THE PERSISTENCE OF BLACK MALES IN THE STEM FIELDS

AT TEXAS STATE UNIVERSITY

by

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DEDICATION

This work is dedicated to the Woodson, Jones, Mathis and Day family, to my husband Tracy, my parents, grandparents, and to my sons, Devin and Christopher, always strive for the top and believe in yourself.

There are no shortcuts to anywhere worth going. The journey may be long, but the road taken to get there is something to be remembered for an eternity.

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ABSTRACT

For the past five years, enrollment in the College of Science and Engineering by first-time undergraduate students has steadily increased. However, retaining the students through their first-year and their persistence to their second year of college and beyond has been problematic. The purpose of this study is to add to the knowledge of why Black students, specifically Black men, are not persisting at Texas State University in the STEM majors. It will also determine if specific factors like the SAT scores, parent's education, high school rank, college GPA, college science and math courses (physics, math, biology and chemistry), college credits earned and average GPA in all science and math college courses predict college preparation and college performance for all students and for Black male students.

CHAPTER I

INTRODUCTION

For years, educators have been concerned about the diversity of graduates in science, engineering, and mathematics (STEM) fields. The nation's changing demographics and continued need to remain globally competitive make it clear that colleges and universities must increase the number of minority students earning degrees the STEM fields (Anderson & Kim, 2006). STEM fields are inextricably linked to national economic prosperity and innovation, capturing the attention in recent years of a struggling American economic market (National Academy of Sciences, 2007; Riegle-Crumb & King, 2010). Our nation is becoming more racially and ethnically diverse, the economy increasingly global, yet racial and ethnic disparities persist. Educators must better understand how to increase the number of minority students entering higher education in the pursuit of STEM degrees, graduating from college in STEM majors, and joining the STEM workforce with adequate preparation (Museus, Palmer, Davis, & Maramba, 2011). The growing need to compete with technologically advanced nations requires an increase in the number of students who pursue STEM disciplines as college majors and career goals (Bonous-Hammarth, 2000). The Obama Administration acknowledges the urgency of the nation's development and the importance of innovation in moving the country forward in science and mathematics (McPhail, 2011). During President Obama's 2011 State of the Union Address, he stated:

> Over the next 10 years, nearly half of all new jobs will require education that goes beyond a high school education. As many as a quarter of our students aren't even

> finishing high school. The quality of our math and science education lags behind many other nations. America has fallen to ninth in the proportion of young people with a college degree. (Obama, 2011)

President Obama believes that the United States must prepare more students to excel in STEM. The recent budget includes critical investments that will benefit students such as supporting more STEM-focused school districts and improving undergraduate STEM education by improving retention of undergraduate STEM majors (White House Office of Science and Technology Policy, 2014). According to *Rising above the gathering storm: Energizing and employing America for a brighter economic future* (National Academy of Science, 2005), there has been an effort, nationally, to increase the number of students pursuing STEM degrees in the United States. The report called for strengthening the STEM pipeline from primary through postsecondary education (National Academy of Science, 2005). Although the United States has increased the college-age population earning university degrees in the natural sciences and engineering over the last quarter-century, there are still competitors such as China and India, who produce more people trained in the STEM fields. While there has been much information gathered about the number of students completing degrees in the STEM fields. There is still limited knowledge about students' progression as undergraduates through the STEM pipeline (Anderson & Kim, 2006).

STEM occupations are projected to grow by 17.0 percent from 2008 to 2018 compared to 9.8 percent growth for non-STEM occupations (Langdon, McKittrick, Beede, Khan & Doms, 2011). Not since the mid-1950's has the nation faced a more

serious shortage of skilled workers in science, technology, engineering, and mathematics (ACT, 2006). This focus on STEM has caused colleges, universities and other organizations around the country to acknowledge the issues and begin finding solutions.

Underrepresented in STEM

Traditionally, participation in STEM has been the domain of non-minority groups and researchers have been interested, for some time, in the equity of STEM and how and why certain groups have more or less access, opportunity, and success in the educational trajectories leading to STEM occupations (Bystydzienski & Bird, 2006). A considerable amount of the current conversation surrounding STEM includes discussion about the relative absence of women and minorities in various STEM-related jobs (National Academy of Sciences, 2005). Historically, White and Asian males heavily occupied the STEM fields, while women and male minority group members were less likely to enter into these occupational sectors (Campbell, Denes, & Morrison, 2000). Despite the advancement of women and minorities over the past several decades (i.e. increased college enrollment and conferred STEM degrees) and the increasing demands of a rapidly evolving technological society, those trained and employed in STEM fields remain overwhelmingly White and male (National Science Foundation, 2006). The inequality is most pronounced for minority women and women from economically disadvantaged backgrounds (NAS, 2006). Students of color have remained underrepresented in the STEM fields even with the changing demographics of the United States (Fries-Britt, Younger & Hall, 2010). According to the National Action Council for Minorities in Engineering (NACME, 2008), African American, Native American, and Latinos account

for 30% of the nation's undergraduate student population age 18 to 24. This population is expected to grow to 38% by 2025. These groups share low rates of high school completion, college attendance, and college completion in comparison to Whites and Asians (NACME, 2008). Fewer than 12% of baccalaureate engineering degrees are awarded to underrepresented minorities (NACME, 2008). Out of those 12%, Blacks constitute only about 2% of the nation's engineers (Museus, Palmer, Davis, & Maramba, 2011). Underrepresented racial minorities earn college degrees in STEM fields at lower rates than their peers (Museus & Liverman, 2010). Only about 24% of underrepresented minorities complete a bachelor's degree in the STEM fields within six years of enrollment, compared to 40% of White students (Center for Institutional Data Exchange and Analysis, 2000). This considerable gap continues to exist between the intentions of first-time college students and their successful completion of STEM degrees. Students either leave STEM for other majors or leave college (Yang, 2005).

The STEM dropout rates for Native American, Hispanics and Blacks are substantially higher than those of Caucasians or Asians (Morrison, 1995). The gaps are just as large for underrepresented students that pursue graduate and professional education. In 2004, underrepresented students held 18% of bachelor's and only 7% of doctoral degrees in the sciences (National Science Board, 2006). At the doctoral level, Blacks are practically absent in the STEM fields. Underrepresentation in STEM graduates is likely to continue to be a problem. The National Action Council for Minorities in Engineering shows that awarding degrees continues to be a problem because only about 4% of underrepresented minorities graduate high school "engineering eligible" (NACME, 2008, p 5). Students are not "engineering eligible" because they are

not taking the necessary math and science courses to be fully qualified for admission to study engineering. With the minority student population continuing to grow and participation in the STEM disciplines decreasing, the challenge will be to facilitate a solution to the problem.

From early childhood to secondary educational settings, many schools have failed to provide students of color with high quality instruction in mathematics and science (Berry, 2008). Young students' interests in a STEM career may start before they enter college, but it is the postsecondary education that creates the career path and prepares the student for work in a STEM occupation; therefore it is important to analyze the university or college experience with STEM courses and the reasons for the high attrition rates from STEM majors (Kokkelenberg & Sinha, 2010).

In Texas, there is a need to increase the number of students pursuing STEM degrees. The Texas Higher Education Coordinating Board, an agency whose mission is to work with the Texas Legislature, Governor, governing boards, higher education institutions and other entities to help meet the goals of the state's higher education plan, has set a plan to help Texas meet educational goals. The plan is called *Closing the Gaps by 2015*. According to the Texas Higher Education Coordinating Board Report (THECB, 2010), the goals of *Closing the Gaps* are to:

- increase the participation in higher education,
- increase success in achieving degrees and other programs,
- increase the number of nationally recognized programs and services at colleges and universities in Texas,

- increase the participation of Hispanic and Black males and preparing them for college and careers,
- improve the success rates by increasing the percentage of students in higher education, and
- improve the participation and success of students in STEM fields.

Much research has focused on Black students' low achievement in higher education by examining cultural and environmental factors that impede academic success (Fordham & Ogbu, 1986; Kunjufu, 2001; Price, 2000). A significant portion of Black men who are undergraduate students attended high school in urban settings and have overcome significant challenges that confront young men in urban communities (Noguera, 2008). It should also be noted that Black men growing up in such localities commonly have to overcome challenges in order to achieve academically. Those challenges include lowered teacher expectations and being labeled as educationally handicapped, which resulted in the disproportionate channeling of a number of minority children in Special Education (which some believe is inferior education). Other challenges include failure of school personnel to understand the culturally based behaviors of minority child and offering less upper level math courses (i.e. Advanced Placement courses) (Ogbu, 1990). The low number of Black males who graduate each year from STEM majors has become a major concern. Studying Black male college students, there needs to be some consideration and understanding that these students bring with them to college their struggles to become socially integrated as well as their feelings of being academically under-prepared and financially overburdened (Williamson, 2007). These students also face obstacles at the primary and secondary education levels with the lack of qualified teachers and

insufficiently rigorous curricula (Darling-Hammond, 2001). These students are at a greater disadvantage due to ineffective schools, neighborhood and individual poverty, and low skilled-living wage employment opportunities (Cohen & Nee, 2000). Poverty remains a constant factor that increases the risk of low academic performance in school (Gabarino, 1999). Between 2008 and 2009, the poverty rate increased for non-Hispanic Whites from 8.6 percent to 9.4 percent, for Blacks from 24.7 percent to 25.8 percent and for Hispanics from 23.2 percent to 25.3 percent. The poverty rate increased for children under the age of 18 from 19.0 percent to 20.7 percent and people aged 18 to 64 from 11.7 percent to 12.9 percent (U.S. Census Bureau, 2010).

Theoretical Framework

This study is based on the theoretical framework of critical race theory (CRT). CRT is used as an analytical lens to understand how race might influence the persistence of Black male students in college and to offer suggestions for future research, and improving completion rates for Black students. CRT emerged in the mid-1970s primarily from criticism of the critical legal studies movement (Comeaux, 2013). Critical Race Theory was developed to address social justice and the ways in which the judicial system has legitimized and legislated racial inequalities in the United States (Comeaux, 2013). Critical race scholars developed tenets that describe CRT's role in education. They include the centrality of race and racism and their intersection with other forms of oppression; the challenge to Eurocentric epistemology and traditional claims that institutions make toward objectivity, knowledge, race neutrality, and equal opportunity in the education system; the legitimacy of experiential knowledge; the commitment to social

justice and transformative response to racial, gender and class oppression (Crenshaw, 1991; Delgado, 1989; C. Matsuda, 1991; M.J. Matsuda, Lawrence, Delgado, & Crenshaw, 1993; Solorzano & Yosso, 2001, 2002).

In this study, CRT is used to understand and deconstruct the systematic barriers that hinder the Black male from persisting. Institutions predict the persistence of students when they apply based on their academic record and documents they provide during admission. Institutions determine what successful students look like using a set of guidelines developed for the general population. These guidelines often result in characterizing student of color as at risk before entering institutions of higher education and remaining at risk once they are at the university (Iverson, 2007). CRT challenges notions of colorblindness, merit, and racial equality. CRT emphasized the ways by which pervasive institutional policies and practices perpetuate racial inequity in the education system (Villalpando, 2004). Looking thru the CRT lens provide individuals, such as faculty who work with students of color and administrators that write policy, an opportunity to recognize how labels can effect students and how there are disparities in social interactions with Black students and faculty. To promote equity in the classroom and on campus, it is imperative that the institutions recognize that social interactions are important to understanding the Black male student from the time they step onto campus until the time they graduate with a degree.

Retention in STEM

Considerable research has been done on the factors that impede minority retention in STEM over the past 20 years. As many as 65% of college students who enter STEM

majors do not complete a degree within six years of matriculation (National Center for Education Statistics, 2009). The numbers are worse for many students of color with less than 16% of Black, Hispanic and Native American college student's actually accomplishing graduation within five years (Higher Education Research Institute, 2010). Black students who aspire to attain a STEM degree have the lowest rates of completion among all racial groups. Specifically, 13.2% of Black STEM degree aspirants complete a STEM degree within 5 years of matriculation, compared with 14% of Native Americans, 15.9 % Hispanics, 24.5 % of Whites, and 32.4 % of Asian American, Pacific Islander (AAPIs) (Museus, Palmer, Davis, & Maramba, 2011). For example, researchers have examined pre-college factors such as adequate high school preparation and ACT scores (Fletcher, 1998; Marguerite, 2000; Takahashi, 1991), while others looked exclusively at activities designed to facilitate the transition to college (Harris, 1989; Smith, 1989; Martino, 1990). Some have focused on activities developed to enhance the likelihood of student success past the first-year (Prather, 1996). Still others have focused on services for the ill-prepared student identified at admission as at-risk for failure, or those created to provide the skills essential to succeed in the STEM disciplines (Good, 1998; Jonides, 1995; Sanders, 2000). The State of Texas is not producing sufficient college graduates with science-related degrees. The *Closing the Gaps* initiative created targeted goals to assist in closing the gaps of success of students. One goal is by 2015, close the gaps in participation rates to add 630,000 more students to close the gap in participation rates. Another goal consists of increasing the number of students completing engineering, computer science, math, and physical science bachelor's degrees, associate's degrees and certificates from 12,000 in 2000 to 24,000 by 2010, and to 29,000 by 2015. A third goal

is to increase the number of African American students completing bachelor's degrees, associate degrees and certificates to 19,800 by 2010 and to 24,300 by 2015. (THECB, 2010; THECB, 2014).

In the Closing the Gaps 2014 Progress Summary, African Americans reached the final enrollment target in fall 2009. African Americans continued to add more students every year thereafter, except a drop of about 4,500 students in fall 2013. The gender gap for African American females continued to have the highest participation rate in Texas higher education in fall 2013 at 9.3 percent of their statewide population. African American males lagged that percentage by 3.5 percentage points (THECB, 2014).

Although African American males exceeded the participation rate in fall 2011 and have remained above since, the Closing the Gaps Progress Summary identifies African American persistence rates as low relative to other groups. The one-year persistence rate for first-time, full-time undergraduate African American students fell from 79.2 percent from fall 2011 to 78.3 percent from the fall 2012 (THECB, 2014).

Many students who are enrolling are not persisting to receive a degree. These students are underprepared academically or do not have the financial or other support necessary to be successful (THECB, 2010). There are students who do not return after their first-year of college and with less than 50% of undergraduate students receiving a degree in six years or less, the need to retain students is critical. While STEM majors have increased from 15,929 in 2000 to 19,874 in 2013, the target of awarded STEM degrees is 9,000 degrees short and not on track to meet the final target of 29,000. (THECB). African Americans' share of the total STEM degrees awarded decreased from 2003 to 2013, from 9.5% to 8.3% (THECB, 2014). While there is an increase in the

number of Blacks enrolling in institutions of higher learning, the issues of retention and high attrition rates are still a concern to universities (Russell & Atwater, 2005). Even with this increase, Black students are still leaving institutions in disproportionate numbers without completing their degree (Yohannes-Reda, 2010). Before students can matriculate to the point of receiving a degree, the institution must recruit, admit, and retain these students to the stage of completion. Closing the Gaps has a success target for STEM fields. The goal is to increase the number of students completing engineering, computer science, math, and physical science bachelor's degree, associate degrees, and certificates from 12,000 in 2000 to 24,000 by 2010, and to 29,000 by 2015. Public institutions are not on track to meet this target.

Retention Pattern of the Colleges of Science at Selected Institution

At Texas State University, there are seven colleges which are housed under Academic Affairs that award undergraduate degrees. They include the College of Applied Arts, McCoy College of Business Administration, College of Education, College of Health Professions, College of Liberal Arts, College of Science and Engineering, and College of Fine Arts and Communication. Within these colleges, the student's first-year retention rate was tracked for first-time students. According to Institutional Research, the College of Science and Engineering one-year retention rate is the lowest out of the seven academic colleges on the Texas State campus from 1997-2003 (Institutional Research, 2010). Table 1 shows the 1-year retention rate for freshman by college. The table shows the combined cohorts and the students' first major choice. The table gives an account of where the cohort of students remained after the first year and which major college they moved to after the first year.

The College of Applied Arts has a first-year retention rate of 71.0%, McCoy College of Business Administration first-year retention rate is 69.5%, the College of Education has 72.9% first-year retention rate, the College of Fine Arts and Communication is 75.0%, the College of Health Professions is 61.5%, the College of Liberal Arts is 68.9%, and the College of Science and Engineering is 60.1%. The 6-year graduation rate from the 1997-2003 cohort of first-time, full-time students for the College of Science and Engineering continues to be the lowest amongst the seven academic colleges. The College of Applied Arts has a 55.3% graduation rate, the McCoy College of Business has a 56.4% graduation rate, the College of Education is 56.1%, the College of Fine Arts and Communication is 54.4%, the College of Health Professions is 40.1%, the College of Liberal Arts is 48.3%, and the College of Science and Engineering is 29.9% (Institutional Research, 2010).

