THE EFFECT OF REMEDIATION AND STUDENT SUPPORT PROGRAMS ON THE ACADEMIC OUTCOMES OF UNDERPREPARED COLLEGE STUDENTS

By

MARIA CARMEN PANLILIO

A Dissertation submitted to

The Graduate School – Newark

Rutgers, The State University of New Jersey

in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

Graduate Program in Urban Systems

written under the direction of

Dr. Alan Sadovnik

and approved by

____

Dr. Alan R. Sadovnik, Rutgers University, Chair

____

Dr. Dula F. Pacquiao, UMDNJ

____

Dr. Jeffrey R. Backstrand, Rutgers University

____

Dr. Lawrence J. Miller, Rutgers University

Newark, New Jersey

May, 2012

ABSTRACT OF THE DISSERTATION

The effect of remediation and student support programs on the academic outcomes of underprepared college students

By MARIA CARMEN PANLILIO

Dissertation Director:
Alan Sadovnik

Access to higher education is no longer enough. The issue of the achievement gap between Black and Hispanic students on the one hand and White and Asian students on the other do not disappear when these students enter college. The consequences of this achievement gap are felt most keenly by the Black and Hispanic students in the post-secondary years of education as they are required to complete remediation courses in college before proceeding to take college level coursework that counts towards degree completion. One of the key reasons for this achievement gap is the higher probability of minority students from disadvantaged backgrounds dropping out of college due to remediation requirements (Attewell, Lavin, Domina, & Levey, 2006; Carroll, 2007; Venezia, Kirst, & Antonio, 2003). Remedial education is one means by which colleges attempt to help underprepared college students succeed in college-level coursework.

This dissertation is a quantitative analysis of the transition to college and the subsequent academic performance of underprepared college students at a public, four-year, minority-serving institution of higher education. The study examines the effect of remediation and student support programs provided at this institution to assist underprepared students succeed. The study combines the use of regression discontinuity design and multiple regressions to provide insight on the effect of remediation and student support programs on the academic outcomes of these students.

Data from this study suggest that remediation alone, as it is currently delivered, is not effective in helping improve student outcomes. Student support programs show greater evidence of helping improve the academic outcomes of these students. Further research on a broader scale is needed as the generalizability of the student sample in this study is limited. Improved measures of academic outcomes are also recommended to better analyze the effect of remediation, support programs and other interventions needed to help underprepared students succeed in college.

Acknowledgements

I would like to begin by thanking my dissertation committee members: Dr. Alan Sadovnik, Dr. Jeffrey Backstrand and Dr. Lawrence Miller of Rutgers University, and Dr. Dula Pacquiao of the University of Medicine and Dentistry of New Jersey. Outstanding scholars all, they have been excellent mentors in the world of academic research - always looking at capacity and pushing to get more done. More importantly, they made it possible to get things done. Special thanks are sent to Dr. Alan Sadovnik for understanding that my full-time administrative position in higher education was my first priority and yet finding a way of providing me with the encouragement to also focus on this dissertation. An amazing scholar and administrator, you have shown how things can get done without compromising academic rigor, equity and fairness, or good human relations. Thank you also for introducing me to the world of academic research and scholarship. Who knows what could have happened had I met you earlier in my career? To Dr. Dula Pacquiao, an unwavering source of quiet support and confidence, another special thank you for always trying to find solutions and options, even when things seemed stalled. To Dr. Larry Miller and Dr. Backstrand, for introducing me to a world of regression discontinuity and quantitative analyses. To Dr. Peijia Zha, for patience and an ever-steady positive attitude. I would also like to acknowledge my fellow students – Paulette, Brian, Jermaine, Sonay, Robert , Sevin and Kylie -Sherpa's, sounding-boards, group-therapists and just plain cheer-leaders.

This dissertation would never have been completed had it not been for the support of incredible people at work. To Dr. Carlos Hernandez, the quintessential statesman, for being so supportive of all my efforts and allowing me to take a closer look at things. To

Dr. John Melendez – for being a champion and cheerleader even when people would rather I just sat quietly at the table. Thank you also for being my critic, for reminding me that other perspectives are still worth hearing and also for your faith and belief in what we do. To Kay Misyak, my former secretary, for pulling me out of meetings to send me off to class, and to Marisa Ocasio, for listening and reminding me why I do what I do. To Phyllis Szani, who never hesitated in helping me get the resources in place to answer even more questions. To Miriam Laria, for dropping everything just to get me information at the last minute. She always claimed to not understand why I would work so hard on something I "did not really need!"

