the students at three time points to give a better understanding of the interaction between different factors of the model. Also, the general conceptual model shows that the relationship between institutional context and student learning outcomes is reciprocal causation (Terenzini & Pascarella, 1980).

Tierney (1999) argued that Tinto (1993) ignored a large number of older, nontraditional students and failed to take into account the differing circumstances of students of color. A major gap in Tinto's theory has been the role of external variables in shaping perceptions and commitments. Cabrera et al. (1993) looked at a student population from a large southern urban institution and tried to examine the extent to which Bean and Tinto's models could be merged to gain more understanding of the process that affects students' decisions to remain in college. For their analysis, Cabrera et al. (1993),used a two-step structural equation modeling strategy and found that when the two theories were merged into one integrated model, a more comprehensive understanding of the complex interplay among the individual, environmental and institutional factors was achieved. Their findings supported Bean's assertions that environmental factors should be taken into account in explaining persistence processes. However, the generalizability of Cabrera et al. (1993) findings to other institutions was questionable since the patterns underlying college persistence vary by type of institution.

Schlossberg's Transition Theory

Schlossberg's transition theory provides insights into factors related to the transition, the individual, and the environment that are likely to determine the degree of impact a given transition will have at a particular time (Evans, 2010; Schlossbereg, 1989). "A transition can be said to occur if an event or non-event results in a change in assumptions about oneself and the world and thus requires a corresponding change in one's behavior and relationships" (Schlossbereg, 1989). There are three different types of transitions: anticipated transitions (occur predictably), unanticipated transitions (not predictable or scheduled), and non-events (events expected to occur but do not) (Evans, 2010). An individual experiences a series of phases associated with transitions. Schlossberg identities these phases as "moving in", "moving through", and "moving out". Schlossberg's (1989) conclusion is "significant transitions, such as entering college, graduating from college, addressing relationship issues, and facing career decisions, can all be better understood and approached when using this model". In the context of this study, the "moving in" phase is associated with participants beginning the SBP, "moving through" encompasses the SBP and the participants first year of college and "moving-out" is defined by participants attending the University beyond their first-year. As individuals' experience a transition uniquely, the need for SBPs becomes important.

The Need for Transitional Programs

The need for transition programs appears to be greatest for those students who are first generation, minorities, disadvantaged, or students with disabilities. Data indicates that students of color students graduate from high school, enroll in college, and complete college at much lower rates than other students. In 2001, 55 % of African American and

52 % of Hispanic high school graduates enrolled immediately in college, compared to 64 % of White graduates. Students whose parents have not attended college have similar needs. According to a 2001 report by the National Center on Education Statistics (NCES), “disparities exist along all the stages of the path to college” for students whose parents did not have any type of postsecondary education compared with students whose parents had a bachelor’s degree. Students whose parents did not have any type of postsecondary education are more likely to be African American or Hispanic and to be from families that earn less than $25,000 per year (Choy, 2001). Students with disabilities are also considerably less likely to enroll in postsecondary education than their nondisabled peers.

Previous research describes the potential academic and social transitions students face as they enter college and shows the importance of student academic and social engagement in regards to individuals’ persistence beyond their first-year of enrollment. Summer transition programs are “designed to assist individuals overcome or at least cope with the many social and academic difficulties that arise in the transition to college” (Tinto, 1993). Quite simply, the more students are academically and socially involved, the more likely they are to persist. Involvement during the first year serves as the foundation upon which subsequent affiliations and engagements are built. (Seidman, 2005). This is where summer transition programs are imperative as “participation in summer transition program(s) enhances both the academic and social transition to college” (Wolf-Wendel, Tuttle, & Keller-Wolff, 1999).

Many factors affect students' transitions including: separation from the past high school association and peer groups, separation from family, and differences in social and academic demands (Borman, Rachuba, & Stringfield, 2000). "Though past performance in high school may help prepare new students for college, the preparation is rarely perfect; the transition to college is rarely without a period of sometimes quite difficult adjustment" (Allen & Bir, 2011). Summer transition programs assist students through this potential difficult transition. Wolf-Wendel et al. (1999) explained: "For example, through a summer transition program, new students may learn their way around campus, meet new friends, register for fall classes, begin to develop relationships with faculty, and become acclimated to college coursework by enrolling in summer classes" (p. 8). Support for transition programs stem from the need to close these educational gaps. Policymakers and educators argue that college transitions programs are needed in order to address the historical disparities that exist in our educational systems.

Summer Programs at Other Institutions

Summer programs at other institutions were reviewed to show the importance of the programs to students' transitions, and to provide an explanation into the uniqueness of the SBP. A bridge program is a type of retention program geared towards at-risk students to assist them in acclimating to the college setting in order to be academically successful and graduate (Pascarella et al., 2004). Institutions' summer transition programs vary in regards to name, population, and mission; however, the outcome of helping students transition to college from high school is similar. Below is a table of summer programs offered by different universities (Figure 4).

Figure 4. Summer Bridge Programs without Provisional Admissions

Program Length	Description	Key Components	Credit Hours Earned
6 weeks	Designed to help incoming freshmen succeed in the transition from high school to college to experience the expectations and opportunities of being a University student in a fun and comfortable environment.	Academic classes, college success workshops, tutoring and peer mentoring,	None
4 weeks	Program serves as an introduction to the college experience for recently graduated high school students. Students selected to participate will be introduced to the skills necessary to be successful in college and individualized support in adjusting to the college environment.	Academic classes, college success workshops, tutoring and peer mentoring,	Students enroll in two of the following: College Reading, Composition Fundamentals, Elementary or Intermediate Algebra, or Speech Communication.
6 weeks	Program provides students with a rich academic curriculum.This curriculum maximizes students' success as they transition.	Academic classes, college success workshops, advising seminar	Students will be placed in two credit-bearing university classes, based on their high school coursework, test scores, and intended academic and career path.
7 weeks	For first-generation college students, and students who are disadvantaged by economic or educational circumstances, this high school to college bridge program is designed to help ease students' adjustment to college life and build a foundation for academic success.	Academic classes, meet faculty, staff, and administrators	Take freshman level or preparatory level classes of up to 7 credit hours (based on placement or college entrance test scores).
10 days	Program is a special opportunity designed to prepare students to be successful in college. All incoming freshmen in participating schools or majors are eligible.	Academic classes, meet faculty, staff, and administrators, presentation skills	None
4 weeks	Program enables incoming freshmen who qualify as underrepresented students to become familiar with campus life and the student support programs and services available.	Academic classes, meet faculty, staff, and administrators	Students earn 6 academic credits in a small, interactive, intensive classroom setting.
7 weeks	Program helps its participants make the transition from high school to college. The program targets incoming first-year students from small/rural high schools that may lack AP or other college preparatory courses. Students enter the fall semester equipped with the tools to continue their academic success.	Academic classes,advising, workshops and presentations on campus resources.	Students take a college-level English course, along with a math or science course, depending on availability. Students can earn up to 6 academic credit hours.
10 weeks	Students get an idea of what life on campus is all about so that by the start of the Fall semester they are better prepared for the challenges of a University.	Academic classes, seminars connected to learning communities, peer mentoring and academic advising , tutoring services, student support services, testing services.	Bridge students can enroll in summer courses to earn 9 semester credit hours.
5 weeks	Students get an early start on their college education.	Academic classes, residential living on campus, tutoring services and activities from student peer advisers, and advising from faculty and staff.	Student earn six hours of transferable coursework from a regionally accredited college with at least a 2.0 GPA during a single summer session.

The summer transition programs that are highlighted in Figure 4 show the uniqueness and outcome of specific programs. Summer Bridge Programs for high-risk, low-income, and students of color are becoming an established part of the effort to recruit, retain, and graduate a population of students underrepresented in higher education (Ackermann, 1991). These programs enable students to get a head start on building academic skills, especially in English and mathematics. One of the benefits of the residential program is that it provides a context in which at-risk students can learn to integrate their social lives with their academic lives. The above programs have individual characteristics that are essential to their institution. However, the mission of these programs is "to assist first-year students in their transition to college and encourage their persistence beyond their first-year" is similar. The most successful SBPs are very structured, and convey the clear message that college is "serious business" (Kluepfel, 1994).

Psychological Aspects of Retention

As suggested by Rodgers and Summers (2008), it is important to question our assumptions regarding the elements that are deemed necessary for academic success and retention of students in programs and general academic spaces in which they are the students of color due to race, ethnicity, or gender. Several psychological processes deemed important in the retention process and their implications for the retention of underrepresented students in STEM disciplines will be discussed. Specifically, this overview focuses on critical social theory, critical race theory, and the relationship of each to retention outcomes.

Critical Social Theory

A number of prominent interdisciplinary (critical social theory and critical race theory) and disciplinary-based approaches from the social sciences provided other perspectives on inquiry in this study. Critical social theory (CST) explains that domination and exploitation are reproduced systemically to deny certain populations e.g., low-income and first-generation students equitable opportunities such as attaining a college degree (Ladson-Billings, 2009). CST researchers believe that, by their very presence, they influence and are influenced by the social and technological systems they are studying (Ladson-Billings, 2009). Moreover, CST posits that (1) there is a difference between observing nature and observing people and (2) inquiry into social activity should focus on understanding meanings from within the social context. For critical social theorists, the responsibility of a researcher in a social situation does not end with the development of sound explanations and understandings of it, but this must extend to a critique of unjust and inequitable conditions of the situation.

Social class reproduction theory also provides an important framework in studies of the persistence decisions of first-generation and low-income students. Latter theory emphasizes social class differences that are replicated in social institutions, like colleges (Berger,2000; Lohfink & Paulsen, 2005). Human capital theory also informs the current study because of the importance of examining the costs and benefits of investment in higher education and what factors impact decisions about higher education (Becker, 1993).

Critical Race Theory

Critical Race Theory (CRT) has its roots in the fields of sociology, history, philosophy, and law. CRT has been identified as a useful framework to critique educational policies and policy-making within a historical and cultural context, as well as analyze racial exclusion and other forms of discrimination against students (Ladson-Billings, 2009; Solorzano & Bernal, 2001; Villalpando & Bernal, 2002). Ladson-Billings (2009) is often credited with introducing CRT into educational research and their concept of a critical race theory in the educational reform movement proposes that: (1) race continues to be significant in the United States; (2) US society is based on property rights rather than human rights; and (3) the intersection of race and property creates an analytical tool for understanding inequity (p. 48). Education scholars advocate for the importance of considering historical events and interactions between communities and schools; for example, how many students of color attend academically under-resourced schools and are tracked into non-college preparatory courses, in addition to other factors that hinder students' ability to successfully attain a college degree (Villalpando & Bernal, 2002).