Table 1

1-Year Retention Rates for Combined Fall 1997-2003 Cohorts of 1st-time, Full-time Freshman by College at Texas State University

			Last Major College (most recent or current)							
First Major College	Semester	Data	Applied Arts	Business Admin	Education	Fine Arts and Comm	Health Professions	Liberal Arts	Science and Engineerin	University College
Applied Arts	Cohort Initial Yr	N	770	42	52	52	9	89	25	18
		%	100%	100%	100%	100%	100%	100%	100%	100%
	Cohort After 1stYr	N	547	36	41	48	9	77	18	10
		%	71.0%	85.7%	78.8%	92.3%	100%	86.5%	72.0	55.6%
Business Admin	Cohort Initial Yr	N	127	1,878	103	185	29	235	71	92
		%	100%	100%	100%	100%	100%	100%	100%	100%
	Cohort After 1stYr	N	113	1,306	89	166	27	212	65	68
		%	89%	69.5%	86.4%	89.7%	93.1%	90.2%	91.5%	73.9%
Education	Cohort Initial Yr	N	87	53	1,334	84	29	113	32	13
		%	100%	100%	100%	100%	100%	100%	100%	100%
	Cohort After 1stYr	N	79	47	973	78	24	101	29	5
		%	90.8%	88.7%	72.9%	92.9%	82.8%	89.4%	90.6%	38.5%
Fine Arts and Comm	Cohort Initial Yr	N	107	73	101	1,982	21	293	40	60
		%	100%	100%	100%	100%	100%	100%	100%	100%
	Cohort After 1stYr	N	93	69	82	1,486	18	268	33	40
		%	86.9%	94.5%	81.2%	75.0%	85.7%	91.5%	82.5%	66.7%
Health Professions	Cohort Initial Yr	N	59	32	121	34	441	63	34	20
		%	100%	100%	100%	100%	100%	100%	100%	100%
	Cohort After 1stYr	N	51	28	109	34	271	58	30	14
		%	86.4%	87.5%	90.1%	100%	61.5%	92.1%	88.2%	70%
Liberal Arts	Cohort Initial Yr	N	89	70	79	125	15	1,330	28	20
		%	100%	100%	100%	100%	100%	100%	100%	100%
	Cohort After 1stYr	N	84	65	69	115	13	916	23	14
		%	94.4%	92.9%	87.3%	92%	86.7%	68.9%	82.1%	70%
Science and Engineering	Cohort Initial Yr	N	115	215	131	124	83	281	1,415	62
		%	100%	100%	100%	100%	100%	100%	100%	100
	Cohort After 1stYr	N	102	185	114	118	76	248	851	33
		%	88.7%	86%	87%	95.2%	91.6%	88.3%	60.1%	53.2%
University College	Cohort Initial Yr	N	373	645	499	554	127	826	258	1,390
		%	100%	100%	100%	100%	100%	100%	100%	100%
	Cohort After 1stYr	N	346	595	457	501	117	760	219	414
		%	92.8%	92.2%	91.6%	90.4%	92.1%	92%	84.9%	29.8%

Note. The shaded areas are students who started and remained in the college as of fall 2009. Information supplied by the Texas State University database. Complied on June 16, 2010 by Institutional Research.

Purpose of the Study

The National Science Board has long been concerned with the state of STEM education in the United States and has continued, over several years, to express the need for more students to major in the STEM fields (NSB, 2010). Although it has been a major feature in research, the question continues to be asked why students, particularly Black male students, are not persisting in the STEM fields. Black males continue to face more obstacles before they reach college: misinterpretation of their behavior, high suspension rates, school closures in urban neighborhoods, inadequate schools, concerns about "acting white", single parent households, poverty, violence, and a lack of positive images of successful black males (Patton, 2014). Research continues to document the issues faced by Black male students in STEM fields. There are many factors like academic and cultural isolation, difficulty performing in the face of negative stereotypes and low expectations among faculty and other administrators (Patton, 2014). In STEM fields at predominantly White institutions (PWI), Blacks students are significantly underrepresented (Russell & Atwater, 2005). Despite the increase in attendance at PWI's, Black students leave in disproportionate numbers without completing their degree programs in the STEM major (Yohannes-Reda, 2010). Students often change their plans or interests in a particular subject, but when this happens in the STEM fields, the underrepresented Black student numbers can become even lower. Despite the significant investments in STEM education for Black males, the rate of increase in their enrollment remains sluggish compared to those of other groups. Low completion rates in postsecondary-degree programs are more pronounced among Black males (Patton, 2014). Black men accounted for 4.57 percent of the general undergraduate population in 1976.

More than three decades later, their presence has risen but only by less than one point, 5.43 percent (U.S. Census Bureau, 2000).

Enrollment in the College of Science and Engineering at Texas State University, by first-time undergraduate students, has steadily increased, however retaining the students through their first-year and their persistence to their second year of college and beyond has been problematic. This study is to determine why Black students, specifically Black men, entering Texas State University and majoring in the STEM fields are not persisting and graduation. During the time of this study, data acquired from Institutional Research provides a numerical picture of the graduation numbers. Table 2 shows that 5,007 degrees were awarded in the College of Science and Engineering to undergraduate students from fiscal year 2002 to fiscal year 2014 at Texas State University. Table 3 shows that only 103 Black males were awarded a Bachelor's degree in the STEM fields from 2002 to 2014 at Texas State. Strayhorn (2008a) reported that "only 1 out of every 4 African American males completes his degree" (p. 501). This is a major concern not only for Texas State University but across the state and beyond.

Table 2

Degrees Awarded at Texas State University by Fiscal Year for All Students in the College of Science and Engineering

Texas State Fiscal Year	Bachelor's Degree
FY2002	335
FY2003	332
FY2004	310
FY2005	306
FY2006	321
FY2007	349
FY2008	412
FY2009	379
FY2010	375
FY2011	456
FY2012	452
FY2013	500
FY2014	480
Total Students	5,007

Note: Information Supplied by the Texas State University Department of Institutional Research and Degree History Texas State Database. (Retrieved April 25, 2015).

Table 3

Degrees Awarded at Texas State University by Fiscal Year for Black Male Students in the College of Science and Engineering

Texas State Fiscal Year	Bachelor's Degree
FY2002	1
FY2003	4
FY2004	9
FY2005	8
FY2006	8
FY2007	13
FY2008	7
FY2009	7
FY2010	6
FY2011	9
FY2012	8
FY2013	14
FY2014	9
Total Students	103

Note: Information Supplied by the Texas State University Department of Institutional Research and Degree History Texas State Database. (Retrieved April 25, 2015).

The purpose of this study is to add to the knowledge base of why Black students, specifically Black men, are not persisting at Texas State in the STEM majors. It will also determine if specific factors like the SAT score, parents' education, high school rank, college GPA and STEM courses predict college performance in Black men and hinder them from persisting and graduating in the College of Science and Engineering. The study will answer this by asking the following research questions:

Research Questions

1. Do major, SAT, parent's education and high school rank effect college preparation for all students?
2. Do major, SAT, parent's education and high school rank effect college preparation for Black males?
3. Do college GPA, earned credit hours and college GPA in STEM courses effect college performance for all students?
4. Do college GPA, earned credit hours and GPA in STEM courses effect college performance for Black males?
5. Does College preparation effect college performance?

Definitions of Terms

1. AAPI –Asian American Pacific Islander students. A person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or Pacific islands This includes people from China, Japan, Korea, the Philippine Islands, American Samoa, India, and Vietnam (Common Data set of U.S. Higher Education Terminology, 2010).

2. ACT –American College Test. A standardized college entrance exam administered by the American College Testing Program. Four separate, multiple-choice tests measure knowledge of English, math, reading, and science, and one optional writing test measures essay planning and writing skills. Most students take the ACT during their junior or senior year of high school, and most colleges and universities accept scores from either the ACT or SAT. Some schools may recommend, but not require, international students to take the ACT or SAT (American College Testing, 2010).
3. Academic Self-Efficacy – Refers to a belief in one's competence to perform a task (Bandura, 1986). It is students' feelings about their ability to accomplish academically oriented tasks – is associated with students' academic success in college (Strayhorn & Terrell, 2010).
4. ApplyTexas application - An application created through a collaborative effort between the Texas Higher Education Coordinating Board and the colleges and universities represented on the site. With ApplyTexas, students can accomplish applying for admission to any Texas public university, community and private colleges, apply for undergraduate, international and graduate admissions, submit application essays online, and search for and view general and university specific information (Texas Higher Education Coordinating Board, 2014)
5. Black, non-Hispanic – A person having origins in any of the Black racial groups of Africa (except those of Hispanic origin) (Common Data set of U.S.

Higher Education Terminology, https://www15.uta.fi/FAST/US5/REF/dataset.html).

6. Engineering – Aeronautical or astronautical, chemical, civil, electrical, industrial, mechanical, and others terms (Yang, 2005). As of date, Texas State University has the following engineering majors: Manufacturing Engineering, Industrial Engineering, Electrical Engineering and Engineering Technology.
7. First generation – A student who is the first member of his or her immediate family to attend a college or university; neither of his or her biological or adoptive parents have ever attended a college or university (THECB Glossary, 2012).
8. First-time student/undergraduate- An undergraduate student entering college for the first-time after graduation from high school or who has never attended any college. Includes students enrolled in the fall term who attended college for the first-time in the prior summer term of any college. Also includes students who entered with advanced standing (college credits earned before graduation from high school). Students who have not completed their high school work are not included (THECB Glossary, 2012).
9. Former students - Sometimes referred to as re-admits or stop-outs, "former students" are students who have been away from Texas State for a minimum of one long semester but now want to return to campus to continue their studies (Texas State University Undergraduate Admissions, 2015)

10. Grade Point Average (GPA) –- The numerical value assigned to letter grades to provide a basis of quantitative determination of an average. The grade assignments in a four-point system are A=4, B=3, C=2, D=1, and F=0 in non-developmental education courses taken during the reporting period (THECB Glossary, 2012).
11. Hispanic Serving Institution (HSI) – An institution of higher learning with a full-time equivalent undergraduate student enrollment that is at least 25 percent Hispanic (Hispanic Association of Colleges and Universities, www.hacu.net, 7/7/2015).
12. Institutional Research (IR) – The Office of Institutional Research serves the Texas State University community. IR's primary function is to provide members of the University administration, as well as State and Federal officials, information including enrollment history, data for academic planning and assessment, information for state and federal reporting, and the results of various administrative surveys (www.irtxstate.edu, 2/16/2015).
13. Mathematics and Computer Science – math, statistics and computer science, programming (Yang, 2005).
14. PWI – Acronym for Predominately White institution. This is where the majority of the population of the student body is white.
15. Persistence– Continued enrollment or degree completion at any higher education institution (www.nscresearchcenter.org, 7/7/2015).
16. Retention Rate– In higher education discussions, the rate at which students are retained or graduate, and thereby persist, in higher education, as often

measured by the percentage of students who continue in higher education from one year to the succeeding year. The cohort generally consists of students who started in a fall term or in the previous summer term and who continued in the fall term. More recently, the term "persistence rate" is used more commonly to avoid confusion with the use of retention rates in the public education sector, where it refers to students who are held back and not promoted to the next grade (THECB Glossary, 2012).

17. SAT – Scholastic Assessment Test. An examination administered by the Educational Testing Service and used to predict the facility with which an individual will progress in learning college level academic subjects (THECB Glossary, 2012).
18. STEM – an acronym for science, technology, engineering, and mathematics. The acronym is used in this study to represent undergraduate majors in the departments and schools of engineering, engineering technology, mathematics, physics, chemistry and biology (Yang, 2005).
19. Credit hour - An amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency. THECB defines a credit hour as a unit of measure of instruction consisting of 60 minutes, of which 50 minutes must be direct instruction over a 15-week period in a semester system. Academic administrative units are responsible for ensuring that credit hours are awarded only for work that meets this requirement (Texas State Catalog, 2014-2016).

20. Texas State University – At the time of this study, a university with 35,546 students (31,005 undergraduates, 3,505 master's students and 329 doctoral students) with 97 bachelor's, 88 master's and 12 doctoral degree programs. It is classified as a Hispanic Serving Institution with 30% of the student body identifying as Hispanic. Texas State is located in San Marcos, Texas near the Texas Hill Country (Texas State University Enrollment Management and Marketing, 2011).
21. Texas Education Agency (TEA) - The Texas agency that provides leadership, guidance, and resources to help schools meet the educational needs of all students. Located in Austin, Texas, TEA is the administrative unit for primary and secondary public education. Under the leadership of the Commissioner of Education, the agency manages the textbook adoption process, oversees development of the statewide curriculum, administers the statewide assessment program, administers a data collection system on public school students, staff and finances, rates school districts under the statewide accountability system, operates research and information programs, monitors for compliance with federal guidelines and serves as a fiscal agent for the distribution of state and federal funds (TEA Glossary, 2015)

Summary

The gap between White and Black students in the STEM fields, high school completion rates and enrollment in college has narrowed in the past 20 years. The discrepancy has not disappeared (NACME, 2008). There continues to be a lack of Black

students enrolling in college, specifically Black men in the STEM fields, and persisting in those fields. The body of research on experiences of minorities in the STEM fields continues to grow, but there is limited research specific to Black men in STEM related majors, their success, and persistence.

CHAPTER II

LITERATURE REVIEW

The purpose of this study is to add to the knowledge base of why Black students, specifically Black men, are not persisting at Texas State University in the STEM majors. This investigation will also determine if specific factors like the SAT, parent's education, high school rank, college GPA and STEM courses are significant predictors of college preparation and college performance in Black men. An additional question to be investigated is whether such variables hinder them from persisting and graduating in the College of Science and Engineering.

Nationally there are 65 percent of college student who enter STEM majors not completing a degree within six years of matriculation. This number is worse for many students of color. Recent statistics indicate that about 42 percent of Black students who matriculate at a four-year postsecondary institution completes a baccalaureate degree within six years which is approximately 18 percent lower than their white peers (National Center for Education Statistics, 2007). Black students account for 12 percent of the national population but only 2 percent are scientists and engineers (Anderson, 1990). This chapter will focus on the literature in the organized areas of academic preparedness, pre-college factors, persistence in major, parental background and support, and student faculty relationship.

Academic Preparation

Academic preparation is measured and defined by test scores, grades and courses taken (Riegle-Crumb & King, 2010). There are some researchers that see academic

preparation the same as college readiness. According to Conley (2007b), "College readiness can be defined as the level of preparation a student needs to enroll and succeed, without remediation, in a credit bearing general education course at a post-secondary institution that offers a baccalaureate degree or transfer to a baccalaureate program"(p.5). Students who are "college ready" are defined as having the knowledge, skills and behaviors to complete a college course of study successfully, without remediation (Baisey-Jackson, 2010). Research shows that only about 70 percent of all students in public high school graduate, and only 32 percent of all students leave high school qualified to attend four-year colleges (Baisey-Jackson, 2010). Black students have a low college readiness rate and are seriously underrepresented in the pool of minimally qualified college applicants. Only 9 percent of all college ready graduates are Black (Baisey-Jackson, 2010). Among Black men who do make it to college, a significant portion of the group are burdened with what can be characterized as an 'under preparedness' for the academic challenges of postsecondary education (Cuyjet, 1997). This stems from a number of conditions: attending academically poorer elementary and secondary schools, lowered expectations of peers and significant adults toward academic achievement, peer pressure to disdain educational accomplishments and education as an outcome, financial hardships limiting educational access, lack of appropriate role models, and other barriers owing to racism. With intense focus on raising high school academic standards, lowering the dropout rate, and decreasing the student academic achievement gap, reforms were initiated in Texas in the first decade of the 21st century including Closing the Gaps by 2015, P-16 College Readiness Initiatives, Recommended High School Curriculum, College and Career Readiness Standards, and Texas Success

Initiative. To create a college going attitude and to prepare college ready graduates, Texas legislators enacted Texas Education CODE [TEC] Sect. 39.051 (b) (13), mandating all Texas school districts to report on six indicators of college readiness, which are: (a) advanced placement exam scores; (b) dual credit course enrollment; (c) SAT critical reading and math test scores, ACT English and math test scores, or TAKS English/language arts (ELA) and mathematics exit level test scores; (d) advanced coursework in science, math, and foreign languages; (e) scores from state college readiness assessments; and (f) the percentage of college ready graduates in each high school and district as determined by the first four indicators (TEA, 2009a).