To my family and friends, for their support and their understanding. (I guarantee that some of those moments of being "masungit" were really warranted.) Most of all I thank my husband Joseph Runci for supporting my wish to earn a doctorate at this stage of my life and my career. Private-industry through and through, he may not fully understand why anyone would subject themselves to the rigor of a doctorate in their forties, but he fully supported me trying to balance a demanding full-time job, coursework-research-writing, family and a social life. He forced me to take sanity breaks in the forms of dinners out, movies or just plain funny television. Thank you also for allowing "the boys" to come into our lives and cheer me on. Everything will B-OK!

There is nothing more humbling and yet more enlightening, in my experience, than having to write a doctoral dissertation. Thank you to all of you who supported and sustained me through this process, and the years of preparation for it as well.

Table of Contents

LIST OF TABLES

List of Figures

CHAPTER 1

Introduction and Statement of the Problem

The purpose of this study was to examine the transition to college and the subsequent enrollment patterns and academic outcomes of underprepared freshmen at a four-year public institution of higher education. The study also examined the efficacy of compensatory higher education and student support programs provided at this institution to assist these underprepared students succeed.

Background on the Institution and the Students It Serves

This study examined data from a four-year publicly funded college located in a large and densely populated city in New Jersey. State College has had a tradition of providing opportunities to minority and first-generation college students. In 2009-2010, for example, the percentage of black and Hispanic students totaled 56 percent. Located in a densely populated urban area, State College's student body has reflected the diversity of the city that is indicative of the waves of migration that have, over the years, passed through this part of the country. State College has seen immigrants from over 40 countries and regions that include Ireland, Eastern Europe, Asia, South and Central America and the middle-east. State College has also served African-American migrants from the south. Established prior to the Great Depression, State College started as a Normal (Teaching) School educating teachers and school personnel. State College offers 41 academic programs that lead to a baccalaureate degree and 27 graduate degree and diploma programs as well.

While the academic program offerings have evolved over the years, the diversity of its student population has remained a distinct feature of this institution. Its commitment to the city and the county in which it is located has also stayed strong. In the course of serving the cities and the counties in its immediate geographic area, however, State College has had to provide compensatory higher education programs to students considered to be college-skill deficient and in need of remediation. These programs are provided to ensure both the quality of the higher education and equality of educational opportunities for all its students.

The demographics of the student body at State College are quite different from those of its peer state institutions. In the 2007-2008 year, it had the lowest percentage of full-time students at 71 percent, the highest percentage of Hispanic students at 35 percent, the second highest percentage of black students at 19 percent (the highest was 20 percent), and the highest percentage of Pell grant recipients at 47 percent (the next highest was at 29 percent). State College also had the highest percentage, at 26 percent, of dependent students with family income less than $30,000 a year, as compared to the next highest percentage of 13 percent at another state institution. The average age of undergraduate students at State College is 26. In fall 2006, 73 percent of all enrolled students came from the county in which the College was located and another 10 percent came from the neighboring urban county to its west. These numbers emphasize the predominant socioeconomic status and the diversity of the student population at State College, a level of socioeconomic status and diversity that are reflective of its primary recruitment area.

State College is also a commuter school with only 250 beds available, allowing only 3 percent of all students to live in dormitories on campus. This is another factor that limits the recruitment of students from regions further away. The College does not provide assistance or referral services for apartments or off-campus housing. The limited availability of dorm space also limits the regions from which the College recruits its students. Because it is located in a highly urban area, parking is limited and costly. This encourages State College students to use mass transit, which is easily accessible.

The students at State College primarily come from the immediate urban area and the towns and cities surrounding the institution, as well as cities in the immediate counties north and west. The high schools in the counties to the north and west that send students to State College are similarly located in dense urban areas with high percentages of minority and low-income families.

This region is populated by a large percentage of Hispanic and African American families, as well as other racial/ethnic and minority groups that include Asians, Africans, and people from the middle-eastern countries. It is densely populated and diverse, with the percentage of non-white residents totaling 57.4 percent, of which 63 percent are Hispanic, 19 percent are Black non-Hispanic and 17 percent are Asian non-Hispanic (U.S.Census, 2000). According to the 2006-2008 American Community Survey conducted by the U.S. Census Bureau, 37 percent of the population within the unified school district are foreign born, and 50 percent speak only English at home with the other 50 percent speaking a language other than English at home .