First-Year Students in Context

Many research studies have focused on first-year students and their background characteristics which influence academic performance and persistence (Astin, 1993; Astin, 1999;Kuh & Hu, 2001). These pre-college characteristics researched include gender, ethnicity, and SES in relation to college outcomes. Typically, students confront many challenges through this transitional first-year and their attitudes influence their motivation and performance (Astin, 1999). Consistent with Tinto's (1993, 2012b) model

after students are academically and socially integrated to the college they are more likely to persist. Freshman-to-sophomore persistence is extremely important because "of student vulnerability at the beginning of college and because institutions can react quickly with interventions" (Seidman, 2005). Many students find ways to cope successfully and persist while other students have difficulty with this transition.

Student Characteristics

According to Tinto (2012a) approximately 75% of college students will leave higher education within their first two years of college. Research shows that the level of academic preparation in high school is positively related to high school graduation rates, college entrance examination scores, predisposition toward college, college enrollment, rates of transfer from a two-year to a four-year institution, progress toward earning a bachelor's degree by age 30, college persistence rates, and college completion rates (Ackermann, 1991; Kirby & Sharpe, 2001; McGrath & Braunstein, 1997; Ryland, Riordan, & Brack, 1994; Swail et al., 2003).

For four-year colleges and universities, whether public or private, 38% of those who leave will do so in their first year, and 29% in their second year (Tinto, 2012b). Only 67% of first-generation and low-income students enroll in a second year of college, compared to 85% of students without these risk factors (Roach, 2008). Additionally, a 1996 study indicated that students from families in the top income quartile completed bachelor's degrees at a rate of 74% while those from families in the lowest income quartile completed at a rate of only 5% (Thayer, 2000). Since much of the attrition in the second year reflects what happened the first year, it is understandable that college focus many of their resources on the first year of college.

Anastasi (1988) found a relationship between college entrance test scores and academic performance in college. In Braxton and Hirschy (2005), the study controlled for pre-college characteristics and their initial college goals and found that student' institutional commitments and their levels of involvement and integration in the university's academic and social systems contribute to persistence. Kirby and Sharpe (2001) found that high performing students are more likely than lower performing students to persist.

Underrepresented Students in STEM

Although prior research confirms that enrolling and succeeding in college requires students to become academically prepared, groups of underrepresented students continue to be less academically prepared for college (Tierney et. al, 2005). The research literature shows that access to high quality academic preparation is uneven for low-income and other disadvantaged students. In *Measuring Up*, Koretz discusses score inflation. He argues that high stakes induce "teaching to the test," which in turn produces artificial test-score gains (i.e., test-score inflation). Koretz (2008) noted that the level of access to high-quality of academic preparation was less for Blacks and Hispanics than whites. Analyses of data from the National Educational Longitudinal Study: 92/94 [NELS: 92/94] also shows that a smaller share of Black and Hispanic high school graduates are academically prepared for college (Radford et al., 2010).

St John, Carter, Chung, and Musoba (2006) examined factors affecting African Americans, Hispanic, and white students' persistence and found substantial similarities and a few very important differences in factors that influence persistence of the three ethnic groups. Namely, the differences included availability of advanced courses and

college choices. Taking advanced courses is associated with better preparation and higher college entrance test scores. Additionally, having a declared major is positively associated with persistence. Studies have also concluded that there are precollege factors such as work experiences and family educational level which are influential in determining persistence to the second year of college (Nora, Cabrera, Serra Hagedorn, & Pascarella, 1996; Tierney & Hagedorn, 2002). This means that academic achievement is important, but support services and SBPs are needed to bridge the gap for students to navigate courses, choose a major, and becoming acclimated to the university.

Campus and STEM Climate

Cabrera et al. (1999) describe retention models that emphasize a reciprocal commitment between students and their universities as demonstrating a *Student-Institution Fit* perspective. This perspective is useful in explaining the institutional adjustment of some students of color students. According to the authors, when students perceive the campus climate to be intolerant of a particular subculture (ethnic, gender, etc.), this creates a barrier between student members of that subculture and institutional resources deemed useful and necessary for academic success and satisfaction. When these students encounter problems, students become less likely to seek academic support from faculty, staff, and peers. They are less willing to be involved with campus activities that might serve to increase their feelings of social and academic integration (Fischer, 2010; Tinto, 1975), thereby decreasing the likelihood that they will remain at the institution.

Academic Performance and Retention

Academic integration and preparation are primary features of many models of retention (Swail et al., 2003)). These steps include: (1) Ensuring rigorous academic preparation; (2) Beginning efforts to improve academic preparation before student enter college; (3) Delivering academic preparation activities in culturally appropriate ways; and (4) Coordinating with K-12 and college educators (Tierney et al., 2005). Without the prerequisite skills needed to survive the rigorous curricula of most college campuses, many students underachieve and leave college during their freshman year or before their sophomore year begins (Astin, 1975; Richardson, Simmons, & De Los Santos, 1987; Tinto, 1975). These studies discuss the relationship between student's academic performance and persistence.

Academic preparedness is often defined on the basis of students' pre-college academic performance as measured by one or more of the following: high school GPA, high school rank, college entrance test scores, high school college preparatory courses, advanced placement courses, the quality of high school attended, and quality and intensity of high school curriculum (Swail et al., 2003). A number of research studies have correlated academic preparedness of students of color and non- students of color students with their persistence and college completion rates (Adelman, 1999; Borman et al., 2000; Fiske, 1988; Richardson et al., 1987). Other studies also found significant correlations between academic preparation and persistence for low achievers (Porter, 1989) and Hispanic students (Astin, 1999). These findings support Tinto's theory (1975) of academic integration and college persistence.

In light of the barriers faced by disadvantaged students, transition programs offer a systematic approach for raising the academic level of these students. In turn, this higher level of quality in academic preparedness will have an impact on college enrollment and persistence rates for underrepresented students. Academic preparation is a key component of many currently existing transitional preparation programs such as SBPs, Upward Bound, Talent Search, and GEAR-UP (Ackermann, 1991; Jun & Tierney, 1999; Perna & Swail, 2001; Tierney et al., 2005).

Conceptual Framework

Success in college can be measured by progression toward the completion of a baccalaureate degree. Typically this success is measured by a student's ability to persist or be retained at a college in good academic standing. SBPs are designed to ease this transition to college success for underrepresented groups. These students considered "at-risk" include low income, first-generation, and students of color students. A number of attributes such as an inequitable high school preparation and a hostile campus climate contribute to this status. This study included demographics, academic preparation, and goals/aspirations to operationalize the model. Although Tinto's (1975, 1993) model has been applied to higher education settings, there is little or no research on the use of integrating this model in studying the persistence of students in SBPs.

This conceptual model examines what potential role pre-college programs could have which could in turn influence first semester GPA, first year GPA, and first-year persistence or success. Controlled variables for this model include demographics, high school preparation, and STEM interest. The focus of this model is the evaluation of the effects of a pre-college program to improve the participation of underrepresented

minorities in sciences and mathematics disciplines at a primarily white institution in the Southeastern United States. The conceptual framework that guided this study is found in Figure 5.

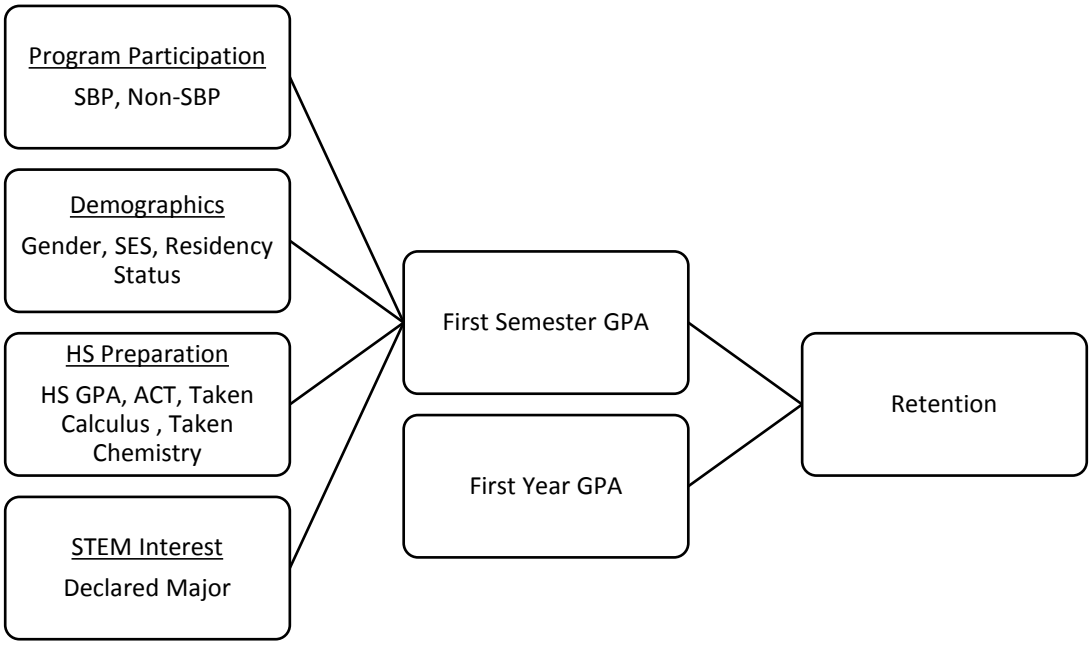

Figure 5. Conceptual Model of First Year Minority Student Retention

Summary

This chapter provided background information on retention theories, first-year students, transitional programs, and academic performance and persistence while showing the difficulties of student transitions to higher education and how SBP can assist students. From the information provided in this literature review, a study a SBP will show the affect the program had on students' transitions to college and their persistence beyond their first-year of enrollment. Chapter 3 provides an in-depth look into the methodology of this study and describes participants in the study.

CHAPTER THREE: METHODOLOGY

The primary purpose of this study was to examine the relationship between a pre-freshmen SBP, academic performance, and first-year persistence. The general research question addressed by this study was: Does participation in a SBP have any effect on academic performance and persistence for first-time, minority freshman college students?

Research Questions

The study investigated the following research questions:

1. Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA1) in sciences after the first semester, after controlling for precollege characteristics*?
2. Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA2) after the first year, after controlling for precollege characteristics*?
3. Is attendance of a Summer Bridge Program a significant predictor of retention after the first year of college for minority students enrolled, after controlling for precollege characteristics?

*Pre-college characteristics include high school GPA, ACT score, gender, SES, taken chemistry, taken calculus, major, and pre-health concentration

Research Population and Participants

The research population included is first time in college (FTIC) full-time undergraduate degree-seeking students attending a public four year university between 2007 and 2012. In 2012, this particular university had an overall population of nearly

25,000. The specific groups of interest within this population were traditional age uundergraduate college students, mostly age 18-22, who have been identified as underrepresented students of color students admitted to the university in sciences. The population for this study was identified with a review of Institutional Research data. Permission to access all data was granted by the University Institutional Review Board. The approval form can be found in Appendix A.