The literature has also shown that students' prior academic preparation and attitudes toward math and science in high school are the strongest predictors of entrance in a STEM major in college (Tai, Liu, Maltese, & Fan, 2006). Research also indicates that all ethnic groups have positive attitudes and aspirations for a STEM career. As minority students progress through their academic careers, their interests in science and mathematics tends to diminish as their lack of success declines (Peng, Wright, & Hill, 1995). Minority students are often assigned or incorrectly placed in developmental or remedial courses based on achievement test scores (Catsambis, 1994). From this they are limited in the number of science and math courses they take and are likely, in the end, not prepared for high school or college level STEM courses (Oakes, 1990; S. Peng, Wright & Hill, 1995; Simpson 2001). In a 2003 report by the National Center for Education Statistics (NCES) which tracked the long term outcomes of high school graduates, it was found that there was a direct relationship between the intensity of a student's high school curriculum and the number of remedial courses they need to take in college (Gerald,

2009). Similar outcomes by Adelman (2006) showed that students tracked for 12 years from the eighth grade found that the academic intensity of students' high school curriculum was a more powerful predictor of their ability to complete the baccalaureate degree than any other precollege factor.

Bonoud-Hammarth (2000) found that Black, Hispanic, and Native American undergraduates were less likely to be retained in the STEM majors in college compared to white undergraduates because they were not prepared in K-12 to succeed in the STEM subjects. A study conducted by Trusty (2002) looked at the effects of academically intensive high school science and math course work on choice of science or math majors and other college majors. Results showed that the course taken in high school influenced the choice of science and math majors. Trusty also found that taking trigonometry, pre-calculus, and calculus positively impacted women's choice of a science or math major. For men, only physics had a significant positive effect on choice of science or math major though the relationship was weak. Maltese (2008) discovered that most students who completed the majority of their college coursework in STEM had taken at least 3 to 4 years of STEM courses in high school. An even greater number of those completing STEM majors had taken advanced math and science courses in high school. Two other researchers, Adelman (1999) and Drew (1996) both concluded that math education in K-12 is important for future success. The fact that minority students often attend K-12 schools that are inadequately prepared to teach math classes and are discouraged from pursuing advanced math leads to the problem of not having enough highly qualified students pursing postsecondary degrees in STEM.

With the completion of high school, 58 percent of Black males fail to graduate from high school with their peers (Holzman, 2006). Another study revealed that Black men tend to experience a larger drop in academic performance and higher course failure rates over their high school careers than their peers (Roderick, 2003).

In Texas, only 39 percent of the 7,800 schools will meet annual yearly progress requirements which is down from 61 percent in 2002 when 4,309 schools were considered Exemplary or Recognized under testing guidelines (Houston Chronicle, 2004). Hursh (2005) stated,

> because test scores correlate with the student's average family income, a school's score is more likely to reflect its students' rather than teaching or the curriculum.

Pre-College Factors

Black men are significantly underrepresented in STEM majors at predominantly White institutions (PWI) (Russell & Atwater, 2005). Black male academic success and college attendance at these institutions is the lowest of any group in higher education (Allen-Meares, 1999; Roach, 2001). Every year large numbers of Black students with high SAT scores, above average high school GPAs, and success in high school honors math and science courses leave the science pipeline (Seymour & Hewitt, 1997). According to data released by the College Board (2010), more minorities are taking the SAT but test scores still remain lower among racial and ethnic groups. There are some studies that have reported that SAT scores are less predictive of college performance for Black students than for White students (Bowen & Bok, 1998).

Student's first semester or first-year college grade point average (GPA) have traditionally been used as an intermediate criterion of their success in college and a high predictor of success. Sawyer and Maxey (1979) studied the validity over time of grade prediction equations for college freshmen. They concluded that although most colleges witness some changes in their students' academic abilities, their curricula, or their grading practices over a period of time, the GPAs of freshmen can, in most cases, be accurately predicted using equations as old as 4 years. Other research done by the Center for Studies in Higher Education found that the GPA is consistently the best predictor not only of freshman in college, but for four-year college outcomes as well. Students' first semester or first-year college GPAs have traditionally been used as a measure of their success in college. GPA is a convenient benchmark, and a student's first-year GPA is available after their first semester unless they entered with credit courses from another institution (Yang, 2005). Noble and Sawyer (2002) found that both high school GPA and the ACT composite score were effective predictors of success. High school GPA was a somewhat more accurate predictor than the ACT composition score. Geiser and Studley (2003) demonstrated that high school GPA in college preparatory courses was the best predictor of freshman grades for a sample of almost 80,000 students admitted to a university on the west coast across all disciplines. Another study sought to determine if academic self-efficacy was better at predicting first-year college grades than high school GPA and SAT scores. Combs (2001) verified what Hackett and her colleagues (1992) discovered. Combs found that academic self-efficacy was the strongest predictor of first-year college performance for 140 high-achieving Black students attending PWIs, while the combination of high school GPA and combined SAT scores were not significant in

predicting performance for this sample. Another study by Schwartz & Washington (2002) found that high school GPA and class rank combined with non-cognitive factors – intrinsic motivation, being motivated internally to succeed in college, students' academic and social integration on campus, students feeling a part of the academic and social environments, value placed on education, and believing that education is the conduit to achieving their career and financial goals – are more likely to predict Black males persistence in college than ACT scores.

In *Measuring College and Career Readiness: The Class of 2009*, ACT reported that only 23 percent of the nation's 2009 graduating seniors were likely to be successful in entry-level credit-bearing courses at a college or university (ACT, 2009c). In Texas, 22 percent of the 2009 graduating class was prepared to be successful in entry-level credit bearing courses at a college or university (ACT, 2009b). In an earlier ACT report, research revealed that approximately 50 percent of the students in the 2005 graduating class who took the ACT were not prepared for college reading. ACT (2006) also showed that college readiness in reading continued to decrease from 1994 to 2005.

Completion and Major Changes

The disparities from which Blacks suffer appear to begin early in the education system. Black students exhibit the lowest levels of performance of all racial groups on their fourth grade math scores. This disparity continues into the eighth grade where their scores continue to trail those of other racial groups. When degrees of completion are reported by race, Black students who aspire to attain a STEM degree have the lowest rates of completion among all racial groups.

Working towards a STEM degree and graduating is a high goal to set. There are several disparities when Black students aspire to work towards and complete a STEM degree. According to the Higher Education Research Institute (2010), Black students who aspire to attain a STEM degree have the lowest rates of completion among all racial groups. 13.2 percent of Black STEM degree aspirations complete a STEM degree within five years compare to 14 percent of Native American, 15.9 percent for Hispanics and 24.5 percent White. Research has found that students begin with great intentions to major in the STEM fields but may later discover that the area of study is not the right fit for them or they are not prepared. Riegle-Crumb and King (2010) found that although Black and Hispanic male college matriculates are more likely to declare a STEM major than their White female peers, Black and Hispanic male college matriculates are as likely as their White male peers to enter STEM majors, despite pronounced differences in average levels of academic preparation. Once these differences are accounted for, Black males are in fact substantially more likely to declare a physical science or engineering major than White males.

In one study, Yang (2005) found that in the important factors that influence student's college achievement and completion of degree programs in STEM that there is a gap that exists between intentions of college freshman and their successful completion of STEM degrees. Although 25 to 30 percent of students entering college intend to major in STEM fields, less than half of those intending to major in STEM fields complete STEM degrees within five years. Students leave STEM for other majors or drop out of college. The study sees that the completion rate of STEM programs for women and underrepresented minorities is lower than that of males and Caucasians (National Science

Foundation, 2002.) Other result indicated that students who are better prepared in high school are attracted to the STEM fields.

Shaw and Barbuti (2010) conducted a study that focuses on patterns of persisting in and switching from one college major that was chosen while in high school versus being in the third year of college was observed. Results from this study observed differences in persistence by academic field, gender, parental income and first generation college student status (Shaw & Barbuti, 2010). In another study of postsecondary outcomes and student characteristics, Chen (2009) found that among all students entering a STEM field in their first-year of postsecondary enrollment, 55 percent switched to a non-STEM field or left postsecondary education without earning any credential. A higher percentage of students entering the physical sciences completed a STEM degree compared to all STEM entrants (59% vs. 41%), and students entering computer/information sciences and engineering/engineering technologies had a lower percentage of students completing STEM degrees (36% and 40%).

Socioeconomic Factors

Researchers have documented that socioeconomic factors have impacted students' achievement (Chenoweth, 2004; Rumberger & Palardy, 2005). In 1996, "the Coleman Report was the first major national study to demonstrate that a student's achievement is more highly related to the characteristics of other students in the school than any other characteristics" (Coleman, Campbell, Hobson, McPartland, Mood, et al., 1966, as cited in Rumberger & Palardy, 2005). Rumberger and Palardy (2005) used data to examine achievement growth of eighth thru twelfth graders in mathematics, science, reading, and

history. They concluded that segregation still has an impact and socioeconomic makeup of the high school student body impacts student achievement. Affluent high schools are organizationally structured differently than lower socioeconomic high schools and have greater benefits and resources. It is common for affluent high schools to have a full-time math coordinator, whereas urban high schools barely have teachers trained in mathematics (Williamson, 2007).

In a study by Griffin, Jayakumar, Jones and Allen (2010), they discovered the importance of socioeconomic factors in college access. Despite some increases during the mid-1980s, the percentage of Black male freshman from low-income families declined, 38 percent in 1971 to 33.2 percent in 2004. Such economic disparities translate into diminished rates of college attendance. According to data from U.S. Census Bureau (2000), 65 percent of all students whose families earn more than $75,000 a year attend college, compared to 24 percent of students whose families earn less than $25,000 (Marable, 2003). Since only 22 percent of academically qualified students who come from low-income families attend college (Marable, 2003), it is unlikely that these trends can be solely a function of student ability rather than income (Perna, 2006; St. John, Asker, & Hu, 2001). Assuming that there is a large number of Blacks among America's poorest families, it is likely that many able and talented Black males do not attend college simply because their families lack the necessary financial resources (Griffin, Jayakumar, Jones, & Allen, 2010).

Viadero and Johnston (2000) reported that poverty is the primary cause of the academic achievement gap and deficits in academic achievement scores of ethnically diverse students, whereas, growing up in the middle and upper socioeconomic

environments has a positive effect on academic achievement scores (Balfanz, 2009; Levin, 1995; Phillips, Brooks-Gunn, Duncan, Klebanov, & Crane, 1998; Ravitch, 2010; Roderick, Nagaoka, & Coca, 2009; Sirin, 2005). Compared to Asian and White students, Hispanic and Black students are twice as likely to live in lower socioeconomic households (Gray, 2005; Munoz 2005).

Socioeconomic hardships, lack of stability, and dire economic conditions in poverty stricken households of ethnically diverse families limit learning opportunities and parent involvement; thereby diminishing student academic achievement (Duncan & Magnuson, 2005; Lee & Bowen, 2006; Philips et al., 1998; Tapia, 2004). Parents who did not or could not be involved with student learning, experienced an information gap between school and home; but students from families who were involved at school experienced higher grade point averages and higher academic achievement test scores (Teske, Fitzpatrick, & Kaplan, 2006, p.969). As compared to parents in middle-class and wealthy households, parents in impoverished households (i.e., less than $10,000 per year) received far less important information from schools (Duncan & Magnson, 2005; Lee & Bowen, 2006; Tapia, 2004; Teske et al., 2006).

Parental Educational Background and Support

Bandura, Barbaranelli, Caprara, and Pastorelli (1996) developed a model addressing persistence that suggests the effectiveness of parents, students, and peers, when combined with socioeconomic status, predict academic success. Bandura et al., (1996) says that positive effects cannot solely drive a student to succeed; but rather must operate in conjunction with social variables as peer interactions and socioeconomic status

of the family. The literature states that parent's educational background directly affects the students' views of education, and thereby influences the development of the value of education (Yang, 2005). Having a parent who has a high level of education is an important factor. Children from highly educated families often follow in their parents' footsteps and are more likely to complete high school and undertake further study (Staver & Walberg, 1987). Trends in family income, college preparation and attendance patterns of Black students reflect that Blacks are less likely than Whites and Asians to have college-educated parents (Cota-Robles & Gordan, 1999). Ringdal (1996) traced the influence of the level of education of the parents and that of their children from 1973 to 1995. The main finding was that both parents influence the level of the education of their children, and the influence of mother and father are almost identical. There are a number of researchers that have noted that parental expectations and involvement can facilitate the success of racial and ethnic minority students - Black students in particular - in the STEM circuit (Fries-Britt, Younger & Hall, 2010; Hrabowski, 2003; Hrabowski & Maton, 1995, Russell & Atwater, 2005; Smith & Hausfaus, 1998). A declining involvement of Black parents in their sons' education has been positively associated with negative academic performance. For example, in Garibaldi's study (1992), when parents were surveyed, about 80 percent of the 3,523 parents indicated that they believed their sons expected to go to college, but 25 percent of parents surveyed had never gone to the child's school for parental conferences. In a study by Russell and Atwater (2005), they interviewed eleven Black college students attending a predominantly White institution to gain insight into factors that lead them to pursue and persist in STEM majors. Participants credited their parents for helping them develop good study skills. A study

that Moore (2006) conducted with forty-two Black males in engineering revealed how the participants' parents affected their desire to pursue engineering in college. A quantitative study by Walker and Satterwhite (2002) found the relationship between the academic performance of Black and Caucasian college students and the role of their family in academic life were that family structure was not related to academic performance for Blacks or Caucasians; parental emotional support led to a decrease in students withdrawing from classes or school; and family variables had different impacts on academic outcomes across ethnic groups. Cabrera, Nora, Terenzini, Pascarella, and Hogedorn (1999) examined that parental support and encouragement positively affected their persistence in college and their commitment to the institution and earning a degree. Other research has shown that first-generation students are significantly less likely to succeed than those whose parents have earned a college degree (Freeman & Huggans, 2009). First-generation student typically have more limited cultural and social capital needed for success in academia in comparison to their non-first-generation peers (Strayhorn, 2006).

There seems to be a number of Black students that come from single parent homes. This status seems to minimize the students' academic achievement, which is highly correlated with lower household incomes, and in many instances, poverty (Lloyd, Tienda, & Zajacova, 2001; Phillips et al., 1998). Additionally, unexpected or unwarranted changes in income and socioeconomic status are more likely to plague uneducated, lower socioeconomic; ethnically diverse single-parents, predominantly Black and Hispanic females who live paycheck to paycheck, with little or no availability of liquid assets (Anyon, 2005; Berliner, 2006; Kaiser & Delaney, 1996; Levin, 1995; Miller,

Rein, Roby & Gross, 1967; Seccomb, 2000). When parents invest in the academic achievement of their students, the student stands a better chance of succeeding (McCarron & Inkelas, 2006). When there is low parental efficacy, it can be detrimental to the persistence of the student because students lack parental leadership that promotes development of educational goals and values that are vital to persistence (Smith & Fleming, 2006; Tierney & Auerbach, 2005).

Student-Faculty Relationship

A major link to the academic life of a campus often begins with interactions with faculty. Faculty play a critical role in predicting the success of racial and ethnic minority students in STEM. Research on minority student in general demonstrates that faculty can have both a negative and positive impact on racial and ethnic minority students' experiences and outcomes (Ceja & Rhodes, 2004). For Black male students, these relationships can be difficult to establish. Jacqueline Fleming's study (1984) reveals that senior Black men on a predominantly White campus expressed concern about their relationships with faculty and administrators. Davis (1994) perceives that academic integration is at the core of understanding the variations in the academic experience and outcomes of Black men in higher education. Research continues to integrate academic experience and faculty interaction with success. Davis also found that the student-faculty relationship is what is important for the success of Black men. The amount of time spent between the faculty and student is not important but the type of interaction significantly affects the students' academic performance.

Summary

Much research has been conducted on minority students, Black females and Black students as a whole, but there is limited research on Black males who are persisting in a STEM field. It is known that minority students have made significant progress toward closing the majority-minority gap in both course-taking and test scores over the past few decades; yet disparities still remain. Research shows that the factors that allow Black students to be persistent are based on their test score, GPA, academic preparedness and parent's educational background. Critical race theory is used to understand and address the issues of racial inequalities and the barriers that Black males are encountering on campus and in the classroom. This study will add to the research on Black males and the factors that allow them to persist in the STEM fields. Understanding the factors that allow them to continue to be successful in the STEM fields and persist to graduation is important information for the institution, policy makers, faculty and researchers at Texas State University.

CHAPTER III

METHODOLOGY

The methodology section provides the data collection, sample and data analysis of this study. It focuses on the procedures, the variables and the model used to explain Black males entering Texas State University majoring in the STEM fields, and their persistence. Quantitative data about these students were obtained from Texas State's Office of Institutional Research. The data consisted of first-time students that enrolled at Texas State University in a STEM major within the College of Science and Engineering beginning fall 2002. To determine if the first-time student that entered Texas State University was not being retained after their first-year and beyond, a quantitative, non-experimental research design within a structural equation modeling framework was employed. This chapter defines key terms associated with structural equation modeling and regression, the population and sample, the data analysis, the models and summary. The Institutional Review Board approval was acquired prior to working with the existing data.