State College accepts students from areas that include nine school systems designated as Abbott districts. The top ten high schools from which State College students graduate include some of the largest urban high schools in the state. In 2008-2009, the percentage of regular students who graduated by passing the State High School Proficiency Assessment (HSPA) was 30.6 percent for one school, as compared to the state average of 89.3 percent. Participation in Advanced Placement for 11th and 12th graders in one of the local high schools averaged 3.6 percent as compared to 19 percent for the state. The drop-out rate for the local district was 6.2 percent for the 2008–2009 school years, as compared to 1.7 percent for the state average for the same years. The district high school graduation rate in 2007-2008 was 74 percent as compared to 92.8 percent for the state, increasing in 2008-2009 to 79.1 percent as compared to the state average of 93.3 percent. The average Mathematics SAT score of five out of six public high schools in the local district was 388, and the average Verbal SAT score for the same schools for 2008-2009 was 369. Only one of the public high schools in the local district is a highly ranked honors academy that admits students based on PSAT scores, academic performance from 6th to 8th grades, extracurricular activities and teacher recommendations. The average Mathematics SAT score for 2008-2009 was 581 and the average verbal SAT score was 551 (NJDOE, 2010).

State College is also a Hispanic Serving Institution (HSI). The federal designation of "Hispanic Serving Institution" is based on a college or university having a full-time equivalent (FTE) enrollment of undergraduate students that is at least 25 percent Hispanic students and having no less than 50 percent of all students eligible for need-based Higher Education Act Title IV aid (federal student financial assistance) as reported through the Integrated Postsecondary Education Data System (IPEDS). The IPEDS is an annual census survey conducted by the National Center for Education Statistics which is the "primary federal entity (responsible) for collecting, analyzing and reporting data related to education in the United States and other nations" (Carroll, 2007). The designation of HSI qualifies the institution to receive grants under Title V and Title III, Part A, Programs of the Higher Education Act of 1965 (HACU, 2009; USDE, 2009). A grant from Title III, Part A of the Higher Education Act of 1965 is used to fund one of the student support programs being examined in this study.

State College was given the Hispanic Serving Institution status by the U.S. Department of Education based on its 33.88 percent full-time equivalent (FTE) enrollment of Hispanic undergraduate students and 85 percent of all students were eligible for and received need-based Title IV aid (USDE, 2006).

Identifying and Remediating Underprepared College Students

Colleges and universities identify underprepared college students by administering placement test or by using standardized test scores to determine college readiness (Achieve, 2007; Boatman & Long, 2010; Conley, 2007, 2010; Connolly, Westlund, & Plank, 2012). The tests are designed specifically to gauge the knowledge and skills of entering students in reading, writing and mathematics. The most common placement tests are the ACCUPLACER (developed by the College Board), ASSET (developed by ACT), and the COMPASS (also developed by ACT). Some states require all first-time degree-seeking students enrolling in community colleges and state universities to demonstrate college readiness by taking basic skills tests. In Florida, for example, students are required to take the Florida College Entry Level Placement Test (CPT) and meet specified cut point scores set by the State Board of Education in order to be considered college-ready (Calcagno & Long, 2008, 2009; Florida_Department_of_Education, 2011). Other states consider their public colleges and universities to be autonomous and allow them to choose the placement test and the cut point scores used to determine college-readiness (Bettinger & Long, 2009; Connolly, et al., 2012). Colleges and universities also have the option of administering local tests developed and scored by their own faculty. Standardized test scores from the SAT or ACT are sometimes used in combination with placement tests to determine if the incoming student is college skill deficient in math or English. The procedures for placement into remediation depend on the tests used and the set qualifying scores which vary from state to state, and from institution to institution in some states, (Achieve, 2007; Bettinger & Long, 2004, 2006; Boatman & Long, 2010; Calcagno & Long, 2008; Martorell & McFarlin Jr., 2010).

All freshmen who enroll at State College are required to take a placement exam that determines college skill-deficiency and remediation needs. The placement test currently used in the years of this study is the ACCUPLACER placement test. Prior to that, State College used the Statewide College Basic Skills Placement Test**.** The switch to ACCUPLACER, which started in the fall of 2005 and fully implemented in the fall of 2006, was made with the intent of facilitating and expediting the scoring of the test. The ACCUPLACER is a standardized test designed and marketed by the College Entrance Examination Board as a measure of students' academic skills in the areas of math, English and reading (College_Board, 2010). It is a computerized adaptive testing system that allows for the test program to select the items to be administered to a specific examinee, based in part on the proficiency of the examinee. The sequence of the test questions and the questions themselves will therefore vary from student to student (College_Board, 2003). The test asks multiple-choice questions, in addition to an essay used to assess English writing skills.