During 2007 to 2012, approximately 6,036 full-time undergraduate students enrolled in the sciences. During this time, nearly 896 students traditionally underrepresented in sciences matriculated into the college. These students were eligible to apply to the SBP offered. This includes 688 African American, 56 Native American, and 152 Hispanic. Of those students, 500 students that applied for the summer program were identified as the sample for this study. This group includes 140 male (28%) and 360 female (72%) participants. A total of 440 African American (88%), 15 Native American (3%), and 45 Hispanic (9%) students applied to the program.

Selection of the Research Sample

The accessible sample consisted of students entering the university from Fall 2007 to Fall 2012. This sample of 500 students included FTIC degree-seeking students of color students admitted to the university as participants in the SBP (n=126) and non-participants (n=374) that applied to SBP and were accepted, declined, waitlisted, or decided not to participate in the program. The university selected as a study site is a public, four-year, doctoral granting institution in the southeast region of the United States. During the 2012-13 academic year, the total average enrollment at the institution was nearly 27,000 student. On average, undergraduate students accounted for 21,000 of

the student body. In Fall 2012, the full-time undergraduate student population was 50.8% male and 49.2% female. The racial breakdown of the full-time undergraduate students for this same year included 85.2% White students, 7.2% African American students, 2.8% Hispanic students, and 4.8% other racial/ethnic students. The study site was also chosen due to the similarity in terms of admission criteria, students of color student and gender representation of its undergraduate student populations to other public Research I institutions in the United States. This university was also chosen because of the availability of data from the proposed population.

Research Design

A quantitative research approach is used to test objective theories by examining the relationship among variables (Creswell, 2013). The goal of the SBP is to address the persistent underrepresentation of African-American and other underrepresented student populations in the sciences and the disproportionately high attrition rate of students of color students when compared to their majority cohort. This study analyzed academic records of students in sciences and mathematics who entered as first-time freshman in the fall semesters during the interval of 2007 to 2012 to determine if participation in a SBP would be a significant predictor of academic performance and retention status after the first and second semesters of college. The sample for this study consisted of six cohorts of FTIC, full-time freshman students who enrolled in the University and applied to the SBP between 2007 and 2012 (n=500).

In this study, all students in the sample were students that applied to the SBP which was used as a sample frame for students of color students. This design includes participants in the program (treatment group) and non-participants (control group). The

Summer Bridge participants will be compared to the Summer Bridge non-participants to see if attending a summer program could affect academic performance and retention. The research design utilized for this ex post facto quantitative study was a quasi-experimental nonequivalent groups design. The Non-Equivalent Groups Design (hereafter NEGD) is one of the most frequently used designs in social research (Trochim & Donnelly, 2005). NEGD is structured like a pretest-posttest randomized experiment, but lacks random assignment. In other words, the researcher did not control the assignment to groups through the mechanism of random assignment. As a result, the groups may be different prior to the study. In NEGD, the researcher tries to select groups that are as similar as possible in order to fairly compare the treated group with the comparison group.

In this case, participants are selected via application, high school grades in science and mathematics courses, standardized test scores, essay, transcript, and references. Each participant's application is scored by three readers. The readers are provided score sheets which rank each component of the application on a scale of 1 (low) to 5 (high). The same three readers scored all applicants from 2007 to 2012. The scores are averaged and the top thirty students are sent an acceptance letter to participate in the program. Students not in the top thirty are waitlisted. If students in the top thirty decline or decide not to attend, students from the waitlist are sent an invitation to participate in the program. Those students that are waitlisted or decided not to attend the program become part of the control group for this study. This waitlist process is repeated until all slots are filled for the summer program based on funding for that year.

Data Collection

Data gathered from existing institutional databases was used in this study. This information includes a student's participation in a pre-college program, demographic attributes (e.g., race/ethnicity, gender, SES) and student pre-college academic attributes (e.g., High school grade point average (HS GPA), SAT/ACT score, chemistry and mathematics courses). Verification of student GPAs at the end of their first year (academic performance) and student enrollment for the fall semester of their second year will be confirmed by data from the university's Office of Institutional Research and the programs annual reports. Already documented information collected from the SBP applications, the Office of Admissions student database, and Registrar's Office was used in this study.

Variables

Summer Bridge Program Participant (SBPGRM)*:* A dichotomous variable measuring whether or not a student participated in the SBP or not. In this study, program participation was measured on a 2-point scale: (0) Non-Summer Bridge participant; (1) Summer Bridge participant.

Academic Achievement*:* In this study, academic achievement was measured using the first semester (GPA1), second semester (GPA2), and cumulative college grade point averages (CUMGPA1). In the statistical analysis for the study, college GPA is a continuous variable.

Retention (RETSEM2): In this study, retention is a dichotomous variable defined as the number of semesters the student returns to the university. Retention was measured on a 2-point scale: (0) Not retained; (1) Retained. The term first-year persistence is used

interchangeably with the term retention. In this study, institutional persistence rather than system persistence was examined.

High School GPA (HSGPA): This is a continuous variable measured by ending high school grade point average the student had upon graduation.

ACT Score (ACT): College admissions test scores are standardized. Each case in the sample had a standardized SAT score, ACT score, or both. In order to include all cases for the subjects that took either the SAT or ACT, but not both, the researcher found those cases who had only taken the SAT and converted their SAT score to an ACT score. All SAT scores were converted using the official ACT/SAT Score Conversion Table (See Appendix B).

Control Variables

Gender (GENDER)*:* This refers to the sex of a student. Gender was measured on a 2-point scale: (0)Males; (1) Female.

Race/Ethnicity (ETHNIC): Each participant was coded by ethnic background. Race was measured as (0) African Americans; (1) Hispanic; (2) Native Americans.

Socioeconomic Status (SES): A dichotomous variable measuring whether or not a student is from a home considered above or below the average US poverty line based on zip code. In this study SES was measured on a 2-point scale: (0) Low SES; (1) High SES

Chemistry courses (CHEM): A variable measuring the number of chemistry courses taken in high school. In this study, chemistry courses are measured on a 2-point scale: (0) No chemistry sequence; (1) Chemistry sequence

Mathematics courses (CALC): A variable measuring the number of mathematics courses taken in high school. In this study, mathematics courses are measured on a 2-point scale: (0) No calculus sequence; (1) Calculus sequence

Residency (RESIDENT): A dichotomous variable measuring if a student is a resident of the state the summer program is located in. In this study, residency was measured on a 2-point scale: (0) Non- residency; (1) Residency

Major (MAJOR): A variable measuring if a student is enrolled in science and mathematics with a declared or undeclared major. In this study, major was measured on a 2-point scale: (0)-Undeclared sciences major; (1)Declared sciences major

Pre-Health Concentration (CONC): A variable measuring if a student is enrolled with a pre-health concentration (pre-health coded as "1"; no pre-health concentration coded as "0")

Instrumentation

The Southeastern University was provided with a survey to collect pertinent data on participants. The respondents provided answers which reflect Summer Bridge and Non-Summer Bridge participants' characteristics. Data downloaded from the University's databases were entered into an Excel file and then loaded by the researcher into the Statistical Package for the Social Sciences (SPSS), where these data were manipulated. The goal of this particular statistical analysis was to find if there were variables evidenced by those students who participated in a SBP that could affect college performance and persistence.

Operationalizing the Dissertation

This study uses a quantitative approach to explore the transition of underrepresented Summer Bridge participants to college, and their persistence beyond their first-year of enrollment at a Southeastern University. This study addressed the research gap that exists regarding the relationship between a pre-freshmen SBP and two college outcomes—student academic performance and persistence. Participants' academic and social transitions were defined through their participation, involvement, and retention at the University beyond their first-year. Specifically, students of color in STEM are studied to identify factors relevant to their success.

This study examines a SBP based on (Tinto, 1975, 2012a) student integration model which has been previously validated to understand retention. Two different types of regression models were used in the data analysis for the study (Table 1). The primary research method analysis used to examine whether participation in a pre-college SBP affects academic achievement was multiple regression. Logistic regression was used for the retention variable. These analyses were used to determine if the values were significantly different between the population of students who participated in the SBP and those who did not. The results were then used to make recommendations for the SBP in terms of areas of continued focus or new focus, and to determine significant factors in the successful retention of students.

Table 1. Summary of Statistical Analysis Used in the Study

Research Question	Statistical Analysis	Independent Variable(s)	Dependent Variable(s)
No. 1: Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA1) in sciences after the first semester, after controlling for precollege characteristics*?	Multiple Regression	1. Summer Bridge Program 2. Gender 3.SES 4. High School GPA 5. ACT Score 6. Chemistry 7. Mathematics 8. Residency 9. Major 10. Pre-Health	Academic Achievement (GPA1)
No. 2: Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA2) after the first year, after controlling for precollege characteristics*?	Multiple Regression	1. Summer Bridge Program 2. Gender 3.SES 4. High School GPA 5. ACT Score 6. Chemistry 7. Mathematics 8. Residency 9. Major 10. Pre-Health 11. GPA1	Academic Achievement (GPA2)
No. 3: Is attendance of a Summer Bridge Program a significant predictor of retention after the first year of college for minority students enrolled, after controlling for precollege characteristics?	Logistic Regression	1. Summer Bridge Program 2. Gender 3.SES 4. High School GPA 5. ACT Score 6. Chemistry 7. Mathematics 8. Residency 9. Major 10. Pre-Health 11. GPA1 12. GPA2	Retention (RETSEM2)

*Pre-college characteristics include high school GPA, ACT score, gender, SES, taken chemistry, taken calculus, major, and pre-health concentration

Data Analysis

The purpose of this study was to identify the effects of participation in a SBP on academic success and retention of first-time students of color. Using the Statistical Package for the Social Sciences (SPSS, 2012), statistical analysis and descriptive findings were obtained to address the research questions of this study. This data analysis used a logical and sequential series of analysis techniques which included descriptive and frequency statistics, correlations, and ANOVAs. The analysis is organized to correspond in sequence with the research questions.

Multiple Regression and Academic Achievement Outcomes

Multiple regression is used to further understand the relationship between several independent or predictor variables and a dependent variable. Multiple regression is most effective at identifying relationships between a combination of predictors (IVs) of the dependent variables. The following assumptions are tested in multiple regression (Tabachnick & Fidell, 2007). First, linearity can be assessed through examination of various bivariate scatterplots. If the relationship between independent variables and the dependent variable is not linear, the results of the regression analysis will underestimate the true relationship. Second, normality is evaluated through the assessment of values for skewness and kurtosis. Highly skewed variables or variables with substantial outliers can distort relationships and significance tests. Lastly, homoscedasticity is assessed by interpreting the results of Box's test. Homoscedasticity means that the variance of errors is the same across all levels of the independent variable. When the variance of errors differs at different values of the independent variable, heteroscedasticity is indicated.