Population and Data

The data used in this study stem from Texas State University's Office of Institutional Research (IR). IR delivers mandated reports to the National Center for Education Statistics at the U.S. Department of Education. Student data are acquired upon application using the ApplyTexas application process. The ApplyTexas application (Appendix A) was designated as a centralized application for all public four-year institutions and select two-year and private colleges in the state of Texas. The

information captured was comprehensive of the students and parents' socioeconomic data, ethnicity, educational background, major of study, gender, geographic region and high school. The students also supplied an official high school transcript that provided courses taken during the four years of high school upon applying to Texas State University. The study site is an Emerging Research University located in central Texas. Texas State University was established in 1899 with a rich history of undergraduate education. The university is located on the edge of the Texas Hill Country just a short distance from two large metropolitan areas. At the time of the study, the university has a diverse student body with 45% of the students designated as ethnic minority. The data listed in Table 4 shows the enrollment of students for 2013-2014. For this year, there were approximately 35,546 students with 31,005 undergraduates, 3,505 master's students and 329 doctoral students. During this academic year, a total of 2,199 African American students enrolled, 468 of those being first-time freshman students.

Table 4

Enrollment of Degree Seeking Undergraduates 2013-2014

	Degree-seeking First-time First-year	Total Undergraduates (both degree- and non-degree-seeking)
Nonresident aliens	8	133
Hispanic/Latino	1,920	9,748
Black or African American, non-Hispanic	468	2,199
White, non-Hispanic	2,483	16,665
American Indian or Alaska Native, non-Hispanic	11	92
Asian, non-Hispanic	74	572
Native Hawaiian or other Pacific Islander, non-Hispanic	7	41
Two or more races, non-Hispanic	202	917
Race and/or ethnicity unknown	6	638
Total	**5,179**	**31,005**

Note: Information supplied by the Texas State University Department of Institutional Research and Texas State Common Data Set website. http://www.ir.txstate.edu/reports-projects/common-data-set (retrieved September 27, 2014).

The enrollment of Black students in all academic disciplines from 2002 to 2014 is 25,552. This number includes all Black students at all levels to include undergraduate, masters and doctoral, and classifications in all majors offered at Texas State. This number also includes students who are first-time, continuing, formers and transfer students. Table 5 specifically looks at the overall enrollment of Black males from 2002 to 2014 at all majors and classes.

Table 5

Distribution of Black Male Students Enrolled at Texas State University from 2002-2014 at All Levels and Major

Texas State Fiscal Year	Undergraduate	% of Change	Post Bac	Master's	Professional	Doctoral	Total	% of Change
2014	2,535	14%	27	180	2	17	2,761	12%
2013	2,182	13%	61	174	3	14	2,434	13%
2012	1,901	6%	56	182	4	14	2,157	3%
2011	1,800	15%	52	216	4	20	2,092	16%
2010	1,565	11%	37	183	3	15	1,803	10%
2009	1,416	8%	46	160	1	16	1,639	9%
2008	1,313	7%	41	133	0	16	1,503	5%
2007	1,228	6%	47	144	0	10	1,429	6%
2006	1,156	-1%	44	135	0	7	1,342	-3%
2005	1,173	-1%	67	141	0	8	1,389	-1%
2004	1,190	3%	77	128	0	7	1,402	4%
2003	1,160	11%	69	115	0	0	1,344	11%
2002	1,041		69	104	0	0	1,214	

Note: Enrollment by Fiscal Year at Texas State University, Institutional Research, 2014

The data analyzed in the study included first-time students enrolled starting in 2002. The data consisted of students, male and female and all ethnicities and majors. The College of Science and Engineering majors of Biology, Chemistry, Biochemistry, Mathematics, Engineering, Engineering Technology, Computer Science and Physics were the focus for this study.

The data included the students college entrance exam test score (SAT or ACT), high school class rank, socioeconomic status, ethnicity, their intended major, parental education, gender, high school name, first-term of entry to Texas State University, admission type, grades from STEM courses taken at Texas State University and the final major, final GPA and credits received while enrolled at Texas State University.

A sample of 5,422 was drawn from the collection of 65,000 student data that were enrolled at Texas State University and had applied to Texas State University using the ApplyTexas application. The data were taken from a database and acquired in a TXT format. The data went thru a series of data cleansing and merging and is explained in the following section. A random sample was pulled consisting of White students and Black students. An analysis was conducted on the groups to determine if they showed a significant difference. The data, coming from two student data record systems; the Legacy data system and the Banner data system, provided a different set of variable names and duplicate names. In the data cleansing, duplicate names were removed. All students, regardless of the semester of entry, fall, spring or summer were included. Students that did not have an ethnicity, high school rank, gender, admission type, parental education or family income were eliminated. The data also included both SAT and ACT test scores but not all of the students took both tests, so all ACT scores were converted to SAT scores using the ACT-SAT Concordance Table (Appendix B). An attempt to fill in the missing data resulted in 26 missing data records to be repopulated with information. Table 6 below provides the demographic composition of the 5,422 sample. From the 5,422, there are 1,627 Black males.

Table 6

Students in the Data Sample

Ethnicity	Number of Students	Female	Male
White, non-Hispanic	1546	850	680
Black, non-Hispanic	3742	2131	1627
Hispanic	122	59	63
Asian/Pacific Islander	9	3	6
International, non-resident	1	0	1
Unknown ethnicity	2	1	1
Total	**5422**	**3044**	**2378**

This university was selected because the researcher was an administrator and has access to the population data and understood the culture and College of Science and Engineering due to the researchers' involvement as an undergraduate student in the COSE. The university has shown a decline in male enrollment, particularly Black males despite increases in the population of Blacks in the general population. The data were entered into SPSS 21 designating a numerical value of each variable. The models were drawn graphically in the statistical software, Analysis of Moment Structures (AMOS) and computations conducted. The analysis looked at the effect College Preparation (COP) had on College Performance (CP). Frequencies and descriptive were ran to determine the effects of the variables.

Variables in the Study

The following variables described in table 7, include personal and academic background data: gender, ethnicity, parent's education, intended major and final major, college math and science courses, SAT scores, and student's high school rank, the Texas State GPA and hours taken.

Table 7

Description of Variables

Variables	Description	Level
Background Data		
Gender	Male or Female	Nominal
Ethnicity	Black, Hispanic, Asian, White, Native American, American Indian	Nominal
Parent's Education	Less than High School Some High School High School Graduate Some College Bachelor's Degree Master's Degree Professional Degree	Nominal
Intended Major	Biology, Chemistry, Physics, Mathematics, Engineering, Computer Science, Electrical Engineering, Concrete Industry Management, Engineering Technology, Industrial Engineering, Manufacturing Engineering, Biochemistry, Engineering Technology, Construction Science and Management, Technology Management	Nominal
College mathematics and science courses	General Physics I, General Physics II, Elementary Physics, Astronomy, Mechanics, Modern Biology I, Modern Biology II, Functional Biology, Organismal Biology, Functional Biology Laboratory, Organismal Biology Laboratory, College Algebra, A Survey of Contemporary Mathematics, Plane Trigonometry, Discrete Mathematics I, Pre-Calculus, Calculus I, Calculus II, General Chemistry Laboratory I, General Chemistry Laboratory II, General Chemistry I, General Chemistry II	Nominal
SAT Examination Scores	Range from 600 to 2400	Ordinal
Student's High School Rank/Percentile	Top 10% First Quarter (75% -100%) Second Quarter (50% - 74%) Third Quarter (25% -49%) Fourth Quarter (0-24%)	Interval
Texas State GPA	The GPA scale from 0.00 GPA to a 4.00 GPA	Interval
College Hours	Range from 0-200	Ratio

Gender. Research findings indicate that gender serves as one of the most powerful and robust predictors of choice of college major for minority students, as female minority students are much more likely to pursue degrees outside of STEM fields (Simpson, 2001) and less likely to aspire to STEM careers than males (Catsambis, 1994). In 2004, the National Science Board revealed that the number of STEM degrees awarded to women at the undergraduate level increased each year between 1966 and 2001. In 1998, women received 56% of degrees conferred, but only 37% of the STEM degrees were awarded. In 1999, women constituted only 24% of employed people in STEM occupations. Vogt, Hocevar, and Hagedorn (2007) found that women currently entering engineering programs demonstrated four characteristics that were different from women in the past: (a) they are at the top of the mathematics test score range, (b) they are as likely as men to have taken the appropriate prerequisite mathematics and science courses in high school, (c) they are unambiguous about their academic and career choices, and (d) they are confident in their academic abilities. In the higher education arena, women have continued to be underrepresented in the science majors. In 1996 only 20% of first-year college women planned to major in a STEM field compared to 31% of first-year college men. Hayes (2003) reported a 16% difference in men and women for all first-time STEM majors. Other studies (Adelman, 1991; DeBoer, 1984; Bridgeman & Wendler, 1989) have found that women do as well as or better than men in science and math courses, just as they do in other parts of the curriculum. Other studies (Boli, Allen, & Payne, 1985; Elliott & Strenta, 1988; Levin & Wyckoff, 1988; Young, 1991) have found that men do better in science or quantitative courses though not in other parts of the curriculum. Another study shows that Black females have higher levels of academic preparation in

math and science than their male peers, including higher test scores and levels of course taking (Hyde & Linn, 2006; Riegler-Crumb, 2006).

Ethnicity. In 2002, the National Science Board reported that underrepresented minorities, this including Black, Latino, and Native Americans, received only 12% of the total STEM degrees in 1998. Asians, Blacks, Hispanics, and American Indians combined accounted for only 18% of persons in STEM occupations in the United States in 1999 (NSB, 2002). Ethnicity and race has been a critical issue at all academic levels. A report (Huang, 2000) shows that a greater number of non-Asian minority students do not persist in the STEM majors compared to White students. It was determined that more than twice the number of non-Asian minority students switched to non-STEM majors. Hayes (2003) stated that between 1 to 9% of all first-time freshmen major in a STEM field were minority students compared to 83% of White students. The importance of increasing the number of undergraduate Hispanic students completing degrees in science, mathematics, and engineering has been recognized by Congress in the Goals 2000 Educate America Act (Goals 2000, 1994, section 102, 5Biii). In response, the federal government has allocated billions of dollars to increase funding earmarked for postsecondary STEM programs (U.S. Government Accountability Office, 2006). In 2012, the GAO reported that 209 education programs were administered to increase knowledge of STEM fields and attainment of STEM degrees (U.S. Government Accountability Office, 2014). Many of these programs focus on moving Hispanic students through the K-12 pipeline by impacting student achievement, promotion and graduation (e.g., No Child Left Behind Act, The College Board's Equity 2000 program, Project GRAD, Gaining Early Awareness and Readiness for Undergraduate Programs).

Parent's Education. Parents, along with other environmental factors, affect learning indirectly by influencing ability, motivation, and responsiveness to instruction, while in turn influence learning (Staver & Walberg, 1987). Parent's educational background directly affects student's views of education, and influence the development of their student's value of education (Yang, 2005). Tinto (1987) found that college students that persisted were more likely to have parents with a higher education. Other research states that the direct effect of parental education, income and occupation on student education attainment was significant (Ekstrom, Goertz, & Rock, 1988).

High School GPA. According to Geiser and Santelices (2004), high school grades were as strong a predictor of cumulative four-year college grades as they were of first-year college grades. Geiser and Santelices argued that standardized test scores added a "small but statistically significant improvement in predicting long-term college outcomes." Geiser and Santelices stated that SAT scores were so intertwined with students' socioeconomic status and added so little predictive value that their use in college admissions should be minimized. Geiser and Santelices stated, "High-school grades provide a fairer, more equitable, and ultimately more meaningful basis for admissions decision-making."

High School mathematics and science courses. According to the Texas Education Agency (TEA, 2009a) website, mathematics and science courses that high school students take include, Algebra I, Algebra II, Geometry, PreCalculus, Statistics, AP Calculus, IB Mathematics, and Engineering Mathematics. Science courses include Biology, AP Biology, IB Biology, Chemistry, AP Chemistry, IB Chemistry, Physics, AP Physics, IB Physics, Engineering Design and Problem Solving, and Scientific Research

and Design. Aldeman's National Study (2006) found academic intensity of one's high school curriculum to be the most important pre-collegiate factor in providing momentum toward completing a bachelor's degree. According to Higher Education (2006), University officials and researchers reported that the quality of teachers in kindergarten through 12th grade and the levels of mathematics and science courses completed during high school affected students' success in the decisions about pursing STEM fields. Because many students have not taken higher-level mathematics and science courses such as calculus and physics in high school, they were immediately behind other students. A study (Seymour& Hewitt, 1997) of several hundred students who had left the STEM fields reported that about 40 percent of those college students who left the science fields reported some problems related to high school science preparation (U.S. Government Accountability Office, 2006). Adelman's national study (2006) found academic intensity of one's high school curriculum to be the most important pre-collegiate factor in providing momentum toward completing a bachelor's degree. Benbow and Arjmand (1990) pointed out that differences in school programs appear to have a profound effect on levels of ability and achievement, even among the intellectually talented. Intellectually talented students will not achieve as highly if not provided with appropriate educational opportunities, (p. 437). Astin and Astin (1992) national study found that the strongest and most consistent predictor of changes in college students' interest in a science major and career is students' entry level of mathematical and academic competency. However, for example, when compared to White or Asian students, Latino students are far less likely to attend high schools offering trigonometry, much less, calculus (Adelman, 2006). In addition, when compared with students in the

highest socioeconomic status quintile, students in the lowest socioeconomic status quintile attend high schools that are less likely to offer any mathematics above Algebra II (Adelman, 2006).

SAT and ACT Examination. The SAT is a curriculum-based, college readiness test that assesses the academic skills and knowledge students acquire in high school and the ability to apply that knowledge. The ACT is a curriculum-based, college readiness test that assesses what students learn in their classes; similar to an achievement test. According to the ACT, females from all racial groups who planned to major in science consistently outscored males on the ACT math and science reasoning test. The College Board and ACT, Inc., have implemented policies to help overcome financial barriers that might otherwise prevent students from taking one or both of the examinations (ACT, Inc., 2010, College Board, 2010). For instance, test fee waivers from the College Board and from ACT, Inc., are available to junior and senior high school students based on economic need. In many Texas schools and districts, students who do not meet College Board or ACT, Inc., criteria for financial assistance may receive fee waivers if they meet local criteria and local funding is available.

Research Questions

1. Do major, SAT, parent's education and high school rank effect college preparation for all students?
2. Do major, SAT, parent's education and high school rank effect college preparation for Black males?

3. Do college GPA, earned credit hours and college GPA in STEM courses effect college performance for all students?
4. Do college GPA, earned credit hours and college GPA in STEM courses effect college performance for Black males?
5. Does College preparation effect college performance?

Research Hypotheses

Based on a *priori* review of the existing persistence of Black males in STEM fields, the following hypotheses will be evaluated during this study:

(H1) There is a significant and positive relationship between the variables major, SAT, parent's education and high school rank and college preparation for all students at Texas State.

(H2) There is a significant and positive relationship between the variables major, SAT, parent's education and high school rank and college preparation for Black male students at Texas State.

(H3) There is a significant and positive effect between the variables college GPA, earned credit hours and college GPA in STEM courses on college performance for all students.

(H4) There is a significant and positive effect between the variables college GPA, earned credit hours and GPA in STEM courses on college performance for Black male students.

(H5) There is a significant and positive relationship between college preparation and college performance.

Structural Equation Modeling

Structural equation modeling (SEM) is a collection of statistical techniques that allows a set of relationships between one or more independent variables, either continuous or discrete, and one or more dependent variables either continuous or discrete, to be examined (Tabachnick & Fidell, 2007). SEM is used within a confirmatory perspective and can also be used in an exploratory mode. SEM is also referred to as causal modeling, causal analysis, simultaneous equation modeling, analysis of covariance structures, path analysis, or confirmatory factor analysis. SEM conveys two important aspects of the method: (a) that the activities under analysis are represented by structural equations, and (b) that the activities under analysis can be demonstrated in a diagram or model form to enable a clearer concept of the hypothesis under examination. In this study, the model was tested to determine the extent in which it was consistent with the data (Byrne, 2000).

Structural equation modeling was appropriate to use in this study because of a number of advantages. One of these was that complex relationships are examined simultaneously. When the phenomena of interest are complex and multidimensional, SEM is the only analytic technique that allows complete and simultaneous tests of all the relationships (Tabachnick & Fidell, 2007). SEM is also a suitable method because it is a *priori*. A *priori* requires researchers to think in terms of conceptual models. According to Kline (1998), a *priori* specification reflects the researcher's hypotheses, and in total make up the model to be evaluated in the analysis. SEM was viewed as confirmatory in the present study, that is, the model was a given at the beginning of the analysis, and whether it was supported by the data was the main question to be answered.