At State College, the test in its entirety is administered by the College Advisement Office. The scores for the arithmetic and algebra sections, as well as the English reading section, are generated by the program immediately after the student finishes the test. The English writing section results are more subjectively evaluated by a committee of English department faculty. The evaluation scores of the writing section are shared with the Advisement Office staff within five to ten business days. Students who accept an offer of admission to State College are asked to choose from a roster of testing dates, and required to take the test on campus. The results of the test are used as a measure of the students' readiness for college level coursework. The "skills" measured are in the areas of arithmetic, algebra, reading comprehension and writing. Students who score below 92 on the reading comprehension section are considered skill deficient in that area, and will be required to take Reading for College or Reading and Writing Across the Disciplines, which are considered remedial courses, before being allowed to take college level English courses. Students who score below 3 in the English writing section are also considered skill-deficient and will be required to take College Writing, a remedial course, before being allowed to take college level English courses. Students who score below 77 in Algebra or below 68 in Arithmetic are considered skill deficient and required to take Basic College Math and/or Algebra for College, both remedial courses, before being allowed to take college level math courses. All the remedial courses are considered semester hours; however, they do not carry college level credit and do not count towards the 128 credit hours needed for graduation. It is possible for students to score below the cut point in all four sections, and therefore be considered four-skill deficient. These students are then required to take at least 12 semester hours of remediation course-work before being allowed to take college level courses.

The college skill-deficient students are considered in need of remediation and are required to take the developmental courses as part of their first semester. State College policies allow students to take the College's remedial courses for a maximum of two times. If the student fails to pass a remedial course after two attempts, he/she is academically dismissed and is advised to go to a community college (or other four year state college) for further remedial work. These students are considered for readmission on a case by case basis, and only after they have successfully completed developmental or remedial coursework.

The switch to the ACCUPLACER exam was started in the fall of 2005, and was completed by fall 2006. Over 80 percent of the freshmen admitted and tested in the fall of 2005 were found to be at least one skill deficient, and at least 66 percent were found to be at least two-skill-deficient. In the fall of 2006, over 85 percent of students were determined to be skill deficient through the ACCUPLACER test. This increase in percentage of students determined to be skill-deficient through the ACCUPLACER test is even more curious when compared to the percentage of students determined to be skill-deficient based on the Statewide College Basic Skills Placement Test. In the prior years of using the Statewide College Basic Skills Placement test, the average percentage of skill-deficient students was below 80 percent. While there are some concerns about the substantial increase in students assessed to be skill-deficient and in need of remediation between one placement test and another, this study will not examine this change and will focus on the ACCUPLACER scores as generated for new students from fall 2006 through fall 2010.

With the high stakes associated with remediation that include additional costs for tuition and fees for remediation courses, delay in progression towards degree attainment, and the possible stigma of being considered underprepared for college level coursework, it is quite possible for students to seek ways to avoid the required remediation and proceed straight into college level coursework. Students at State College, however, are blocked from self-registration by the College's integrated data management system until an academic advisor meets with them and removes the holds on their accounts. Incoming freshmen therefore cannot bypass the remediation requirement and register for college level courses without the permission and assistance of an academic advisor.

To balance the quality of the higher education and the equality of educational opportunities for students, State College provides compensatory higher education programs to assist underprepared students. State College also provides special support programs designed to provide tutoring and counseling services to its students. The two longest-running special support programs at State College are the Educational Opportunity Fund (EOF) program and the Student Support Services Program (SSSP). The Educational Opportunity Fund Program is administered through the Division of Academic Affairs and emphasizes academic support services. The Student Support Services Program (SSSP) is administered through the Division of Student Affairs and emphasizes student support services. Both programs provide a combination of academic and student support services, but the emphasis is slightly different.

The EOF program is partially funded by state grants. This program provides scholarship funds as well as academic and student support in the form of tutoring, counseling and advisement. These services are provided through a designated staff of academic advisors and mentors who work with students throughout their college career. Academic support is emphasized, and socially oriented programs are a secondary priority. A designated work space for students and staff is set aside for the program, and resources in the form of computer and programming support is provided. In addition, students selected for this program are required to take an academically focused summer bridge program immediately prior to their first semester at State College. This summer bridge program is designed to introduce new students to college life and the expectations and requirements of college level learning. The new students are housed on campus for summer bridge programs, regardless of whether or not they stay on campus during the academic year. On average, more than 500 students participate in the EOF program during any given year.