Hierarchical multiple regression was utilized to explore academic achievement dependent variables. Independent variables and other controlled background variables (gender, HS GPA, ACT test scores, chemistry courses, mathematics courses, SES , major, and pre-health concentration) were entered into the regression model in an order determined by past research and researcher expectations. This statistical technique allows the independent variable of interest Attendance of a SBP to be introduced as the last variable in the prediction model to determine whether it contributes to a significant difference in explained variance of the dependent variable (GPA1 and GPA2) after prior explanatory variables are controlled. With each stage, an additional variable added to the model and the change in R^2 is calculated. For the data analysis, variables were entered stepwise in blocks. The multiple regression equation model specified for examining academic achievement in the study is:

$$Y=\beta_0 + B_1X_1 + B_2X_2 + B_3X_{3+\ldots}$$

Y is the value of the dependent variable (Y), β_0 is the constant or intercept, B_1 is the Slope (Beta coefficient) for $X_{1;}$ X_1 is the first independent variable that is explaining the variance in Y, B_2 is the Slope (Beta coefficient) for $X_{2;}$ X_2 is the second independent variable that is explaining the variance in Y; B_3 is the Slope (Beta coefficient) for X_3; X_3 is the third independent variable that is explaining the variance in Y and so on. This technique is only valid when the dependent variable is measured on a numerically continuous scale.

Logistic Regression and Persistence Outcome

A binomial logistic regression was used to measure the effects of a pre-freshman SBP participation on the dichotomous variables of first-year retention (1-retained or 0-not retained). The primary analysis used to explore the dichotomous outcome variable of persistence was hierarchical binary logistic regression. It is similar to a linear regression model but is suited to models where the dependent variable is dichotomous. Logistic regression coefficients can be used to estimate odds ratios for each of the independent variables in the model.

After a review of the literature on students of color retention, several variables were selected. The logistic regression equation model specified for examining persistence in the study is: $Y = \log (\text{Pi})/(1- p_i) = \alpha + \beta x + e_i$

In examining persistence, p_i is the probability that student i will persist; x is series of variables involving student background (gender, SES, residency), high school preparation (high school GPA, ACT test scores, chemistry courses and mathematics courses), program participation and college GPA; β is the estimated regression coefficients of the predictor variables, and e_i represents a random error term. The outcome variable Y is coded 0 for those who did not persist to the fall semester of their sophomore year and 1 for those who did persist. For this analysis, the following variables were included in the model:

X_1 = SBPGRM (a dichotomous variable; 0-non- participant, 1-participant)

X_2 = GENDER (a dichotomous variable; 0-male, 1-female)

X_3 = SES (a dichotomous variable; 0-low SES, 1- high SES)

X_4 = HS GPA (continuous variable)

X_5 =ACT (continuous variable)

X_6 = CHEM (a dichotomous variable; 0- no chemistry sequence; 1- chemistry sequence)

X_7 = CALC (a dichotomous variable; 0- no calculus sequence; 1- calculus sequence)

X_8 = RESIDENT (a dichotomous variable; 0- not a resident; 1-state resident)

X_9 = MAJOR (a dichotomous variable; 0- undeclared sciences major; 1-declared sciences major)

X_{10} =CONC (a dichotomous variable; 0- not pre-health; 1-pre-health)

X_{11} = GPA1 (continuous variable)

Sequential logistic regressions that involved entering variables into the equation one by one was first conducted to examine the net effects of predicting variables on the criterion value of student persistence (enrollment to second year). Student persistence was examined using logistic regression by sequentially including other relevant background variables (gender, HSGPA, ACT, etc.) and pre-college program participation first, then college GPAs as a predictor of retention status after the first and second semesters. This analysis involved entering variables in five blocks: (Block 1) SBP participation; (Block 2) Gender, SES, residency; (Block 3) HS GPA, ACT, Mathematics, Chemistry; (Block 4) Major, Pre-health; and (Block 5) GPA1,

GPA2. Statistical significance was based on an alpha level of .05. This statistical design technique is similar to hierarchical multiple regression except the dependent variable of interest first year retention (SEMRET2) is dichotomous. The logic in this analysis is that attendance of a SBP could affect college performance, and both then could influence persistence.

Limitations and Assumptions

Limitations of the study include the data was collected only for a six year span between 2007 and 2012. The sample is restricted to underrepresented students of color students in the STEM at a Southeastern University. Therefore, the generalizability and utility of the findings are generalizable only to this institution. Additionally, because this study is correlational and not experimental, limited conclusions can be drawn. The study provides an understanding of the academic performance of students who have self-selected to apply to the SBP and a comparison group.

Another limitation is researcher bias. On a personal note, as a first generation college student in a STEM field myself, I understand the challenges faced by students like those in summer programs. Additionally, I have coordinated a SBP for four years. With this background, there may be an attitude of SBPs having a positive impact on student achievement and retention. However, it was important for this study to draw conclusions based solely on the data and not my own college experiences.

Heck and Hallinger (2005) noted that one's historical position, one's class, one's race, one's gender, one's religion and so on may all interact and influence, limit and constrain the production of knowledge. As a conscientious researcher, I admit to the biases of which I am aware. Since this is a quantitative study, research credibility can be

established through the transparency of the data and the extent to which others have access to the actual data of the study. My review of anonymous data provided few ethical challenges.

Similarly, several assumptions were made throughout the research study. First, it is assumed that Tinto's student integration model, the theoretical framework chosen for the study, remains relevant and is applicable to the study population and the SBP (Tinto, 1975, 1993, 2012b). Although the literature suggests that the student integration model provides a foundation for research across many types of programming and institutions, it is nonetheless assumed that students who complete the SBP do so because of integration into the institution gained directly from the SBP. However, there are other reasons that these students may be successful having nothing to do with integration.

Second, internal validity could be impacted by subject characteristics, because the students in the SBP sample group could have been more developed, in regards to the cognitive factors that are being examined, before the start of the study. To address this, a comparison of entering students' demographic data is examined to see if these students may have been successful regardless of program participation. It is also possible that other confounding variables not included in the analysis exist.

Delimitations

In addition to limitations and assumptions, several delimitations of the study should be noted. First, because the population was drawn exclusively from a Southeastern University, a comparison of academic performance levels between institutions and programs is not possible. Additionally, this limited sampling strategy does not account for other factors which may impact or influence retention. Lastly, the sample and location

of the study should be considered a delimitation of this study. Results may vary based on institution, program, and location.

Summary

This chapter provided the methodology of the study to understand the impact of a pre-freshmen summer program on academic achievement and retention. Before data collection, approval was sought from IRB. Existing institutional data on students that applied to the SBP served as the primary dataset analyzed in this study and has been explained in this chapter. This chapter has defined the variables of interest, explained the data collection procedures, discussed the coding of variables, and presented the statistical model and assumptions adopted for the data analysis. After data collection, multiple regression and logic regression were used to answer the research questions of this study. Additionally, the limitations of the study were discussed. Chapter 4 presents descriptive statistics for all the variables and the results of the statistical analysis are provided. The results of this study can be used to further understand the effectiveness of SBPs.

CHAPTER FOUR: RESULTS

The purpose of this study research was to identify the effects of participation in a SBP on academic success and retention of first-time students of color students. Using the Statistical Package for the Social Sciences (SPSS, 2012), statistical analysis and descriptive findings were obtained to address the research questions of this study included descriptive and frequency statistics, correlations, and ANOVAs. Multiple regression was used to study academic performance and logistic regression was used to analyze the retention variable. The research questions that guided this study were:

1. Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA1) in sciences after the first semester, after controlling for precollege characteristics*?
2. Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA2) after the first year, after controlling for precollege characteristics*?
3. Is attendance of a Summer Bridge Program a significant predictor of retention after the first year of college for minority students enrolled, after controlling for precollege characteristics*?

*Pre-college characteristics include high school GPA, ACT score, gender, SES , taken chemistry, taken calculus, major, and pre-health concentration

Descriptive Analysis

This chapter first presents descriptive statistics for all the variables, and also provides the results of the statistical analysis. In addition, descriptive explorations, including mean comparisons, ANOVAs and cross-tabs comparing students who are SBP participants versus non-participants were run using SPSS. Multiple regression was used to study academic performance and logistic regression was used to analyze the retention variable. Tables 2, 3, 4 and 5 present descriptive statistics for the total sample analyzed in this study.

Cohort Demographics

When examining the total number of 500 students in the sample, the researcher found that 140 students (28.0%) participated in a SBP and 360 (72.0%) of the students did not participate in a SBP. The number and percentage of students by type for each cohort year are as follows: the 2007 cohort consisted of 31 (22.3%) summer bridge participants and 108 (77.7%) non- participants; the 2008 cohort consisted of 18 (21.2%) SBP participants and 67 (78.8%) non-participants; the 2009 cohort consisted of 22 (50.0%) SBP participants and 22 (50.0%) non-participants; and the 2010 cohort consisted of 20 (38.5%) SBP participants and 32 (61.5%) non-participants; the 2011 cohort consisted of 21 (22.1%) SBP participants and 74 (77.9%) non-participants; and the 2012 cohort consisted of 28 (32.9%) SBP participants and 57 (67.1%) non-participants.

Background Demographics

Background characteristics for the sample include ethnicity, gender, SES, and residency status. The majority of students in the sample were African American students (N=440). The racial distribution was 440 (88%) African Americans, 45 (9%) Hispanics,

and 15 (3%) Native Americans/Pacific Islanders. The racial distribution of students who were participants in a SBP (N=140) consisted of 130 (92.9%) African Americans, 8 (5.7%) Hispanics, and 2 (1.4%) Native American/Pacific Islanders. These numbers were not comparable with the racial representation of the general population of first-year students at the institution being studied where on average between 2007 and 2012 African Americans, Hispanics and other ethnicities only accounted for 13% of the population. All demographic variables were tested for differences between program participants and non-participants. All Chi Square values were non-significant when testing for differences of pre-college characteristics.

Of the study participants (N=500), 357 (71.4%) were females and 143 (28.6%) were males. The percentage of women in the cohorts was higher than the institutional average of all females enrolled full-time during the same six-year period (51.2%). In terms of SES, the overall sample consisted of 192 (38.4%) students considered low SES and 308 (61.6%) considered high SES. The SES variable was measured by whether or not a student is from a home considered above or below the average US poverty line based on zip code. When considering program participants, the ratio of low to high SES is 32.1% to 67.9%. Of the non-participants, the ratio is 40.8% to 59.2%. As for resident status, a majority of the total sample (N=500) were state residents of the university of interest. In the overall sample, 349 (69.8%) students were residents whereas 151 (30.2%) students were not state residents.