Key Terminology

The following terms are relevant to the study and are commonly related with SEM. These key terms provide an overview and may be used in this study. The definitions are presented below.

1. *AMOS.* Analysis of Moment Structures is a module for SPSS. It is designed for SEM, path analysis and covariance structure modeling. It can also be used to perform liner regressions analysis, ANOVA and ANCOVA.
2. *A prior.* Means *prior to*. A distribution of the parameters before they are actually observed. Also known as priors. (Byrne, 2013).
3. *Bootstrapping.* This procedure in AMOS evaluates the sampling distribution of parameter estimates and associated standard errors, which is helpful in determining robustness under assumptions of multivariate normality or model misspecification, comparison of alternative models, and comparison of estimation methods (Schumacker & Lomax, 2004).
4. *Cause.* A direct effect of a variable on another within the context of a complete model (Byrne, 2000).
5. *Chi-square.* A statistic that examines the probability of test takers from different groups with the same ability levels correctly responding to an item. Follows a goodness-of-fit logic by testing the null hypothesis between an expected number of examinee responses in a particular category and the actual number observed to respond in that category (Isaac & Michael, 1995).
6. *Correlation*. The measure of size and direction of the linear relationship between two variables (Tabachnick & Fidell, 2007, p. 56).

7. *Data.* Score measurements related to the observed variables as derived from persons comprising the sample (Byrne, 2012).
8. *Dependent Variable*. The outcome variable that is influenced by another variable in the model (Schumacker & Lomax, 2004).
9. *Effect size.* A measurement of the magnitude of a result (Hulburt, 2006).
10. *Endogenous latent variable*. Endogenous variables are analogous with dependent variable, and are the measured outcomes of interest. Endogenous variables are influenced by the exogenous variables in the model, either directly or indirectly (Byrne, 2000).
11. *Exogenous latent variable.* Exogenous variables are analogous with independent variables. They cause fluctuations in the values of other latent variables in the model. Exogenous variables are influenced by other factors external to the model (Byrne, 2000).
12. *Fiscal Year.* Fiscal Year is a start date that institutions may choose to follow that is either a start date of July 1 or September 1 and an ending date in the next calendar year of June 30 or August 31 (TEA, 2009).
13. *Goodness-of-Fit*. (GOF) Used to indicate how well a specified model reproduces the covariance matrix among the indicator items. GOF measures are classed into three general groups: absolute measures, incremental measures, and parsimony fit measures (Hair, Black, Babin Anderson & Tatham, 2006).

14. *Histogram*. A graphical presentation of a grouped frequency distribution with frequencies represented as vertical bars; it is appropriate for interval/ratio data (Hulburt, 2006).
15. *Independent variable*. A variable that is not influenced by any other variable in the model (Schumacker & Lomax, 2004).
16. *Latent variable*. Abstract phenomena that cannot be observed directly (Byrne, 2000).
17. *Logistic Regression*. Allows one to predict a discrete outcome from a set of variables that may be continuous, discrete, dichotomous, or a mix (Tabachnick & Fidell, 2007).
18. *Measurement Error*. Associated with observed variables which reflects on their adequacy in measuring the underlying factors (Byrne, 2000).
19. *Measurement Model*. Examines the relations between the observed and unobserved variables (Byrne, 2000).
20. *Model.* The hypothesized structure linking the observed variables to the latent variables (Byrne, 2012).
21. *Nominal scale*. A scale of measurement that classifies objects into categories based on some characteristic of the object. Examples of nominal measurements include gender or race (Hulburt, 2006).
22. *Ordinal scale*. A scale of measurement that classifies objects into mutually exclusive categories base on some characteristic of the object and requires that this classification have some inherent, logical order. Examples of ordinal measurements include class rank or class standing (Hulburt, 2006).

23. *Path Diagrams*. Schematic representations that provide a visual portal of relations (Byrne, 2000).
24. *Path Analysis*. A statistical technique that explains the interaction between a set of exogenous variables and an endogenous variable (Mertler & Vannatta, 2005).
25. *Ratio scale.* An interval scale of measurement that has a true zero point (Hulburt, 2006).
26. *Residual term.* Often referred to disturbance terms, represents error in the prediction of endogenous factors from exogenous factors (Byrne, 2000).
27. *Structural Equation Model.* SEM was schematically portrayed using particular configurations decomposed into two sub-models of four geometric symbols – a circle, a rectangle, a single headed arrow and a double headed arrow. The circle represents unobserved latent factors and surrounds the error term, the rectangle represents observed variables and is not latent, the single headed arrows represent the impact of one variable on another, and the double headed arrow represents the correlations between pairs of variables.
28. *Validity.* Shows the extent to which an instrument accurately indicates or evaluates the concept the researcher is endeavoring to investigate (Tabachnick & Fidell, 2007).
29. *Z-score.* Also called the standard score. The z-score is a variable whose value counts the number of standard deviations a score is above or below its mean (Hulburt, 2006).

Method of Analysis

Structural equation modeling (SEM) was used to assess model fit, shown in Figure 2, College Prep, and Figure 3, College Performance to determine the strength of the relationships between the variables. These variables were selected after reviewing existing literature and a decision to conduct research to add to the current literature on this topic. The findings will either support or counter previous established hypotheses from the research. The model in Figure 2 and Figure 3 was postulated by the researcher. Once the model was specified, the credibility of the model was tested based on the empirical. This model testing procedure is defined as the goodness-of-fit between the model that is theorized and the data. It is highly unlikely that a perfect fit will exist between the observed data and the hypothesized model. Having a perfect model-data fit is highly unusual since there are other variables outside that effect the model, however it is possible to improve the model and remove specification error. The model-fitting process is therefore summarized as:

Data = Model + Residual

where the data represents score measurements related to the observed variables, model represents the hypothesized structure linking the observed variables to the latent variables, and the residual represents the discrepancy between the hypothesized model and the observed data (Byrne, 2012).

Path diagrams are key to SEM because it requires the researcher to diagram the hypothesized set of relationships (Tabachnick & Fidell, 2007). The measured variables are represented by squares and are called observed variables. Factors that have two or

more indicators are called unobserved variables. In Figure 1, these configurations represent an important component in the analytic process.

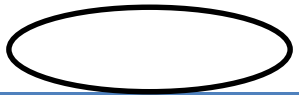
Symbol	Definition
	Rectangles represent observed variables.
	A single headed arrow represents the impact of one variable on another
	A double headed arrow represents covariance or correlation between pairs of variables
	The circle or ellipses represents unobserved latent factors

Figure 1: Diagram Showing Symbol and Definition of Path Analysis Model. Configurations used in path analysis modeling information about symbols used with path analysis modeling taken from Bryne, B. M. (2010). *Structural Equation Modeling with AMOS. Basic Concepts, Applications, and Programming*. New York, Routledge.

Measure of Variables

In this study, the first latent variable model (LVM) is looking at College Preparation (COP), which appears in Figure 2. In this model, college preparation is a latent variable (a factor) that is not directly measured but assessed indirectly using intended major, parent's education, SAT test scores, and student's high school rank. The second latent variable model is College Performance (CP), which appears in Figure 3. In this model, college performance is the latent variable and indirectly assessed by the college GPA, average grade in college STEM courses and credit hours earned.

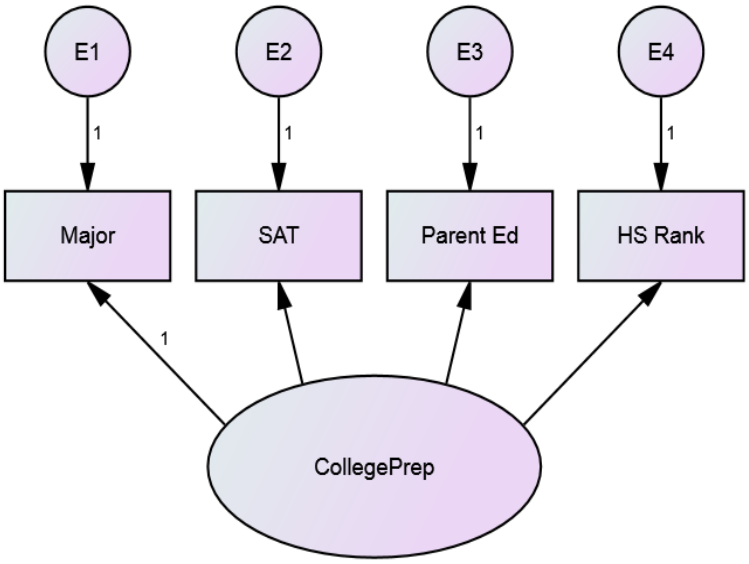


Figure 2: Latent Variable Model for College Preparation. This figure depicts one of the Latent Variable Models developed for this study. Observed variables are in the rectangles (major, SAT score, parent highest education, and high school rank) and the latent variable is in the ellipse (College Preparation). The errors are illustrated as circles.

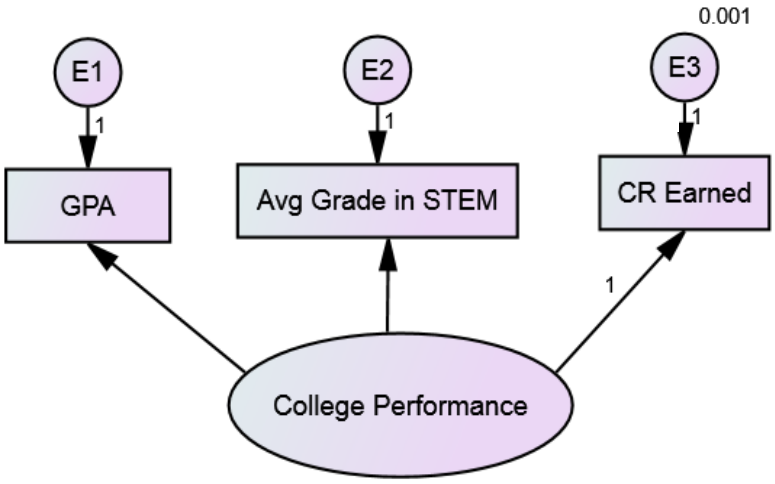


Figure 3: Latent Variable Model for College Performance. This figure depicts one of the Latent Variable Models developed for this study. Observed variables are in the rectangles (college GPA, average grade in STEM courses, credit hours earned) and the latent variable is in the ellipse (College Performance). The errors are illustrated as circles.

The latent variables of College Preparation (COP) and College Performance (CP) were not established and each of these variables were calculated by analyzing the observed variables in each model shown in figure 2 and figure 3. The analysis outcome of college preparation and college performance is saved and a linear regression is used as the statistical analysis to find the effect of the latent variable college preparation on the latent variable college performance. College performance is the dependent variable and College Preparation is the predictor and is independent. Both variables are measured as categorical variables. By using a linear regression model, it provides more flexibility than other techniques. Linear regression or multiple linear regression offer assessments of assumptions simultaneously through analysis of residuals. Examination of the residuals provides a test of assumptions of normality, linearity, reliability of measurement and homoscedasticity. (Tabachnick & Fidell, 2007). Figure 4 depicts the linear regression model for this study.

Figure 4: Linear Regression Model for Finding College Performance (CP). This figure depicts the effect of College Preparation (COP) on College Performance (CP).

Summary

Based on the analytic results, the goal is to demonstrate that the relationships are positive and significant and that adequate goodness of fit statistics will be observed based on the model-data fit. The selection of the linear regression statistical analysis is

necessary based on the two latent variables and finding the effect one would have on the other. With knowledge of this information, Texas State University's College of Science and Engineering would be able to support Black male students in the STEM fields and assist in their persistence at Texas State University.

CHAPTER IV

RESULTS

This chapter provides the results of the analyses of the structual equation models used to evaluate the relatiships between the outcomes of college preparation and college performance of all students. In particular, Black students, specifically Black men that are not persisting at Texas State University in the STEM fields were the focus of the analyses. The sample consisted of quantitative and ordered categorical data that identified students who attended Texas State starting in 2002 with an anticipated major in the STEM fields. This sample was examined and the findings are presented in the following manner: (a) descriptive statistics for each model, and (b) evaluation of the research questions.

The data utilized for this study were provided by Institutional Research located at Texas State University, and included a collection of demographic information that were analyzed by utilizing a logistic regression analyses.

1. Do major, SAT, parent's education and high school rank effect college preparation for all students?
2. Do major, SAT, parent's education and high school rank effect college preparation for Black males?
3. Do college GPA, earned credit hours and GPA in STEM courses effect college performance for all students?
4. Do college GPA, earned credit hours and GPA in STEM courses effect college performance for Black males?

5. Does College preparation effect college performance?

Data screening was performed on the complete data set in order to identify any missing or out-of-range values before using SEM to analyze the data. After data screening and subsequent cleaning, the final analytic sample included all students (N=5422) and Black males (N=1627).

The first model (Figure 5) illustrates the Latend Variable Model for College Preparation (COP) for all students in the data set. The observed, endogenous variables for this model are Major, which is comprised of STEM majors at Texas State and those students that chose one of the STEM fields as their major of choice, the SAT which includes all SAT scores and ACT scores converted to the SAT equivalent using the converstion chart (Appendix B), Parent Education that included parents who did not finish high school to those who have a masters degree or higher, and HS rank. College Preparation is the latent variable that is effected by the listed observed variables for all student population. College Preparation for all students was estimated using the model shown in figure 5.

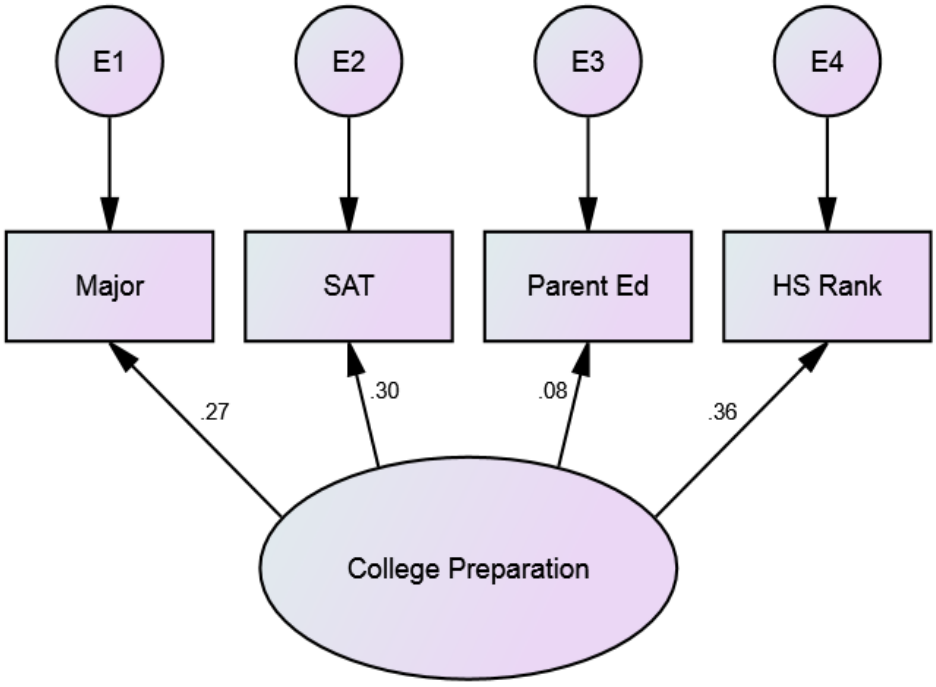


Figure 5: Latent Variable Model for College Preparation (COP) for All Students. This figure depicts the standardized results of the model developed for this study for all students.

Path analysis depends on having normally distributed data. Data can be normally distributed if the absolue values of skewness/standard error of skewness and kurtosis/standard error of kurtosis are both less than two. The data is run for the entire population and forevery variable used in the latent variable models. Table 8 shows the results for these data. These analysis indicate that the data are not normally distributed and are statiscally skewed or multivariate non-normal. In SEM, the maximum likelihood estimator produces biased santard error of beta weights, resulting in incorrect statistical ests of signifcnace. The variable in the study are skewed or display excessive kurtosis so a bias was run, corrected confidence intervals and the results reported in table 8.