Table 2

Descriptive Statistics of Background Demographics

Variables	Overall Sample N (%)	Participants N (%)	Non-Participants N (%)
GENDER			
Male	28.6%	32.9%	29.9%
Female	71.4%	67.1%	73.1%
ETHNICITY			
African American	88.0%	92.9%	86.1%
Hispanic	18.5%	5.7%	10.3%
American Indian	3.0%	1.4%	3.6%
SES			
Low SES	192 (38.4%)	45 (32.1%)	147 (40.8%)
High SES	308 (61.6%)	95 (67.9%)	213 (59.2%)
RESIDENCY			
State Resident	349 (69.8%)	98 (70%)	251 (69.7%)
Not a Resident	151 (30.2%)	42 (30%)	109 (30.3%)

Note: Total Sample (N=500); Summer Bridge Program Participants (N=140); Non-Participants (N=360)

High School Preparation

High school preparation characteristics include high school GPA, ACT score and information on chemistry and mathematics coursework. The average high school GPA was 3.64 for the entire sample (N=500). The average high school GPA for SBP participants (N=140) was 3.71 and the average high school GPA for non-participants (N=360) was a 3.62. In terms of test scores, the average ACT score for the entire sample was 23.23. SBP participants averaged a 23.67 on the ACT while non-participants averaged a 23.06 on the ACT. The ACT scores ranged from 15 to 33.

In terms of chemistry preparation, 195 (39.2%) students from the total sample had taken a chemistry sequence and 302 (60.8%) students had not taken a chemistry sequence. Of this group, SBP participants have 60 (43.5%) students that had taken a

chemistry sequence and 78 (56.5%) students that had not taken the chemistry sequence. The non-participants have 135 (37.6%) students that have taken chemistry versus 224 (62.4%) that have not.

In terms of mathematics preparation, 253 (50.9%) students from the total sample had taken a calculus sequence and 244 (49.1%) students had not taken a calculus sequence. Those that participated in the SBP have 66 (47.8%) students that had taken a calculus sequence and 72 (52.2%) students that had not taken the calculus sequence. The non-participants have 181 (50.4%) students that have taken calculus and 178 (49.6%) that have not.

Table 3

Descriptive Statistics of High School Preparation

Variables	**Overall Sample**		**Participants**		**Non-Participants**	
	N (%)	**Mean**	**N (%)**	**Mean**	**N (%)**	**Mean**
HS GPA		3.64		3.71		3.62
ACT SCORE		23.23		23.67		23.06
CHEMISTRY						
Chemistry Sequence	195 (39.2%)		60 (43.5%)		135 (37.6%)	
No Chemistry Sequence	302 (60.8%)		78 (56.5%)		224 (62.4%)	
MATHEMATICS						
Calculus Sequence	253 (50.9%)		72 (52.2%)		181 (50.4%)	
No Calculus Sequence	244 (49.1%)		66 (47.8%)		178 (49.6%)	

Note: Total Sample (N=500); Summer Bridge Program Participants (N=140); Non-Participants (N=360)

STEM Interest

The STEM interest variables include declared or undeclared major, pre-health concentration, and attendance of a SBP. Declared science majors included microbiology, chemistry, mathematics, physics, etc. The overall sample for a science major included 64 (32.8%) students with a declared science major and 336 (67.2%) students had an undeclared science major. For SBP participants, 58 (41.4%) students had a declared major versus 82 (58.6%) students with an undeclared major. Non-program participants had 106 (29.4%) students with declared majors and 254 (70.6%) students with undeclared science majors.

In terms of pre-health concentration, this includes students with a concentration of pre-medicine, pre-dentistry, pre-pharmacy, pre-veterinary medicine, pre-optometry, etc. The average of the sample with a pre-health concentration program participants (N=285) was 57% and non-participants (N=215) was 43%. Of the program participants, 60% had a pre-health concentration and 40 % did not. For non-participants, the percentage was 55.8% to 44.2%. Also, included in STEM interest is attendance of the summer program. One hundred forty (28%) students participated in the program and 360 (72%) did not participate. participate.

Table 4

Descriptive Statistics of STEM Interest

Variables	Overall Sample	Participants	Non-Participants
	N (%)	N (%)	N (%)
MAJOR			
Declared Science Major	164 (32.8 %)	58 (41.4%)	106 (29.4%)
Undeclared Science Major	336 (67.2%)	82 (58.6%)	254 (70.6%)
PRE-HEALTH CONCENTRATION			
Pre-health	285 (57.0%)	84 (60.0%)	201 (55.8%)
Not Pre-health	215 (43.0%)	56 (40.0%)	159 (44.2%)
PROGRAM PARTICIPATION		140 (28%)	360 (72%)

Note: Total Sample (N=500); Summer Bridge Program Participants (N=140); Non-Participants (N=360)

College Grade Point Average

The average first semester GPA was 2.63, the second semester average was 2.54, and the cumulative college GPA average after the second semester was 2.63 for the overall sample. For the program participants' sample, the average first semester GPA was a 2.85, the second semester GPA was a 2.82, and the cumulative GPA was a 2.83. For the non-participants, the average first semester GPA was a 2.54, the second semester GPA was a 2.43, and the cumulative GPA was a 2.54 (Table 5).

Table 5

Descriptive Statistics of College GPA and Program Participation

Variables	Overall Sample		Participants		Non-Participants	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
COLLEGE GPA						
First Semester	2.63	0.93	2.85	0.78	2.54	0.96
Second Semester	2.54	0.97	2.82	0.81	2.43	1.01
Cumulative GPA	2.63	0.83	2.83	0.72	2.54	0.86

Note: Total Sample (N=500); Summer Bridge Program Participants (N=140); Non-Participants (N=360)

Retention

According to the descriptive data for first semester (Table 6), 496 (99.2%) students from the total sample persisted to their second semester. This figure consists of 140 (100%) of all program participants (N=140) being retained and 356 (98.9%) of all non-program participants being retained (N=360). According to the descriptive data for second semester, 449 (89.8%) students from the total sample persisted to their sophomore year. This figure consists of 135 (96.4%) of all program participants (N=140) being retained and 314 (87.2%) of all non-program participants being retained (N=360). Female students in the sample (N=357) showed better persistence rates than male students in the sample (N=143), with 90.2% (322) of all female students persisting to their sophomore year compared to 88.8% (127) of male students in the sample.

Table 6

Descriptive Statistics of Retention and Program Participation

Variables	Overall Sample	Participants	Non-Participants
	N (%)	N (%)	N (%)
RETENTION AFTER FIRST SEMESTER			
Retained	496 (99.2%)	140 (100%)	356 (98.9%)
Not Retained	4 (0.8%)	0 (0%)	4 (1.1%)
RETENTION AFTER SECOND SEMESTER			
Retained	449 (89.8%)	135 (96.4%)	314 (87.2%)
Not Retained	51 (10.2%)	3 (3.6%)	46 (12.8%)

Note: Total Sample (N=500); Summer Bridge Program Participants (N=140); Non-Participants (N=360)

Statistical Analysis Relative to Research Questions

The focus of this study examined the potential effects of participation in the SBP on first-year persistence and academic performance as measured by first-year college grade point average and retention status. In this study, the researcher posed three research questions pertaining to factors affecting academic performance and persistence for first-time, freshman students of color enrolled in a SBP. Results of the statistical analysis will be presented in order according to research question. Table 7 contains a description of the research questions, statistical test used to analyze the data, and the independent and dependent variables used in the study.

Table 7

Summary of Statistical Analysis

Research Question	Statistical Analysis	Independent Variable(s)	Dependent Variable(s)
No. 1: Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA1) in sciences after the first semester, after controlling for precollege characteristics*?	Multiple Regression	1. Summer Bridge Program 2. Gender 3.SES 4. High School GPA 5. ACT Score 6. Chemistry 7. Mathematics 8. Residency 9. Major 10. Pre-Health	Academic Achievement (GPA1)
No. 2: Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA2) after the first year, after controlling for precollege characteristics*?	Multiple Regression	1. Summer Bridge Program 2. Gender 3.SES 4. High School GPA 5. ACT Score 6. Chemistry 7. Mathematics 8. Residency 9. Major 10. Pre-Health 11. GPA1	Academic Achievement (GPA2)
No. 3: Is attendance of a Summer Bridge Program a significant predictor of retention after the first year of college for minority students enrolled, after controlling for precollege characteristics?	Logistic Regression	1. Summer Bridge Program 2. Gender 3.SES 4. High School GPA 5. ACT Score 6. Chemistry 7. Mathematics 8. Residency 9. Major 10. Pre-Health 11. GPA1 12. GPA2	Retention

*Pre-college characteristics include high school GPA, ACT score, gender, SES, taken chemistry, taken calculus, major, and pre-health concentration

Research Question #1

Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA1) in sciences after the first semester, after controlling for precollege characteristics*?

Research question one examined if there were differences in first semester academic achievement between Summer Bridge Program participants and non-program participants. As previously stated in Chapter one, several studies indicate that SBPs improve academic performance (Santa Rita & Bacote, 1996; Strayhorn, 2011; Walpole et al., 2008). Summer Bridge Programs focus on helping students transition from high school to college and this should translate to higher academic achievement.

Multiple regression was appropriate due to the continuous dependent variable and the continuous and categorical independent variables. In the multiple regression analysis, program participation and background variables were the predictor variables and first semester academic achievement (GPA1) was the outcome variable. The multiple regression equation for predicting the outcome first semester college GPA can be expressed a follows:

$$Y=\beta_0 + B_1X_{Summer\ Bridge} + B_2X_{HS\ GPA} + B_3X_{ACT\ Score} + B_4X_{Chemistry} + B_3X_{Mathematics} + B_4X_{Major} + B_3X_{Pre\text{-}Health} + B_4X_{Gender} + B_3X_{State\ Resident} + B_4X_{SES}$$

Hypothesis One predicts that SBP participation is a significant predictor in a regression equation for GPA1 after background variables are added to the model in two separate steps, sequentially. This means that once program participation is added, the resulting R^2 change must be significantly greater than zero. The R^2 statistic is a statistic

that gives some information about the goodness of fit of a model. In regression, the R^2 coefficient measures how well the regression line approximates the real data points and can be interpreted as the proportion of variance in Y that is explained. An R^2 value of 1.0 indicates the regression line perfectly fits the data. In this model, the R^2= .344 means we have explained about 34% of the variance in first semester academic achievement with the independent variables in the model.

With all independent variables in the equation using the enter method, R^2 =.334 (Adjust R^2=.322, F(9, 481) =26.828, p<.0005. Addition of program participation to the GPA1 did significantly improve R^2. The R^2 change was .010 with the addition of attendance of the SBP. The R^2 is a small effect size and represents a weak association between independent and dependent variables. Participant in a SBP is substantially better than non-participation. After the last step, with program participation added to the prediction of GPA1, R^2 =.343 (adjusted R^2 =.331), F(10, 481) =25.221, p<.0005 and Sig. F Change =.006. The null hypothesis is rejected and SBP participation was determined to be a predictor of GPA1. In this model, program participation, high school GPA and ACT score were all statistically significant predictors of GPA1. Table 8 provides a summary of regression coefficients for the multiple regression analysis.

Table 8

Multiple Regression Analysis for Predicting First Semester GPA

Variable	B	SE B	B	Significance
Model 1[a]				
(Constant)	-1.622	.321		.000
HS GPA	.757	.085	.392**	.000
ACT	.059	.012	.237**	.000
CHEM	.096	.090	.050	.288
CALC	-.071	.087	-.038	.413
RESIDENT	-.082	.080	-.041	.303
MAJOR	.066	.078	.033	.398
CONC	.037	.071	.020	.598
GENDER	.127	.079	.062	.110
SES	.086	.075	.045	.251
Model 2[b]				
(Constant)	-1.605	.319		.000
HS GPA	.743	.085	.385**	.000
ACT	.058	.012	.236**	.000
CHEM	.091	.089	.048	.310
CALC	-.062	.087	-.033	.478
RESIDENT	-.087	.079	-.043	.273
MAJOR	.040	.078	.020	.604
CONC	.026	.070	.014	.716
GENDER	.140	.079	.068	.075
SES	.067	.075	.035	.368
SBPGRM	.215	.078	.103*	.006

N=500; *Significance at p< 0.05; **Significance at p< 0.01

a. Predictors: All variables except the SBP; R^2= .334; F=26.82**

b. Predictors: Adding SBP as predictor; R^2=.344; F=25.22**; ΔR^2=0.01; Δ F=7.5; Sig. Δ F=.006

Research Question #2

Is attendance of a Summer Bridge Program a significant predictor of academic performance (GPA2) after the first semester, after controlling for precollege characteristics*?

Hypothesis Two predicts that SBP participation is a significant predictor in a regression equation for college GPA (GPA2) after background variables are added to the model in two separate steps, sequentially. A similar analyses using multiple regression for GPA2 regarding academic performance yielded results. In this model, the R^2= . 448 means we have explained about 45% of the variance in first year academic achievement with the independent variables in the model. With all independent variables in the equation using the enter method, R^2 =.439 (Adjusted R^2=.427), F(10, 474)=37.050, p<.0005. Addition of program participation to the GPA2 did significantly improve R^2. The R^2 change was 0.009. The effect size is a moderate association between the dependent and independent variables.

When program participation was added to the prediction of GPA2, R^2 =.448 (adjusted R^2 =.435), F(11, 473)=34.912, p<.0005and Sig. F Change =.005. The null hypothesis is rejected and SBP participation was determined to be a predictor of GPA2. High school GPA, taking calculus, first semester GPA, and summer program participation were all statistically significant for first year college GPA. Table 9 provides a summary of regression coefficients for the multiple regression analysis for first year GPA.

Table 9

Multiple Regression Analysis for Predicting First Year GPA

Variable	B	SE B	β	Significance
Model 1[a]				
(Constant)	-.559	.323		.084
HS GPA	.270	.091	.131*	.003
ACT	.020	.012	.076	.089
CHEM	-.029	.088	-.014	.742
CALC	.158	.085	.081	.064
MAJOR	.012	.076	.006	.874
CONC	-.070	.069	-.035	.311
GENDER	.054	.078	.025	.486
RESIDENT	.110	.078	.052	.157
SES	-.021	.073	-.010	.777
GPA 1	.569	.046	.522**	.000
Model 2[b]				
(Constant)	-.572	.327		.081
HS GPA	.267	.090	.129*	.003
ACT	.021	.012	.080	.089
CHEM	-.032	.087	-.016	.713
CALC	.167	.085	.085*	.049
MAJOR	-.012	.076	-.006	.871
CONC	-.081	.069	-.041	.240
GENDER	.070	.077	.032	.368
RESIDENT	.104	.078	.049	.183
SES	-.039	.073	-.019	.596
GPA 1	.554	.046	.508**	.000
SBPGRM	.217	.077	.099*	.005

N=500; * $p < 0.05$; ** $p < 0.01$

a. Predictors: All variables except the SBP; $R^2 = .439$; F=37.05**

b. Predictors: Adding SBP as predictor; $R^2 = .448$; F=34.91**; $\Delta R^2 = 0.009$; Δ F=8.03; Sig. Δ F=.005

Research Question #3

Are there significant relationships between Summer Bridge Program participation, demographic variables, high school preparation, first semester GPA, first year GPA, and retention?

Hypothesis Three predicts that SBP participation is a significant predictor in a binary logistic regression equation for first year retention (SEMRET3), after controlling for background variables (gender, SES, residency), high school preparation (HS GPA, ACT score, mathematics courses, and chemistry courses), STEM interest (major, pre-health), first semester GPA (GPA1), and first year GPA (GPA2). Logistic regression was appropriate due to the dichotomous dependent variable and the continuous and categorical independent variables. The dependent variable, retention, was measured at two levels at the end of first semester and beginning of the second year of enrollment. The variables were entered in five blocks: (Block 1) SBP participation; (Block 2) Gender, SES, residency; (Block 3) HS GPA, ACT, Mathematics, Chemistry; (Block 4) Major, Pre-health; and (Block 5) GPA1, GPA2. Statistical significance was based on an alpha level of .05.

The descriptive statistics revealed that 449 (89.8%) students from the total sample persisted to their sophomore year. This figure consists of 135 (96.4%) of all program participants (N=140) being retained and 314 (87.2%) of all non-program participants being retained (N=360). For this model, only first semester GPA and first year GPA were both significant with a p-value of .000. As a result, the null hypothesis that the coefficient equals 0 would be rejected. This means that controlling for all variables, first semester GPA and first year college GPA were the only variables found to be statistically

significant at p<.01 in predicting retention beyond the first year of college. These statistical results mean that controlling all other variables, the odds of persisting increases by 1.039 times for every one-unit increase in first year college GPA. Summer Bridge ACT score, taking Calculus, declared major, and residency were statistically significant at p <.05.

The Omnibus Test of Model Coefficients represents the traditional chi-square test which tests if the model with the predictor variables is significantly different from the model with only the intercept or constant. In this analysis, the statistics for the Step, Block, and Model are different because stepwise logistic regression or blocking was used. The value given in the significant column of the output is the probability of obtaining the chi-square statistic given that the null hypothesis is true. For this research question, the full model is statistically significant, chi-square = 115.045 (12 df), p < .05. The finding of significance indicates that at least one of the predictor variables is significantly related to the dependent variable of retention.

The β coefficients in the logistic regression equation are the values for predicting the dependent variable from the independent variable. This specifies the amount of change in the log with a one-unit change in the predictor, holding constant all other predictors. The Wald statistic is used to test the significance of individual logistic regression coefficients for each predictor variable. The Wald statistic for SBPGRM is equal to 1.342 and is not significant (p=0.247). As a result, the null hypothesis would not be rejected. This means that controlling for all variables, first semester and college GPA, ACT, taking Calculus, major, and residency were the found to be statistically significant in predicting retention beyond the first year of college.

The p values indicate whether or not the predictor was statistically significant, holding the other predictors constant. Exp (β) values are the odds ratios, which indicate by what amount the odds of retention increase based on changes in the predictor variables. If Exp (β) value equal one, then the odds are unchanged; if greater than one, the odd increase, if less than one, the odds decrease. Results of the logistic regression are summarized in Table 10.

The Cox & Snell R Square and Nagelkerke R Square are pseudo R-squares. Logistic regression does not have an equivalent to the R-squared that is found in linear regression. The Cox & Snell R square and Nagelkerke R square are closely related statistics, and summarize how much of the variability in the data are successfully explained by the model. Larger values of these R squares indicate that the model captures more of the data variability. However, since this statistic does not mean the same thing as in linear regression, where the R-squared describes the proportion of the variance accounted for by the predictors, the researcher interpreted this statistic with caution. The proportion of variance in the dependent variable accounted for by the predictors was estimated to be between .211 for Cox & Snell R Square and .458 for Nagelkerke R Squared. The R-squared tests tell us that the model was improved by the inclusion of these terms. As would be expected, the fit of the model improved, according to both of the R^2 calculations.

An examination of the classification table depicts how well the model predicted retention on non-retention. According to this table, the model does adequately fit the data because of value of the -2 Log Likelihood, 184.618. The table shows that the model did a

better job of predicting the rate of retention at a figure of 93.4% correct (435 out of 440) than at predicting non-retention a rate of 40 % correct (18 out of 45).

Table 10

Logistic Regression Analysis for Predicting Persistence

Variable	B	SE	Wald	Sig.	OR
Model 1					
(Constant)	.361	2.002	.033	.857	1.435
HSGPA	.074	.518	.021	.886	1.077
ACT	.161	.071	5.074*	.024	.852
CHEM	.848	.515	2.706	.100	2.335
CALC	-.952	.481	3.919*	.048	.386
MAJOR	1.324	.563	5.527*	.019	3.759
CONC	.019	.408	.002	.964	1.019
GENDER	-.566	.458	1.530	.216	.568
RESIDENT	.889	.443	4.020*	.045	2.433
SES	.620	.443	1.953	.162	1.858
GPA1	1.088	.267	16.580**	.000	2.969
GPA2	1.131	.229	24.451**	.000	3.100
Model 2[b]					
(Constant)	.374	2.009	.035	.852	1.454
HSGPA	.084	.526	.025	.873	1.087
ACT	-.167	.072	5.425*	.020	.847
CHEM	.874	.517	2.862	.091	2.398
CALC	-.938	.482	3.785	.052	.391
MAJOR	1.316	.565	5.436*	.020	3.730
CONC	.029	.408	.005	.943	1.029
GENDER	-.525	.459	1.310	.252	.592
RESIDENT	.901	.444	4.112*	.043	2.461
SES	.564	.446	1.596	.207	1.757
GPA1	1.085	.268	16.410**	.000	2.961
GPA2	1.109	.229	23.517**	.000	3.031
SBPGRM	.678	.585	1.342	.247	1.969

N=500; *Significance at $p < 0.05$; **Significance at $p < 0.01$
a. Predictors: All variables except the SBP; $R^2 = .453$; $X^2 = 113.581$**
b. Predictors: Adding SBP as predictor; $R^2 = .458$; $X^2 = 115.045$**

Summary

The purpose of this study research was to identify the effects of participation in a SBP on first semester GPA, first year GPA, and first year retention. Data from this study was analyzed using multiple regression for the academic achievement variables and logistic regression for the retention variable.

For research question one, examining first semester GPA using multiple regression found that the program participation variable was statistically significant at .006. High school GPA, ACT score, SBP participation predictor variables were found to be significant. From these results, it does appear that participation a SBP affects first semester GPA.

For research question two, SBP participation, high school GPA, taking at least calculus, and first semester GPA were statistically significant. The results of this multiple regression analysis can be interpreted to indicate that , SBP participation, high school GPA, taking at least calculus, and first semester GPA positively impacted first year college GPA.