Table 8

Skewness and Kurtosis of Variables for All Students

		GPA	Avg Grade in STEM	Credits Earned	Major	HS Rank	Highest Parent Ed	SAT Total
N	Valid	5422	5422	5422	5422	5422	5422	5422
	Missing	0	0	0	0	0	0	0
	Mean	2.65	2.08	31.94	399.17	69.52	4.00	1058.85
	Median	2.78	2.00	16.00	401.20	72.00	4.00	1050.00
	Std. Deviation	.92	1.33	30.57	202.88	17.95	1.31	129.54
	Skewness	-.89	-.22	1.53	.13	-.64	.24	.13
	Std. Error of Skewness	.033	.033	.033	.033	.033	.033	.033
	Standardized Skewness	-26.9	-12.8	4.67	3.94	19.45		
	Kurtosis	.57	-1.11	1.84	-1.04	.023	1.32	.411
	Std. Error of Kurtosis	.067	.067	.067	.067	.067	.067	.067
	Standardized Kurtosis							
	Minimum	.00	.00	0	100.00	2	1	510
	Maximum	4.00	4.00	194	790.99	100	13	1510

Table 9 provides a summary of the statistical results. The chi-square statistic shows x^2 (2, N=5422) = 102.31, p = .000 which is significant. Table 9 include standard error (S.E.), probability (P), critical ratio (CR) which divides the regession weight estimate by the estimate of its standard error and the estimate of the standardized regression weight (r) are expressed in z-score form .

Table 9

Summary of Regression Analysis for College Preparation for All Students

			Estimate	Lower	Upper	S.E.	C.R.	p	r
Major	<---	COP	0.27	0.07	0.34			0.001	0.27
SAT	<---	COP	0.30	0.19	1.08	0.12	5.66	0.001	0.30
Parent Education	<---	COP	0.07	-0.01	0.21	0.00	2.61	0.162	0.08
HS Rank	<---	COP	0.36	0.08	0.51	0.02	5.19	0.014	0.36

There is a moderate correlation between the SAT and college preparation, a moderate correlation between high school rank and college preparation of all students and a moderate correlation between major and college preparation . The parents education shows a weak correlation to college preparation for all students in the sample. Each variable, major, SAT, parent education and HS rank is statistically significant.

Determining adequacy of model fit in SEM involves the evaluation of several model fit indices. Specifcially, criteria have been developed to assist in interpreting structural equation models under different model building assumptions (Schumaker & Lomax, 2004). Evaluation of adequate model fit is determined by the degree to which the sample variance-covariance data fit the proposed (or theorized) structural equation model (Schumaker & Lomax, 2004). The model fit summary for the COP model (Figure 5) shows that the comparative fit index (CFI) is 0.59 (Table 10). Accepatble cutoff for the CFI is 0.95 (Schumacker & Lomax, 2004). The CFI value indicates a poor fit of the model for College Preparation for all students (Table 10). The Root Mean Square Error of Approximation (RMSEA) dispayed a fit index of .09 for the default model (i.e. the COP model) which suggests a poor fit and. the RMSEA point estimate is 0.09 for All

Students with a 90% CI [0.08 - 0.11] for the default model and 0.09 for All Students with a 90% CI [0.08 - 0.10] for the independent model. which suggests a reasonable fit, but close to the indication of a poor fit index (Table 11).

Table 10

Summary of Model Fit for College Preparation for All Students

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0.60	-0.21	0.60	-.021	0.59
Saturated model	1.00		1.00		1.00
Independence model	0.00	0.00	0.00	0.00	0.00

Table 11

RMSEA for College Preparation for All Students

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.09	0.08	0.11	0.00
Independence model	0.09	0.08	0.10	0.00

The same College Preparation model was run for Black males. It looked at the same variables and relationship between those variables and the latent variable, college preparation (COP). Figure 6 indicates the model ran for Black males to determine the statistical outcome of the four variables on College Preparation.

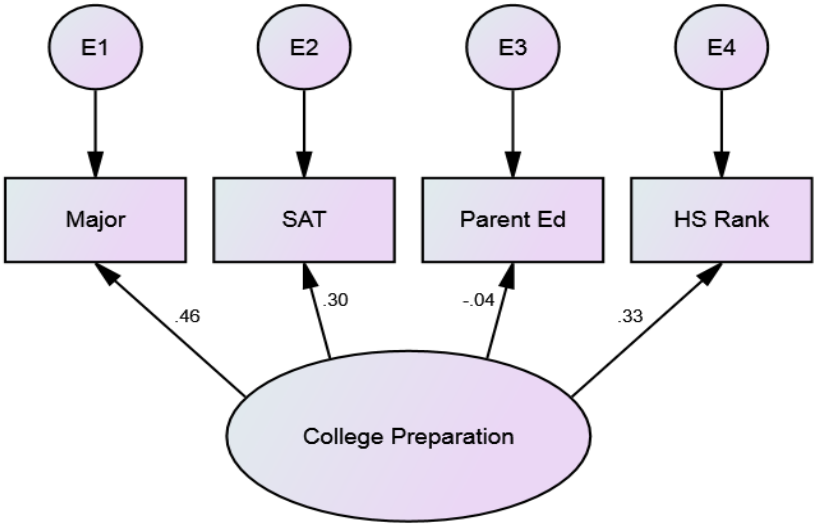


Figure 6: Latent Variable Model for College Preparation (COP) for Black Males. This figure depicts the standardized results of the model developed for this study for Black males.

Table 12 shows the summary of statistics. The chi-square statistic shows a value x^2 (2, N = 1627) = 4.41, p = 0.11 which is significant .

Table 12

Summary of Regression Analysis for College Preparation for Black Male Students

			Estimate	Lower	Upper	S.E.	C.R.	p	r
Major	<---	COP	0.46	0.33	0.77			0.004	0.46
Parent Education	<---	COP	-0.04	-0.12	0.04	0.0005	-0.8922	0.363	-0.04
HS Rank	<---	COP	0.33	0.20	0.43	0.0202	3.5645	0.003	0.33
SAT	<---	COP	0.30	0.30	0.40	0.1268	3.6385	0.003	0.30

There is a moderate correlation for Black males when it comes to the major having a direct effect on College Preparation. The same is true for high school rank and SAT scores. There is a negative correlation between parent education and college preparation where parent education does not effect the preparation of the Black male student. There is, however, some statistical significance of SAT scores, high school

rank and major, but less of a significance for parent education.

The model fit summary shows that the comparative fit index (CFI) is 0.97 and indicates excellent goodness of fit, but not a strong fit for Black males (Table 13). The Root Mean Square Error of Approximation (RMSEA) displays a fit index of 0.03 for the default model (i.e. the College Preparation model) which suggests an approximate fit and the RMSEA point estimate is a 0.09 for the Black males with a 90% CI [0.00 - 0.06] for the default model and 0.09 for Black males with a 90% CI of [0.07-0.11] for the independent model which suggests a poor fit (Table 14).

Table 13

Summary of Model Fit for College Preparation for Black Male Students

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0.95	0.85	0.97	0.91	0.97
Saturated model	1.00		1.00		1.00
Independence model	0.00	0.00	0.00	0.00	0.00

Table 14

RMSEA for College Preparation for Black Male Students

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.03	0.00	0.06	0.83
Independence model	0.09	0.07	0.11	0.00

Comparisons of the findings of all students and Black male students were calculated for each population using the equation found in figure 7. The z model looks at and compares the experience of Black males and all students. The formula encompasses b_1 which represents the regression coefficient for all students, b_2 is the regression coefficient for Black male students, the SE_{b1} is the standard error of the regression coefficient for all

students andd SE_{b2} is the standard error of b_1. This makes up the formula that produces a z-score.

$$z = \frac{b_1 - b_2}{\sqrt{SE_{b_1}^2 + SE_{b_2}^2}}$$

Figure 7: Z formula Diagram. Z formula consists of b_1, which is the regression coefficient for all students, b_2 is the regression coefficient for Black male students, SE_{b1} is the standard error of the regression coefficient for all students (b_1) and SE_{b2} is the standard error of b_1.

The thought in looking at the z-score is that, even though the goodness-of-fit calculations indicate that these models cannot be used for prediction, the regression coeficients are significant and can be used to compare the experiences of Black males to the general population. Table 15 highlights the results of the variables for the z-score and regression coefficients for the comparison of all students and Black males. According to the results, Parent Education is two standard deviations above the mean and HS Rank and SAT are a little over one standard deviation above the mean. Note that the parent education has a signicantly different impact on Black males than the general population. For the general population, parent education is a significant predictor ($z=5.66$, $p<0.01$) but for Black males, there is not a significant relationship between parent education and college preparation ($z=-0.89$, $p=0.37$).

Table 15

Comparison of Regression Coefficient for College Preparation of All Students and Black Male Students

	z	p
Parent Education	2.59	0.01
HS rank	1.48	0.13
SAT	1.37	0.16

College Performance (CP) is a latent variable in the next model, figure 8, and looks at values once a student has entered college and how they are performing. It takes their grade point average (GPA) and their average grade in the STEM courses, those including the math and sciences, as well as their total credits earned and determines if there is some relationship or effect that each of these may or may not have on College Performance. This model utilized the sample of all students (N=5422) that were pursuing a STEM major and for all Black males (N=1627) that were on the same path. The model contained the following observed variables: GPA, average GPA in STEM courses, and credits earned. The Chi-square statistic shows a value x^2 (1, N= 5422) = 1497.81, p =.00 which is statistically signifcant.. The results for all students are shown below in table 16 in standardized estimates.

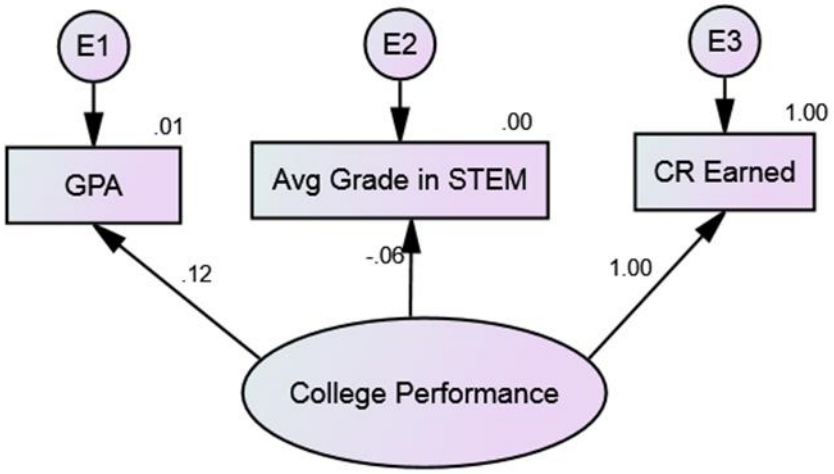


Figure 8: Latent Variable Model for College Performance (CP) for All Students. This figure depicts the standardized results of the model developed for this study for all students.

Table 16

Summary of Regression Analysis for College Performance for All Students

			Estimate	Lower	Upper	S.E.	C.R.	p	r
				0.99	1.00				
CR Earned	<---	CP	0.99					0.003	0.99
Avg Grade				-0.09	-0.01				
In STEM	<---	CP	-0.05			0.00	-3.71	0.049	-0.06
GPA	<---	CP	0.12	0.08	0.16	0.00	7.07	0.003	0.12

There is a strong correlation between the credits earned and college performance, however, there is a negative relationship with the average STEM grade to College Performance, and the overall GPA on College Performance shows a low correlation. The results show there is a statistically significant relationship for GPA, average STEM grade and credits earned.

This model fit is not strong, but it provides the comparison data in table 17. The model fit summary shows that the comparative fit index (CFI) is 0.06 and indicates goodness of fit, but not a perfect fit for all students. The Root Mean Square Error of Approximation (RMSEA) displays a fit index of 0.52 for the default model and a 0.31 for the independent model (i.e. the College Performance model) which suggests an appropriate fit and the RMSEA point estimate is 0.52 for all students with a 90% CI [0.50 - 0.55] for the default model and .031 with a 90% CI [0.29-0.32] for the independent model which results in a poor fit and results are shown in table 18.

Table 17

Summary of Model Fit for College Performance for All Students

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0.06	-1.82	0.06	-1.82	0.06
Saturated model	1.00		1.00		1.00
Independence model	0.00	0.00	0.00	0.00	0.00

Table 18

RMSEA for College Performance for All Students

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.52	0.50	0.55	0.00
Independence model	0.31	0.29	0.32	0.00

The College Performance model (figure 9) shows similar results for Black male students as the statistical findings for all students. Credits earned is strongly correlated with college performance while average grade in STEM and GPA depict a low correlation. The Chi-square statistic shows a value $x^2 (1, N=1627) = 448.20$, $p = 0.00$ which is statistically signifcant. The results for Black males are shown below in table 19 in standardized estimates.

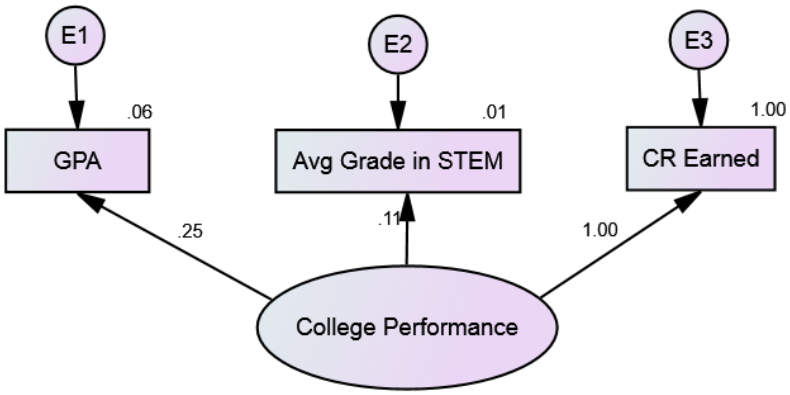


Figure 9: Latent Variable Model for College Performance (CP) for Black Male Students. This figure depicts the standardized results of the model developed for this study for Black male students.

Table 19

Summary of Regression Analysis for College Performance for Black Male Students

			Estimate	Lower	Upper	S.E.	C.R.	p	r
CR Earned	<---	CP	0.99	0.99	0.99			0.005	0.99
Avg Grade In STEM	<---	CP	0.11	0.03	0.17	0.00	4.09	0.045	0.11
GPA	<---	CP	0.24	0.16	0.30	0.00	9.35	0.007	0.24

The model fit is still not the best fit for the data. The model fit summary, displayed in table 20, shows that the comparative fit index (CFI) is 0.08 and indicatesa poor fit.. The Root Mean Square Error of Approximation (RMSEA) displays a fit index of 0.52 for the default model and a .32 for the independent model (i.e. the College Performance model) which suggests an appropriate fit and the RMSEA point estimate is 0.52 for Black males with a 90% CI [0.48 - 0.56] for the default model and 0.32 with a 90% CI [0.29- 0.34] for the independent model which results in a poor fit and results are shown in table 21.

Table 20

Summary of Model Fit for College Performance for Black Male Students

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0.089	-1.73	0.089	-1.74	0.08
Saturated model	1.00		1.00		1.00
Independence model	0.00	0.00	0.00	0.00	0.00

Table 21

RMSEA for College Performance for Black Male Students

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.52	0.48	0.56	0.000002
Independence model	0.32	0.29	0.34	0.000002

Z-scores and regression coefficient were calculated for each population for College Performance for all students and Black males. Comparisons were calculated using the same z formula in figure 7. Table 22 highlights the results of the variables for the z-score and regression coefficients for the comparison of all students and Black males for College Performance. According to the results, average grade in STEM and GPA shows a negative five standard deviations below the mean.

Table 22

Summary of Regression Coefficients Comparisons for All Students and Black Male Students for College Performance

			z	p
Average Grade in STEM	<---	CP	-5.30	<0.01
GPA	<---	CP	-5.92	<0.01

Now that College Preparation and College Performance was observed for all students and Black males, the two observed variables are placed in an overall model that

seeks to determine if College Preparation (COP) has an effect on College Performance (CP). Figure 10 displays the model and table 22 shows the results of the model for both all students and Black male students. There is a similar measure of effect for the Black males and all students. Table 23 and table 24 shows model fit. Table 25 gives the summary of the linear regression coefficient comparisons for College Preparation and College Performance.

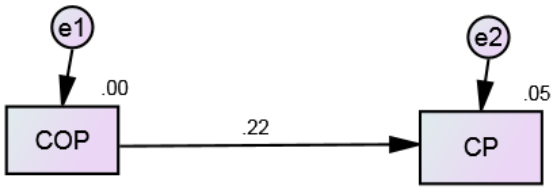


Figure 10: Structural Equation Model for College Preparation (COP) and College Performance (CP).

Table 23

Summary of Regression Analysis for College Preparation and College Performance of All Students and Black Male Students

		Estimate	S.E.	C.R.	p	r
CP – All Students <---	COP – All Students	0.12	0.01	7.73	<0.01	0.10
CP – Black males <---	COP – Black males	0.22	0.04	9.16	<0.01	0.22

According to these results in both cases, College Preparation has a small impact on College Performance. In order to compare these two relationships, Black males and all students, a z-score was calculated using the Estimate and Standard Error for both relationships.