Finally, for research question three examining retention, the logistic model showed that only first semester GPA and first year college GPA were significant with a p-value of .000. ACT, taking Calculus, major, and residency were statistically significant at $p < .05$. This means that academic achievement and was found to be statistically significant in predicting retention through the first year of college. The attendance of SBP participation had no net effect on retention.

CHAPTER FIVE: CONCLUSION AND IMPLICATIONS

The goal of a number of SBPs is to bridge the gap between high school and college by providing access to opportunities to develop students academically, socially, and personally. The purpose of this study was to examine the relationship between SBP participation, academic achievement, and retention.

The general research question addressed by this study was: Does participation in a SBP have any effect on academic performance and persistence for first-time, freshmenstudents of color? The ex post facto design used a sample (n=500) of freshmen who enrolled in the University and applied to the SBP between 2007 and 2012. Existing data was used and data analysis included logistic and multiple regression analyses. The study investigated the following hypotheses:

H_1: Attendance of a Summer Bridge Program is a significant predictor of academic performance (GPA1) after the first semester after controlling high school GPA, ACT score, gender, SES , residency, taken chemistry, taken calculus, major, and pre-health concentration.

H_2: Attendance of a Summer Bridge Program is a significant predictor of academic performance (GPA1) after the first year of college after controlling high school GPA, ACT score, gender, SES , residency, taken chemistry, taken calculus, major, and pre-health concentration.

H_3: Attendance of a Summer Bridge Program is a significant predictor of retention after the first year of college for minority student enrolled, after controlling for high school GPA, ACT score, gender, SES , residency, taken

chemistry, taken calculus, major, and pre-health concentration, first semester GPA, and first year GPA.

Findings

Based on data analysis, the researcher obtained the following findings:

1. High school GPA, ACT scores, and attendance of a SBP were predictors of first semester GPA.
2. High school GPA, taking calculus, first semester GPA, and attendance of a SBP were predictors of first year GPA.
3. First semester and first year GPA, ACT, taking calculus, major, and residency are significant predictors of retention.

Discussion

One of the most significant findings of this study was a difference between the program participation and non-program participants GPA after first semester and after the first year of college. These grade point averages impact retention. Students who participated in the SBP had higher college averages the first semester and the first year of college as their peers who did not participate in the SBP. This is consistent with several studies that indicate SBPs improve academic performance (Santa Rita & Bacote, 1996; Strayhorn, 2011; Walpole et al., 2008). This shows that SBPs achieved their purpose of enhancing academic skills. Wheatland (2000) stated a purpose of SBPs is to assist students with the transition from high school to college. Since the SBP participants performed better than the non-participants, it showed that the program effectively assisted these students in transition.

Another notable finding of this study was the difference between retention rates after the first semester and the first year of college. Program participants were retained at a higher rate than non-participants. Participation in the summer program was not a predictor of retention in this study. These finding are consistent with (Allen & Bir, 2011; Suzuki et al., 2012; Wheatland, 2000). This study shows the program has enhanced academic achievement for participants which is leading to increased retention rates.

Attending a SBP was a predictor of academic achievement for first semester and the first year of college. Another interesting finding of this study was the relationships between high school GPA, ACT score, and program participation which are predictors of first semester GPA. Also, high school GPA, program participation, taking calculus, and first semester GPA are a significant predictor of first year GPA. This related the importance of high school preparation and first year academic achievement.

This study presents equations that account for low percentages of the variance when predicting academic achievement and retention. Additional studies should try to determine what additional factors will increase student persistence and achievement to increase the number of students of color persisting in STEM fields. Several sociological and psychological variables not presented in this study may account for a larger percentage of the explained variance.

Lastly, this study found that GPA was the best predictor of student retention. This finding is consistent with results from (Friedman & Mandel, 2011; Rohr, 2012; Simmons, 1994). These results indicate the importance of high school preparation for college and its influence on GPA. Your GPA impacts major decisions to continue at the university and persist or to decide to withdraw or dropout and not persist within the first year of college.

Conclusions

Understanding educational access, enrollment, and retention issues provide a platform to investigate students of color and factors related to success in STEM fields. Although indicators of programmatic success are difficult to measure, this study highlights the importance of evaluating SBPs. It is important to not only provide interventions but to assess the effectiveness of these programs and make programmatic changes when necessary. This includes both quantitative and qualitative evaluation measures. Jun and Tierney (1999) discussed that programs must build upon what already exits and works well for their targeted students. In this study, the SBP was found to influence academic success and retention. Figure 6 provides a revised model of minority student achievement and retention in the first year. This study provides insight into the strengths of the program which include academic components.

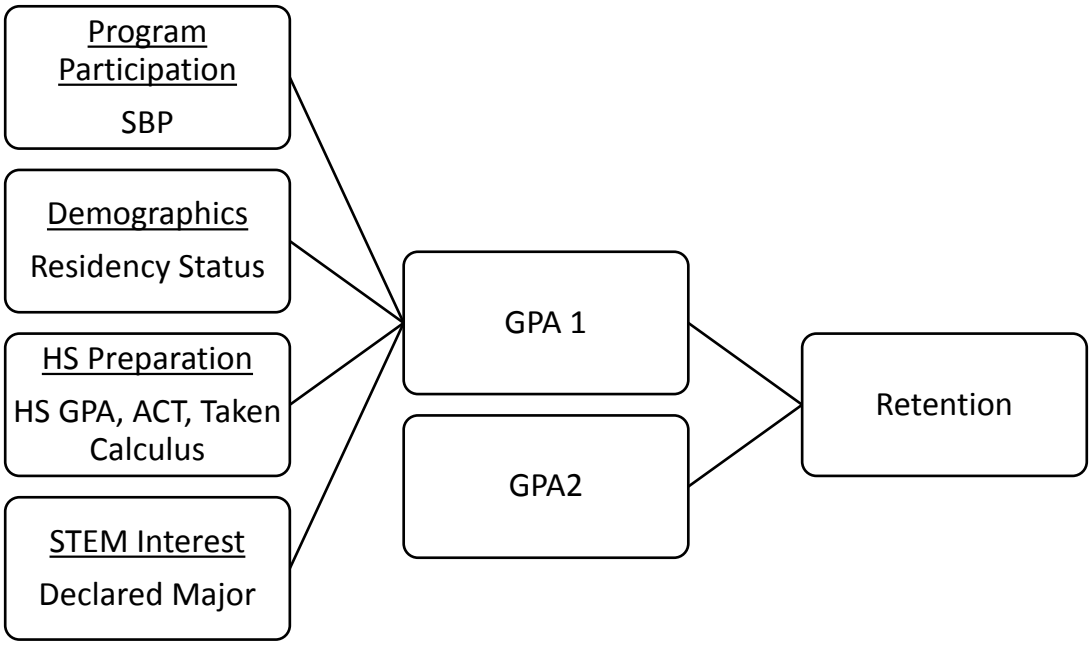

Figure 6 Revised Model of Minority Student Achievement and Retention in Sciences

Based on the significant findings generated from the data analysis of this study, the researcher has the following conclusions.

1. Students who participated in the SBP had higher average grade point averages than non-participants after their first semester of college showing that the program had bridged the initial differences between participants and non-participants.
2. Non-significant differences in grade point averages after first semester based on gender, SES, residency status, and major demonstrates that initial gaps were bridged by the SBP.
3. College students who had taken calculus had significantly higher grade point averages that those who had not taken a calculus course. This shifts the focus to the importance of high school curriculum and intervention programs to bridge the gap in educational access.
4. College grade point average was the best predictor of retention.

Implications

The implications of this study are important for administrators, educators, policy makers, and stakeholders of SBPs who seek to serve educationally disadvantaged students. Program directors and administrators must understand the importance of developing a successful program requires continued intentional effort to improve over time. Several implications emerged from the results of this study. First, the SBP accomplished the purpose of assisting student's transition to college effectively. This implies that similar four year colleges could use this model to assist students of color to enroll and persist at their colleges. Second, with attendance of a SBP as a predictor for grade point average, it is important for these programs to model best practices research to

further improve academic achievement of program participants. Third, one of the overall goals of these programs is student retention. With program participants being retained at such a high rate, SBPs may need to be expanding from just a summer model to a full academic year model to increase college retention rates.

When considering the SBP used for this research, it is important to understand some of the key components of the program. These major components are:

1. STEM specific coursework in Chemistry and Pre-Calculus
2. Seminars on strategies for success (time-management, test-taking skills, financial planning, etc.)
3. Development of a Learning Community
4. Outreach Activities
5. Career explore in the sciences and related disciplines.

The implications of this study indicate that these components are needed for student success within the first year of college. Specifically, a STEM summer program with major emphasis on coursework seems to improve GPA and retention rates.

Recommendations for Further Research

Based on the findings of this study, the following are suggestions for further research: This study focused on the impact of SBP while controlling for demographics (gender, residency, SES), high school preparation (high school GPA, ACT scores, chemistry and mathematics courses), and STEM interest (major and pre-health concentration). However, according to Tinto's student integration model (1993) and Pascarella' s causal model (1983), there are several social factors that may contribute to academic achievement. Other variables such as institutional commitment and campus

environment should be included in the model. Also, psychological variables were not addressed in this study to understand academic achievement and retention status. A study should be conducted that includes both sociological and psychological factors to develop a better understanding of SBP participants.

Additionally, a mixed methods approach to understanding SBPs could provide further insight. A follow-up of this study using qualitative analysis interviewing students with high grade point averages and low grade point averages as well as those who persisted and non-persisted students could expand research on why students of color are successful the first year of college. The implications of understanding additional variables that impact students could lead to more aggressive interventions in SBPs to improve educational outcomes. Lastly, results of this study may have been affected by the number of participants. An expanded study with more participants over a larger timeframe is warranted. Additionally, a large scale study of several institutions with SBPs is needed.

The ultimate goal of SBPs is to bridge the gap between high school and college. Similar studies regarding SBPs, academic achievement, and retention status are needed to provide practitioners with insight to effective strategies to improve academic and social integration for students of color at predominantly White institutions.