The goodness-of-fit of these two variables, College Preparation and College Performance, seeks to look at and compare the two samples and the relevance of the two variables. The RMSEA measures the error of approximation and table 25 shows the

RMSEA is 0.22, which is not a good fit for the model. However, in table 24, the CFI shows a good fit of 1.00.

Table 24

Summary of Model Fit for College Preparation and College Performance

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI	GFI
Default model	1.00		1.00		1.00	1.00
Saturated model	1.00		1.00		1.00	1.00
Independence model	0.00	0.00	0.00	0.00	0.00	0.95

Table 25

RMSEA for College Preparation and College Performance

Model	RMSEA	LO 90	HI 90	PCLOSE
Independence model	0.22	0.18	0.26	0.00

Table 26

Summary of Regression Coefficients Comparisons for College Preparation and College Performance

	z	p
CP<-COP	-3.47	<.01

According to these results, in both cases, College Preparation has a small but significant impact on College Performance. In order to compare these two relationships, Black males and all students, a z-score was calculated using the Estimate and Standard Error for both

relationships. The significant z-score ($z=-3.47$, $p<0.01$) indicates that the experiences of Black males is significantly different than the experiences of the general population.

Summary

Overall, the model fit is poor. It is very difficult to expect a good fit with the variables in the model. The results show that the preparation and experience of Black males is different from that of all students.

CHAPTER V

DISCUSSION AND CONCLUSIONS

Introduction

This chapter looks at the significance of this study, how the use of this data will help with the practical and theoretical aspects of the research, limitations of the study and recommendations for further research. This study took a look at a large student population from Texas State University whose intent is to major in one of the STEM fields.

Review of Research Study

The purpose of this study was to add to the knowledge of why Black students, specifically the rate of persistence of Black males in STEM, is lower at Texas State than it is for the general student body. It was also to determine if specific factors like the SAT, parent's education, high school rank, GPA and STEM courses predict College Performance in Black men. The study sought to determine the effect of College Preparation on College Performance for all students and specifically Black males that have attended Texas State University. The theoretical framework for the study was in critical race theory. A path analysis model was developed to determine the effect that the observed variables had on College Preparation for all students and Black male students. A second path analysis model was developed to determine the effect that the observed variable of GPA, average grade in STEM and credits earned had on College Performance for all students and Black male students. A structural equation model was developed to look at the effect of College Preparation on College Performance for all students and Black male students.

Data analysis was based on student data from Texas State University in 2002 to 2014 and students indicated on their ApplyTexas application that they would major in one of the STEM fields. The quantitative data were provided by the Office of Institutional Research at Texas State University. With such a large sample size over the course of 12 years, the data had to be trimmed down to produce a sample size that included complete data. The sample size of 5,422 consisted of all students and the sample of 1,627 students consisted of all Black males. The results from the data included standardized regression coefficients, goodness-of-fit and z-scores.

Review of Literature Findings

As found in the research, 65 percent of college students who enter into college with the intention majoring in the STEM field were not completing a degree within six years of matriculation (NCES 2009). The number of Black students that matriculate in six years is 18 percent lower than their White peers. The preparation is measured and defined by test scores, grades and courses taken. To determine if this is true for all students and Black males, the study looked at the factors of test score, parental education, grades and courses taken. The literature also showed that student's prior preparation and attitudes toward math and science in high school are the strongest predictors of entrance in a STEM major in college (Tai, Liu, Maltese, & Fan, 2006). Although past studies have identified a relationship between observable college readiness and college performance, there is evidence that much of this relationship is related to high school and college sorting rather than underlying student ability (Rothstein, 2004). Studies also report that SAT scores are less predictive of college performance for Black students than

for other students (Bowen & Bok, 1998). Another study (Spruill, Hirt & Mo, 2014) provided results that race has negative influence on the persistence of Black male students. Being Black significantly, but negatively influenced persistence to a degree. The findings of this study support the body of literature that exits where Black males do not graduate from college or persists in college at the same rate as other students.

As found in the literature, there is still some work to be done with finding a good predicted model. There is not one good way of predicting success. Since there is not one specific way or model to predict success for students in the STEM fields, there may be other ways to support the student. There is no perfect model and what may work for one group of students does not work for other populations. The models in this study indicate that predictors of success vary for each group. There needs to be different models for the general population and a separate model for Black males.

Discussion of the Results

The discussion of results includes an overview of the outcomes of College Preparation and College Performance of all students and Black male students. For all students, high school rank, SAT, and parent education are significant predictors for College Preparation. Parent education, high school rank and SAT were also significant for Black males and had a different impact on the Black males more than all students. For Black males, results indicated that high school rank and SAT demonstrate a moderate contribution, while Parent Education depicts a negative contribution on College Preparation.

For all students, there was a strong contribution of Credits Earned and College Performance. For Average Grade in STEM, there was a negative contribution between the Average Grade in STEM and College Performance, and the overall GPA indicated a low statistical relationship between College Performance. GPA and average STEM grades are both significant for all students. The same results for all students is also indicated for Black males, as having a significant relationship. There is a strong correlation of credits earned to College Performance, but there is a low correlation between average grade in STEM and GPA for Black males.

As an administrator that works with students, it is important for students to have a strong foundation in high school so that as they transition to college, they are prepared academically. Many students are not prepared due to the high schools they are attending or the curriculum they are taking. There are more privileged students with access to better schools, public or private, and at times, better teachers. There are wealthy school districts that have access to college readiness classes, SAT and ACT prep courses as well as the parents playing an active role. For those students that are not in the wealthy districts, majority minority students, they do not have access to prep courses, they do not always have the best teachers and overall support from the parents is limited. Black males having a parent with more than a high school diploma strengthens their ability to succeed. The parents tend to understand the process of applying to college and what it takes to be successful and earn a degree versus those parents that are not knowledgeable about the subject of higher education.

This information is significant because it provides colleges and universities the information needed to better serve Black male students entering into the STEM fields. The information is very useful but there are still questions to be answered based on the variables and factors that predict college success. As the new redesign of the SAT becomes available in 2016, there will be interest in understanding how this will effect student success and if it will continue to be a predictor of academic success and not be considered biased for specific populations.

Implications of Practice

Determining that the relationship between College Preparation and College Performance was significantly different for Black males than the general population means that the college experience of Black males is different than the college experience of the student body in general. There are several indicators in here that say the measures used in College Preparation have a different impact on that variable for Black males when compared to the general population. As such, in practice, it is not logical to assume that the criteria used for measuring College Preparation should be used for Black males as the rest of the student body. When it comes to admissions decisions, the construct "College Preparation" were poor predictors of College Performance. This research would imply that different measures of College Preparation should be developed and the measures for Black males should potentially be different from those used for other groups. Certainly, Universities and Colleges need to work to further define the predictors of College Performance with a focus on developing a flexible approach that improves the predictive performance of the admissions criteria. This can determine if the knowledge

and experience they bring with them to college will predict a positive outcome for them, ultimately resulting in earning a degree. Admission offices need to take this into account that not all students will have the same predictors of success. Admissions offices need to account for this in their processes and especially for those offices that conduct a holistic review of a student's file. Administrators need to look at what they can do to begin removing barriers to promote college success for these students. Many of these students are faced with working to cover college expenses, which financial aid does not cover, resulting in working more hours and possibly studying less. This results in low grades and eventually departure from college. This continues to be a factor of understanding why this happens to students and how to provide better support for students in this predicament.

Implications of Future Research

Based on the results of the study, the following implications for future research are worthy of consideration. First, understanding the type of high school the student attends and the Texas Education Agency high school accountability performance rating that the school holds would provide insight into the rigor of courses offered, student achievement, student progress, closing performance gaps and postsecondary readiness of students. This information would provide a better understanding of the students and their preparation for college based on the courses taken at the high school level.

Another area of future research would be to draw on the strength of a qualitative method of a specific cohort of Black students to determine their academic experience. Gathering qualitative data from the experiences the students had in high school taking STEM related courses, as well as their first year in college and their experiences and

interactions with the professors and other staff on campus would capture a holistic view that would provide a more in-depth understanding of engagement in the classroom and determine if there is a strained and unsupportive relationship with professors. It would also provide educators an opportunity to establish if the students were prepared based on the prerequisite courses taken during their high school years as well as in college.

Another area that would be crucial to future research is to look at the students experience utilizing tutoring services available to them and the use of such services. It would be beneficial to look at Black male students and their experience with student service resources, whether it is group tutoring services, one-on-one tutoring, or study skills and if those services had any effect on their success with persistence in the STEM courses.

Conducting a similar type of research at a Historically Black College and University (HBCU) would be an opportunity to analyze if Black males that enroll at a HBCU have the same experiences and get the same or similar support. It would be beneficial to see if these students are more apt to persist based on their environment, interaction with faculty and campus climate.

One last area to consider for future research is to determine the persistence rate of Black males transferring from the community college. This would provide a different outlook on the matter of College Preparation for those attending a community college and transferring to a 4-year university. This would provide a different view of the students graduating high school and entering the community college first, then transferring to the university setting to complete their STEM degree versus going directly after high school to attend the university.

Limitations of the Study

The data used during this study focused on the information the student provided on their application to Texas State. The ApplyTexas application asks for biographical information and only a small portion of academic information, all of which is self-reported by the student. If the student did not answer all the questions or were unsure of the answers, the results provided through ApplyTexas would be slanted. If the study were to seek academic information from the high school, whether it were the high school transcript or any other academic record for the student, the researcher would have to acquire access to hard copy and electronic high school transcripts in order to get the curriculum data. High school transcripts are not all the same in structure and content. When the high school transcript is sent to the university, it could be in a hard copy form or electronic form. Depending on the process the university has, the high school courses may be hand entered on the student's university record or downloaded. With such a variety of styles and layouts, not one transcript is alike and not all information is loaded the same. To gather the academic data from the high school, it would take more time and manual intervention of the researcher because each transcript is different and the information provided on the transcript is not always consistent with other school districts. Other limitations would be that this study was only done at one institution. Looking at student data from various institutions would provide a more in-depth understanding of Black males and their College Performance in the STEM fields at those institutions.

Summary and Conclusion

This study sought out to determine why Black males were not persisting in the STEM fields at Texas State. With many different factors that can influence and effect the success of a student, this study brought out more issues to research. The study took a look at all students and Black males students to determine if there were any correlations between variables presented and College Preparation and College Performance. This study was important regardless of the models or limitations because research continues to be conducted on the Black male student searching for persistence in STEM. There continues to be a gap in persistence among Black male students and other students. It can be determined that preparation and experience of Black students is different that than of all students, mainly White students. For all students, it was determined that their experience with STEM does not affect their college success. The findings of this study will add important information to the existing research. The findings will also prompt new questions regarding specific experiences the students are encountering when it comes to the various tutoring services available.

While a number of Black students continue to be accepted into institutions of higher learning and successfully graduate in the STEM fields, the rate that Black males that do not persist in the STEM fields is much lower than that of the general population. There continues to be a need for sufficient research analyzing and understanding the problem. There will continue to be challenges for this population in higher education and will need to continue to be studied to determine the factors that make them successful.

APPENDIX SECTION

APPENDIX A

ApplyTexas Application
Freshman Admission

THIS APPLICATION SHOULD NOT BE USED BY INTERNATIONAL STUDENTS.
You are encouraged to complete this application online at www.applytexas.org.
This application is intended for use in applying for Academic Year 2014-2015.

Write in the name of the college or university to which you are applying. On the line below the institution's name, write in your first-choice and second-choice majors. You can find the majors and codes/abbreviations online at www.applytexas.org or on institution websites.

Institution: _____

(Semester / Year)

Major:

_____

(Major Name--First Choice) (Major Name--Second Choice)

PART I. BIOGRAPHICAL INFORMATION

1. U. S. Social Security Number * (see note below):
   _____

2. Date of Birth (Required): _____(mm/dd/yyyy)
   (Month/Day/Year)

3. Full, Legal Name:
   _____
   (Last Name/Family Name) (First Name) (Middle Name)
   (Suffix: Jr., etc.)

4. If you attended school using a different name or took a standardized college entrance exam using a different name, please listname(s):_____

5. Gender: ___ Male ___ Female

6. Place of Birth:
   _____
   (City) (State) (Country if not U.S.)

7. Ethnic and Racial Background: The information in this question will be used for federal and/or state law reporting purposes and may be used by some institutions in admission or scholarship decisions.

(a) Are you Hispanic or Latino (a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race)?
_____Yes _____ No

(b) Select the racial category or categories with which you most closely identify. Check as many as apply.

____ American Indian or Alaskan Native ____ Asian ____ Black or African American ____ Native Hawaiian or Other Pacific Islander ___ White

8. Are you a U.S. citizen? _____ Yes _____ No

(a) If "No," of what country are you a citizen? _____

(b) If you are not a citizen, do you hold U. S. Permanent Resident status (valid I-551)?
_____ Yes _____ No

If "Yes," date permanent resident card* issued: _____/_____/_____

Alien Number: _____

*Enclose a copy of both sides of the card. (Month) (Day) (Year)

(c) If you are not a U.S. citizen or permanent resident, do you have an application for permanent residence (form I-485) pending with the U. S. Citizenship and Immigration Services (USCIS)?

_____ Yes _____ No (If "Yes," enclose a copy of your Notice of Action from the USCIS, form I-797C.)

(d) If you are not a citizen or permanent resident or have no application pending with the USCIS, did you live or will you have lived in Texas for 36 consecutive months leading up to high school graduation or completion of the GED?

_____ Yes _____ No (If "Yes," please submit a completed "Affidavit of Intent to Become a Permanent Resident." The affidavit is usually available from a college or university's admissions or international admissions office.)

(e) If you are not a U.S. citizen or U.S. permanent resident, are you a foreign national here with a visa that makes you eligible to domicile for Texas residency purposes or are you a Refugee, Asylee, Parolee or here under Temporary Protective Status?

_____ Yes _____ No (If "Yes," please submit a copy of your Notice of Action from the USCIS, form I-797C, or a copy of your current visa.)

9. Status as a current U.S. military service member, veteran, or dependent:

U.S. military service member is a person who is serving in any branch of the U.S. Armed Forces, including the National Guard or Reserves. Please select any of the following that apply to you. I am a:

___ Veteran (former U.S. military service member) ___ Spouse or dependent of, or a veteran or current U.S. military

___ Current U.S. military service member

Service member with an injury or illness resulting from military service (service-connected injury/illness)

___ Spouse or dependent of a deceased U.S. service member

___ Spouse or dependent of a veteran or a current U.S. military service member

10. Permanent Address: _____ Apt # _____

City: _____ County: _____ State: _____ Zip: _____ Country: _____

11. Physical Address (Current street address where you reside, if your Physical Address is the same as your Permanent Address, leave this question blank.):

_____ Apt #: _____

City: _____County: _____ State: _____ Zip: _____ Country: _____

12. Phone Numbers:

Preferred Phone: ( ) _____ Preferred Phone Type _____

Alternate Phone: ( ) _____ Alternate Phone Type _____

13. Emergency Contact Name: ___Mr. ___Mrs. ___Ms. _____
(Last Name/Family Name) (First Name)

Address:

_____

Phone: _____ E-mail for Emergency Contact: _____

Your E-mail Address: _____

Please indicate the highest level of your parents' or legal guardians' educational background:

Father/Legal Guardian:

___ No high school ___ Some high school ___ High school diploma or GED ___ Some College
___ Associate Degree ___ Bachelor's Degree ___ Graduate/Professional Degree ___ Unknown

Mother/Legal Guardian:

___ No high school ___ Some high school ___ High school diploma or GED ___ Some College
___ Associate Degree ___ Bachelor's Degree ___ Graduate/Professional Degree ___ Unknown

In addition to English, what languages do you speak fluently?

Language _____ Years Spoken _____

Language _____ Years Spoken _____

Please indicate your family's gross income for the most recent tax year. Include both untaxed and taxed income.

____ Less than $20,000 ____ $20,000-$39,999 ____ $40,000-$59,999 ____ $60,000-$79,999
____ $80,000-$99,999 ____ $100,000-$149,999 ____ $150,000-$199,999 ____ $200,000 and above
____ Unknown

14. How many people, including yourself, live in your household? (Include brothers and sisters attending college) _____
15. Do you have family obligations that keep you from participating in extracurricular activities? _____ Yes _____ No If yes, do you:
    (a) have to work to supplement family income? Please describe.
    _____
    (b) provide primary care for family member(s)? Please describe.
    _____
    (c) have other family obligations that prevent participation? Please describe._____
    _____

EDUCATIONAL BACKGROUND

20. Are you a: Freshman (no college credit hours) _____ Freshman (with college credit hours) _____

Number of college credit hours earned by high school graduation date: _____

21. High school you graduated from or expect to graduate from:

_____
(Complete Name of High School) (City) (State)

High School Code: _____ (See your high school counselor.) Home-schooled: ____ Yes ____ No

Date graduated or expect to graduate: MM (___ ___) YYYY (___ ___ ___ ___)

Do you plan to graduate with an International Baccalaureate (IB) diploma? _____ Yes _____ No

To determine TEXAS Grant eligibility, will you graduate from a Texas high school with the Recommended or Distinguished Achievement Program? _____ Yes _____ No

22. If you did not graduate from high school, do you have a GED? ___ Yes ___ No

If yes, which version: ___ English ___ Spanish Date completed: _____ Month _____ Year.

In what state did you receive your GED? _____

23. Please list **ALL** colleges or universities you have attended or are attending, including college-level correspondence study and dual credit. **Failure to list all institutions will be considered an intentional omission and may lead to forced withdrawal.** Have an official transcript sent to each university to which you apply (refer to institution for admissions policy).

Name of Institution	City and State	Dates of Attendance From	Thru	Hours Earned

Please indicate if you have earned or will earn a degree by the time you plan to enroll.

Major/Area of Study: _____ Degree Date: _____Type of Degree_____

Name of Institution	City and State	Dates of Attendance From	Thru	Hours Earned

Please indicate if you have earned or will earn a degree by the time you plan to enroll.

Major/Area of Study: _____Degree Date: _____Type of Degree_____

Name of Institution	City and State	Dates of Attendance From	Thru	Hours Earned

Please indicate if you have earned or will earn a degree by the time you plan to enroll.

Major/Area of Study: _____ Degree Date: _____ Type of Degree_____

Name of Institution	City and State	Dates of Attendance From	Thru	Hours Earned

Please indicate if you have earned or will earn a degree by the time you plan to enroll.

Major/Area of Study: _____Degree Date: _____ Type of Degree_____

24. Are you currently on academic suspension from the last college you attended? _____yes _____no

REVERSE TANSCRIPT

25. Do you consent to allow your transcript to be shared with the Texas community college(s) you previously attended for considering eligibility for and awarding of an Associate's degree?

____ Yes ____ No ____ Not applicable - question does not apply to me

EDUCATIONAL INFORMATION

26. Check one semester and indicate **semester** and **year** you expect to enter: _____
___(ex. Fall 2014)

27. If you plan to pursue a pre-professional program, please specify which one (e.g., pre-law, medicine, nursing, veterinary, physical therapy).
_____

28. Will you seek teacher certification? _____ Yes _____ No If Yes, indicate which level:

Elementary Level (Early Childhood-Grade 4) ____; Middle School/Junior High Level (Grades 4-8) ____;

High School Level (Grades 8-12) ____; or All-Level (Early Childhood-Grade 12) ____

29. Senior Course Information
List the exact titles of the courses you will complete your senior year. Indicate any Advanced Placement (AP), International Baccalaureate (IB), or dual credit/concurrent enrollment courses and the semester or trimester the course was taken or will be taken. Include college course work, if any, you will complete during your senior year.

Senior Courses	AP/IB	Enrollment	1st	2nd	Dual Credit/ Concurrent Enrollment 1st	2nd	Semester or Trimester 3rd
_____						_____	_____
_____						_____	_____
_____						_____	_____
_____						_____	_____
_____						_____	_____

TESTS SCORES

Please have official test scores sent directly from the testing agency to the colleges and/or universities to which you apply.

ACT - Date taken or plan to take: _____ (Month/Year)

SAT - Date taken or plan to take: _____ (Month/Year)

TOEFL - Date taken or plan to take (if your native language is not English):
_____ (Month/Year)

IELTS - Date taken or plan to take (if your native language is not English):
_____ (Month/Year)

RESIDENCY INFORMATION (Please answer all questions. Use n/a if the question does not apply to you.)

Previous Enrollment:

(a) During the 12-month period before you intend to begin classes, did you attend or are you attending a public college or university in Texas in a fall or spring term (excluding summer)?
____ Yes [If yes, complete (b) through (e).]

____ No (If no, skip to question 32.)

(b) What Texas public college or university did you last attend? (Give full name, not just initials.) (Residency status is not affected by attending a private college or university.)
_____

(c) In which semester were you last enrolled (excluding summer)? ___ fall, 20____ ___ spring, 20____

(d) During your last semester at a Texas public college or university, did you pay resident (in-state) or nonresident (out-of-state) tuition? ___ resident (in-state) ___ nonresident (out-of-state) ___ unknown

(e) If you paid in-state tuition at your last institution, was it because you were classified as a Texas resident or because you were a nonresident who received a waiver?
___resident ___ nonresident with a waiver ___ unknown

31. Residency Claim:
(a) Of what state are you a resident? _____

(b) Did you live or will you have lived in Texas for at least 36 consecutive months before graduating from a public or private Texas high school or completing a GED? (To answer "Yes," you must either graduate from a Texas public or private high school, earn or plan to earn a GED, or plan to complete a home-school program. All others must answer "No.") _____ Yes _____ No

(c) When you begin the semester for which you are applying, will you have lived in Texas for the previous 12 consecutive months? _____ Yes _____ No

If you answered "yes" to both 32(b) and 32(c), skip to question 36.

32. Basis of Claim to Residency.
(If you answered "no" to any part of question 32, answer the following to assist in determining your residency classification for tuition purposes.)

(a) Do you file federal income tax as an independent taxpayer? (An independent tax payer should not be claimed as a dependent for tax purposes by another person. If you file a joint return with your spouse, answer "yes.") _____ Yes (If yes, continue to question 34.) _____ No

(b) Are you claimed or are you eligible to be claimed as a dependent by a parent or court-appointed legal guardian? (To be eligible to be claimed as a dependent, your parent or legal guardian must provide at least one half of your support. A stepparent does not qualify as a parent if he or she has not adopted you.) _____ Yes (If yes, skip to question 35.) _____ No

(c) If you answered "No" to both 33(a) and 33(b), who provides the majority of your support?

____ Self (Continue to question 34.)

____ Parent or legal guardian (Skip to question 35.)

____ Other (Skip to question 36, provide an explanation in number 35, and then read and sign number 37.)

33. If you answered "Yes" to 33(a) or "Self" to 33(c), answer the following:

(a) Are you a foreign national who has submitted an application for Permanent Resident Status to the U.S. Citizenship and Immigration Service (USCIS) and has received a fee/filing receipt or Notice of Action (I-797) from USCIS showing that your I-485 has gone through preliminary review and not been rejected?

(b) Are you a foreign national here with a visa eligible to domicile in the United States or are you a Refugee, Asylee, Parolee or here under Temporary Protective Status?
If so, indicate which Visa Status:

_____

(c) Do you currently live in Texas? (If you are out of state for a temporary job assignment or for another reason, please answer "No" and explain in question 36.)
_____ Yes _____ No (If no, skip to 36.)

(1) If you currently live in Texas, how long have you been living here? _____ Years _____ Months

(2) What is your main reason for being in the state?
____go to college ____ establish/maintain a home ____work assignment If for reasons other than those listed above, give an explanation in question 36.

(d) (1) If you are a member of the U.S. military, is Texas your Home of Record? ____ Yes _____ No

(2) What state is listed as your military legal residence for tax purposes on your Leave and Earnings Statement?

(e) (1) Do you hold the title (Warranty Deed, Deed of Trust, or other similar instrument that is effective to hold title) to residential real property in Texas? _____ Yes _____ No
If yes, date acquired: _____

(2) Do you have ownership interest and customarily manage a business in Texas without the intention of liquidation in the foreseeable future? _____ Yes _____ No
If yes, date acquired: _____

(f) (1) For the past 12 months, have you been gainfully employed in Texas? _____ Yes _____ No
(Gainful employment requires an average employment of at least 20 hours per week for one year or earnings equal to at least half of tuition and living expenses for one 9-month academic year. Employment conditioned on student status such as work-study, the receipt of stipends, fellowships or research or teaching assistantships does not constitute gainful employment.)

(2) For the past 12 months, have you received primary support from a social service agency? _____ Yes _____ No

(g) Are you married to a person who could answer "yes" to any part of question (f) or (g)?
_____ Yes _____ No
If "yes," indicate which question could be answered "yes" by your spouse: _____ How long have you been married to the Texas resident? _____ Years _____ Months

If you answered this question (#34), skip question 35 and continue to question 36.

34. If you answered "Parent" or "Legal Guardian" to question 33(c), answer the following:

(a) Is the parent or legal guardian upon whom you base your claim of residency a U.S. Citizen? _____ Yes _____ No

(b) Is the parent or legal guardian upon whom you base your claim of residency a Permanent Resident of the United States of America? _____ Yes _____ No

(c) Is this parent or legal guardian a foreign national whose application for Permanent Resident Status has been preliminarily reviewed? (Your parent or legal guardian should have received a fee/filing receipt or Notice of Action (I-797) from U. S. Citizenship and Immigration Services (USCIS) showing the I-485 has been reviewed and has not been rejected.) _____ Yes _____ No

(d) Is this parent or legal guardian a foreign national here with a visa eligible to domicile in the United States or a Refugee, Asylee, Parolee or here under Temporary Protective Status?

If so, indicate which:

_____

(Visa/Status)

(e) Does this parent or legal guardian currently live in Texas? (If this parent or legal guardian is out of state due to a temporary job assignment or for another reason, please answer "No" and explain in question 36.) _____ Yes _____No (If no, skip to 36.)

(f) (1) If your parent or legal guardian is currently living in Texas, how long has he or she been living here? _____ Years _____ Months

(2) What is your parent's or legal guardian's main reason for being in the state?
____ go to college ____ establish/maintain a homework assignment
If for reasons other than those listed above, give an explanation in question 36.

(g) (1) If your parent or legal guardian is a member of the U.S. military, is Texas his or her Home of Record?

_____ Yes _____ No

(2) What state is listed as your parent's or legal guardian's residence for tax purposes on his or her Leave and Earnings Statement?

_____

(h) Does your parent or legal guardian:

(1) hold the title (Warranty Deed, Deed of Trust, or other similar instrument that is effective to hold title) to residential real property in Texas? _____ Yes _____ No

If yes, date acquired: _____

(2) have ownership interest and customarily manage a business in Texas without the intention of liquidation in the foreseeable future? _____ Yes _____ No If yes, date acquired: _____

(i) For the past 12 months, has your parent or legal guardian:

(1) been gainfully employed in Texas? _____ Yes _____ No

(Gainful employment requires an average employment of at least 20 hours per week for one year or earnings equal to at least half of tuition and living expenses for one 9-month academic year. Employment conditioned on student status such as work-study, the receipt of stipends, fellowships or research or teaching assistantships does not constitute gainful employment.)

(2) received primary support from a social service agency? ____ Yes ____ No

(j) Is your parent or legal guardian married to a person who could answer "yes" to any part of question (h) or (i)?

____ Yes ____ No

If "yes," indicate which question could be answered "yes" by his or her spouse:

_____

How long has your parent or legal guardian been married to the Texas resident?

_____ Years _____ Months

35. General Comments. Provide any additional information that you believe your college or university should know about when evaluating your eligibility to be classified as a resident.

36. All students must read and sign this section.

- Notification of Rights under Texas Law: Information collected about you through this application may be held by any institution of higher education to which you apply. With few exceptions, you are entitled on your request to be informed about the collected information. Under Sections 552.021 and 552.023 of the Texas Government Code, you are entitled to receive and review the information. Under section 559.004 of the Texas Government Code, you are entitled to correct information held by an institution that is incorrect. You may correct information held by any institution to which you apply by contacting the institution. The information that is collected about you will be retained and maintained as required by Texas records retention laws (Section 441.180 et seq. of the Texas Government Code) and rules. Different types of information are kept for different periods of time

- If my application is accepted, I agree to abide by the policies, rules and regulations at any college to which I am admitted. I authorize the college to verify the information I have provided. I certify that the information I have provided is complete and correct and I understand that the submission of false information is grounds for rejection of my application, withdrawal of any offer of acceptance, cancellation of enrollment and/or appropriate disciplinary action. I understand that officials of my college will use the information submitted on this form to determine my status for residency eligibility. I authorize the college to electronically access my records regarding the Texas Success Initiative. I agree to notify the proper officials of the institution of any changes in the information provided.

- Beginning on January 1, 2012, all entering students are required to show evidence of an initial bacterial meningitis vaccine or a booster dose during the five-year period preceding and at least 10 days prior to the first day of the first semester in which the student initially enrolls at an institution. An entering student includes a first-time student of an institution of higher education or private or independent institution of higher education and includes a transfer student, or a student who previously attended an institution of higher education before January 1, 2012, and who is enrolling in the same or another institution of higher education following a break in enrollment of at least one fall or spring semester.

A student is not required to submit evidence of receiving the vaccination against bacterial meningitis if the student submits to the institution:

- the student is 22 years of age or older by the first day of the start of the semester (effective 1/1/2014); or
- the student is enrolled only in online or other distance education courses; or
- the student is enrolled in a continuing education course or program that is less than 360 contact hours, or continuing education corporate training; or
- the student is enrolled in a dual credit course which is taught at a public or private K-12 facility not located on a higher education institution campus; or

- the student is incarcerated in a Texas prison.
- an affidavit or certificate signed by a physician who is duly registered and licensed to practice medicine in the United States, stating that in the physician's opinion, the vaccination would be injurious to the health and well-being of the student; or
- an affidavit signed by the student stating that the student declines the vaccination for reasons of conscience, including a religious belief. A conscientious exemption form from the Texas Department of State Health Services must be used; or
- confirmation that the student has completed the Internet-based Department of State Health Services form to claim an exemption for reasons of conscience (for entering students at community and technical colleges ONLY).

Information about requesting the affidavit form from DSHS is found at http://www.dshs.state.tx.us/immunize/school/default.shtm#exclusions. The DSHS form may be ordered electronically; however they will be mailed to the address provided by the student. Please allow up to two weeks to receive the form.

Signature: _____Date: _____

PART II. EXTRACURRICULAR AND VOLUNTEER ACTIVITIES

See "General Application Information" on pages ii through v to determine if this part is required for your application to the institution(s) of your choice. Please list, **in priority order**, the organizations, activities, jobs, and internships that indicate your special contributions, talents, honors and abilities in the areas of extracurricular activities, service and work. Include service and work done in the summer. Please spell out the names and describe the organizations in which you have participated. You may attach additional pages if needed. In addition, you may also attach a résumé.

Extracurricular Activities

Organization	**Your Position/Year**
Examples:	Examples:
Speech/Debate Club	Committee Chair/senior
Extemporaneous Speaking	Captain/junior
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Community or Volunteer Service

Service/Volunteer Work
Examples:
Habitat for Humanity Hospital Volunteer

Résumé attached: ____ Yes ____ No

Name of Employer/Sponsor	**Your Specific Role/Job Title**	**From-Thru**	**Hours Per Week**
Examples: Grocery Store	Examples: Sacker: Sacked groceries, helped customers	6/11-9/13	n/a
Exchange Program	Spent two months with host family in Spain	6/11-7/11	

Essays

Institutions do not require all four essays. See "General Application Information" on pages ii through v to determine if you are required to write an essay or essays as part of your application for admission. Unless otherwise specified, your essay(s) should be typed and be no longer than one page (8 1/2" x 11"). Put your name and Social Security number* (see note below) at the top of each page.

Topic A.

Describe a setting in which you have collaborated or interacted with people whose experiences and/or beliefs differ from yours. Address your initial feelings, and how those feelings were or were not changed by this experience.

Topic B.

Describe a circumstance, obstacle or conflict in your life, and the skills and resources you used to resolve it. Did it change you? If so, how?

Topic C.

Considering your lifetime goals, discuss how your current and future academic and extra-curricular activities might help you achieve your goals.

Topic D.

The essay in this section is specific to certain college majors and is not required by all colleges/universities that accept the ApplyTexas Application. Please see the "General Application Information" in the front of this booklet. If you are not applying for a major in Architecture, Art, Art History, Design, Studio Art, Visual Art Studies/Art Education, you are not required to write this essay.

APPENDIX B

Concordance between ACT Composite Score and Sum of SAT Critical Reading and Mathematics Scores

SAT CR+M (Score Range)	ACT Composite Score	SAT CR+M (Single Score)
1600	36	1600
1540-1590	35	1560
1490-1530	34	1510
1440-1480	33	1460
1400-1430	32	1420
1360-1390	31	1380
1330-1350	30	1340
1290-1320	29	1300
1250-1280	28	1260
1210-1240	27	1220
1170-1200	26	1190
1130-1160	25	1150
1090-1120	24	1110
1050-1080	23	1070
1020-1040	22	1030
980-1010	21	990
940-970	20	950
900-930	19	910
860-890	18	870

820-850	17	830
770-810	16	790
720-760	15	740
670-710	14	690
620-660	13	640
560-610	12	590
510-550	11	530

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