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APPENDIX A

AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD for RESEARCH INVOLVING HUMAN SUBJECTS

RESEARCH PROTOCOL REVIEW FORM

For Information or help contact **THE OFFICE OF RESEARCH COMPLIANCE**, 115 Ramsay Hall, Auburn University
Phone: 334-844-5966 **e-mail:** hsubjec@auburn.edu **Web Address:** http://www.auburn.edu/research/vpr/ohs/

Revised 03.26.11 – DO NOT STAPLE, CLIP TOGETHER ONLY. Save a Copy

1. **PROPOSED START DATE of STUDY:** Feb 15, 2013

PROPOSED REVIEW CATEGORY (Check one): FULL BOARD EXPEDITED ✓ EXEMPT

2. **PROJECT TITLE:** Factors that Affect Academic Performance and Retention Status of Underrepresented Minority Students in Sciences and Mathematics

3. Bianca D. Evans (PRINCIPAL INVESTIGATOR) | M.S. (TITLE) | COSAM-Diversity (DEPT) | 844-4642 (PHONE) | bde0005@auburn.edu (AU E-MAIL)

315 Roosevelt Concourse, Rm 235, Auburn, AL (MAILING ADDRESS) | 844-4661 (FAX) | ALTERNATE E-MAIL

4. **SOURCE OF FUNDING SUPPORT:** ✓ Not Applicable ___ Internal ___ External Agency:_____ ☐ Pending ☐ Received

5. **LIST ANY CONTRACTORS, SUB-CONTRACTORS, OTHER ENTITIES OR IRBs ASSOCIATED WITH THIS PROJECT:**

6. **GENERAL RESEARCH PROJECT CHARACTERISTICS**

6A. Mandatory CITI Training

Names of key personnel who have completed CITI:
Bianca Evans ✓

CITI group completed for this study:
✓ Social/Behavioral ☐ Biomedical

PLEASE ATTACH TO HARD COPY *ALL* CITI CERTIFICATES FOR *EACH* KEY PERSONNEL

6B. Research Methodology

Please check all descriptors that best apply to the research methodology.

Data Source(s): New Data ✓ Existing Data
Will recorded data directly or indirectly identify participants? Yes ✓ No
Data collection will involve the use of:
Educational Tests (cognitive diagnostic, aptitude, etc.)
Interview / Observation
Physical / Physiological Measures or Specimens (see Section 6E.)
Surveys / Questionnaires
✓ Internet / Electronic
Audio / Video / Photos
✓ Private records or files

6C. Participant Information

Please check all descriptors that apply to the participant population.
✓ Males ✓ Females ✓ AU students
Vulnerable Populations
Pregnant Women/Fetuses ___ Prisoners
Children and/or Adolescents (under age 19 in AL)
Persons with:
☐ Economic Disadvantages ☐ Physical Disabilities
☐ Educational Disadvantages ☐ Intellectual Disabilities
Do you plan to compensate your participants? ___ Yes ✓ No

6D. Risks to Participants

Please identify all risks that participants might encounter in this research.
☐ Breach of Confidentiality* ☐ Coercion
☐ Deception ☐ Physical
☐ Psychological ☐ Social
✓ None ☐ Other:

*Note that if the investigator is using or accessing confidential or identifiable data, breach of confidentiality is always a risk.

Received APR 29 2013 Research Compliance

Do you need IBC Approval for this study? ✓ No ☐ Yes - BUA #_____ **Expiration date** _____

FOR OHSR OFFICE USE ONLY

DATE RECEIVED IN OHSR: 5/6/13 by GB **PROTOCOL #** 13-083 EX 1305
DATE OF IRB REVIEW: 5/10/13 by CC **APPROVAL CATEGORY:** 45 CFR 46.101(b)(2)
DATE OF IRB APPROVAL: _____ **INTERVAL FOR CONTINUING REVIEW:** 3 years
COMMENTS:

The Auburn University Institutional Review Board has approved this document for use from 5/10/13 to 5/9/16 Protocol # 13-083 EX 1305

7. PROJECT ASSURANCES

PROJECT TITLE: Factors that Affect Academic Performance and Retention Status of Underrepresented Minority Students in Sciences and Mathematics

A. PRINCIPAL INVESTIGATOR'S ASSSURANCES

1. I certify that all information provided in this application is complete and correct.
2. I understand that, as Principal Investigator, I have ultimate responsibility for the conduct of this study, the ethical performance this project, the protection of the rights and welfare of human subjects, and strict adherence to any stipulations imposed by the Auburn University IRB.
3. I certify that all individuals involved with the conduct of this project are qualified to carry out their specified roles and responsibilities and are in compliance with Auburn University policies regarding the collection and analysis of the research data.
4. I agree to comply with all Auburn policies and procedures, as well as with all applicable federal, state, and local laws regarding the protection of human subjects, including, but not limited to the following:
   a. Conducting the project by qualified personnel according to the approved protocol
   b. Implementing no changes in the approved protocol or consent form without prior approval from the Office of Human Subjects Research
   c. Obtaining the legally effective informed consent from each participant or their legally responsible representative prior to their participation in this project using only the currently approved, stamped consent form
   d. Promptly reporting significant adverse events and/or effects to the Office of Human Subjects Research in writing within 5 working days of the occurrence.
5. If I will be unavailable to direct this research personally, I will arrange for a co-investigator to assume direct responsibility in my absence. This person has been named as co-investigator in this application, or I will advise OHSR, by letter, in advance of such arrangements.
6. I agree to conduct this study only during the period approved by the Auburn University IRB.
7. I will prepare and submit a renewal request and supply all supporting documents to the Office of Human Subjects Research before the approval period has expired if it is necessary to continue the research project beyond the time period approved by the Auburn University IRB.
8. I will prepare and submit a final report upon completion of this research project.

My signature indicates that I have read, understand and agree to conduct this research project in accordance with the assurances listed above.

Bianca D. Evans	Bianca D. Evans	Apr 26, 2013
Printed name of Principal Investigator	**Principal Investigator's Signature (SIGN IN BLUE INK ONLY)**	**Date**

B. FACULTY ADVISOR/SPONSOR'S ASSURANCES

1. By my signature as faculty advisor/sponsor on this research application, I certify that the student or guest investigator is knowledgeable about the regulations and policies governing research with human subjects and has sufficient training and experience to conduct this particular study in accord with the approved protocol.
2. I certify that the project will be performed by qualified personnel according to the approved protocol using conventional or experimental methodology.
3. I agree to meet with the investigator on a regular basis to monitor study progress.
4. Should problems arise during the course of the study, I agree to be available, personally, to supervise the investigator in solving them.
5. I assure that the investigator will promptly report significant adverse events and/or effects to the OHSR in writing within 5 working days of the occurrence.
6. If I will be unavailable, I will arrange for an alternate faculty sponsor to assume responsibility during my absence, and I will advise the OHSR by letter of such arrangements. If the investigator is unable to fulfill requirements for submission of renewals, modifications or the final report, I will assume that responsibility.
7. I have read the protocol submitted for this project for content, clarity, and methodology

Dr. Vincenzo Cammarata		Apr 26, 2013
Printed name of Faculty Advisor / Sponsor	**Signature (SIGN IN BLUE INK ONLY)**	**Date**

C. DEPARTMENT HEAD'S ASSSURANCE

By my signature as department head, I certify that I will cooperate with the administration in the application and enforcement of all Auburn University policies and procedures, as well as all applicable federal, state, and local laws regarding the protection and ethical treatment of human participants by researchers in my department.

Dr. Vincenzo Cammarata		Apr 26, 2013
Printed name of Department Head	**Signature (SIGN IN BLUE INK ONLY)**	**Date**

APPENDIX B

ACT®–SAT® Concordance: A Tool for Comparing Scores

The ACT® college readiness assessment and SAT® are different tests that measure similar but distinct constructs. The ACT measures achievement related to high school curricula, while the SAT measures general verbal and quantitative reasoning.

ACT and the College Board (producers of the SAT) have completed a concordance study that is designed to examine the relationship between two scores on the ACT and SAT. These concordance tables do not equate scores, but rather provide a tool for finding comparable scores.

You can also find the concordance tables and guidelines for proper use on our website at **www.act.org/aap/concordance**.

ACT Composite Score	**SAT** Score Critical Reading + Math (Single Score)	**SAT** Score Critical Reading + Math (Score Range)	**ACT** Score Combined English/Writing	**SAT** Score Writing (Single Score)	**SAT** Score Writing (Score Range)
36	1600	1600	36	800	800
35	1560	1540–1590	35	800	800
34	1510	1490–1530	34	770	770–790
33	1460	1440–1480	33	740	730–760
32	1420	1400–1430	32	720	710–720
31	1380	1360–1390	31	690	690–700
30	1340	1330–1350	30	670	660–680
29	1300	1290–1320	29	650	640–650
28	1260	1250–1280	28	630	620–630
27	1220	1210–1240	27	610	610
26	1190	1170–1200	26	590	590–600
25	1150	1130–1160	25	570	570–580
24	1110	1090–1120	24	550	550–560
23	1070	1050–1080	23	530	530–540
22	1030	1020–1040	22	510	510–520
21	990	980–1010	21	490	480–500
20	950	940–970	20	470	470
19	910	900–930	19	450	450–460
18	870	860–890	18	430	430–440
17	830	820–850	17	420	410–420
16	790	770–810	16	400	390–400
15	740	720–760	15	380	380
14	690	670–710	14	360	360–370
13	640	620–660	13	340	340–350
12	590	560–610	12	330	320–330
11	530	510–550	11	310	300–310

The ACT®

www.act.org/concordance

ACT–SAT Concordance Study: June 2008

Estimated Relationship Between ACT Composite Score and SAT CR+M+W Score

In addition, ACT is providing an ESTIMATED Relationship Table for institutions that also use the SAT (Critical Reading + Math + Writing) Score. This table provides a score on the SAT that is similar to an ACT Composite score. The values given are a very accurate representation of what you might get from a concordance table.

ACT Composite Score	SAT Score Critical Reading + Math + Writing (Single Score)	SAT Score Critical Reading + Math + Writing (Score Range)
36	2390	2380–2400
35	2330	2290–2370
34	2250	2220–2280
33	2180	2140–2210
32	2120	2080–2130
31	2060	2020–2070
30	2000	1980–2010
29	1940	1920–1970
28	1880	1860–1910
27	1820	1800–1850
26	1770	1740–1790
25	1710	1680–1730
24	1650	1620–1670
23	1590	1560–1610
22	1530	1510–1550
21	1470	1450–1500
20	1410	1390–1440
19	1350	1330–1380
18	1290	1270–1320
17	1230	1210–1260
16	1170	1140–1200
15	1100	1060–1130
14	1020	990–1050
13	950	910–980
12	870	820–900
11	780	750–810

ACT College Readiness Benchmark Scores

The ACT is the only test with College Readiness Benchmarks directly measuring the ACT College Readiness Standards. The Benchmarks are based on actual college performance of students and reflected by specific test scores.

College Course/Course Area	ACT Test	Benchmark Score
English Composition	English	**18**
Algebra	Mathematics	**22**
Social Sciences	Reading	**22**
Biology	Science	**23**

An ACT College Readiness Benchmark score is the minimum score needed on an ACT subject area test to indicate a 50 percent chance of obtaining a B or higher or about a 75 percent chance of obtaining a C or higher in the corresponding credit-bearing college courses. These scores were empirically derived based on the actual performance of students in college. ACT College Readiness Standards are subject-based knowledge skills statements that are informed by the ACT National Curriculum Survey®, directly measured by the ACT, and grouped by ACT score range. They may be found at **www.act.org/standard/instruct/index.html**.

ACT® www.act.org

Rev 1