The eligibility requirements for the EOF program include residency in the state for at least one year prior to participation and receipt of services and funds, U.S. citizenship or permanent residency status, a high school diploma or GED certificate, and demonstration through an interview of the motivation to complete a university program of study. The interviews are conducted by the professional staff of the EOF office. Students are also required to meet income eligibility criteria that are referred to as "historic poverty". Historic poverty is determined by the State College financial aid office by examining two prior years of federal tax returns. The EOF and financial aid offices also consider the student's area of residence. If the student resides in a town or city that is considered to be a poor district, then the student may be considered to have met the historic poverty requirement. In 2010, for example, a family of four could not have family income of more than $35,000 per year for the student to be eligible to participate in the program.

The SSSP is federally funded through a U.S. Department of Education Title III TRIO grant. The federal Trio programs are designated as outreach and student services programs to assist students from disadvantaged backgrounds (USDE, 2010). They are specifically designed to target and assist first-generation college students from low-income families or individuals with disabilities. The State College SSSP program was established through a grant application written 14 years prior to this study. Similar to the EOF, it provides academic and student support in the form of tutoring, counseling and advisement. Unlike the EOF, it is a much smaller program with an average of 125 students in any given year.

The SSSP program is primarily a student support services program, with an emphasis on the social support it provides low-income, first-generation college students. While also providing academic support in the form of peer tutoring and course advisement, the SSSP program does so through fewer professional staff. The primary requirement for participation is the SSSP is for students to be first-generation college students. The SSSP program gives preference to those who come from low-income families or those who have a federally recognized disability.

Relevance of the Study

Access to higher education alone is not enough. Even as the college degree has replaced the high school diploma as the minimum requisite for social and economic mobility (Blundell, Dearden, & Sianesi, 2005; Kolesnikova, 2010), and even as more high school graduates attend college, a large percentage leave college before earning a degree (Adelman, 2007; Thomas Brock, 2010; Engle & Tinto, 2008; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Ruppert et al., 1998). This study seeks to contribute to the literature on college degree completion and the impact of remedial education courses on student academic success. It also seeks to provide empirical information about the effects of remedial education and compensatory higher education programs on academic outcomes for underprepared college students. The study also recognizes the value of investments in time, money and efforts that students make towards their college education.

A college education, whether a two year associates degree, a four year baccalaureate degree, or advanced and doctoral degrees have been shown to be directly correlated to income (Attewell & Lavin, 2007; Blundell, et al., 2005; Kolesnikova, 2010; Light & Strayer, 2004; Perna, 2005). Statistics from the U.S. Census Bureau have shown that individuals twenty-five years and older with at least an associate's degree (two years of college) earn an average of $41,2226 per year, as compared with those who only a high school diploma who earned an average of $33,618. Individuals twenty-five and older who earned at least a baccalaureate degree earned on average $60,954 and those who earned a master's degree earned on average $71,326 a year. Individuals twenty-five and older with doctorate degrees earned an average of $99,995 a year, while professional degree holders earned on average $125,622 per year (U.S.Census, 2008).

In the 21st century, technical and specialized knowledge is necessary to have better access to job opportunities. The rapid deindustrialization of the American labor market has radically changed the American economy. Job opportunities have now pooled in either the labor-intensive manufacturing and personal services sector or in the technical and specialized sector at the top of "hourglass" shaped economy (Portes & Rumbaut, 2006). Rapid deindustrialization means that the structure of the American labor market looks today less like a ladder, where migrants and their descendants can gradually move up along the layers of blue-collar and white-collar occupations. Instead, it resembles an "hourglass" where demand exists for minimally paid occupations at the bottom and for those requiring advanced training at the top, but where the middle layers have been thinning. (Portes and Rumbaut, 2006:259)

The economic rewards of a college degree, however, are only one of the many benefits of higher education. Institutions of higher education and the college experience have become central institutions for civic incorporation (Flanagan & Levine, 2010; Pascarella, Ethington, & Smart, 1988; U.S.Census, 2000), and the responsibilities and benefits of citizenship and civic engagement, while not as lucrative to the individual, are essentials to a democratic society. The health and social benefits of a college degree have also been studied. Individuals with higher education have better health status at retirement than those with less education (Baum, Ma, & Payea, 2010; Sickles & Taubman, 1986). They are also more likely to be active citizens, less likely to be obese, less likely to smoke, and more likely to have a healthy life-style (Baum, et al., 2010).

This study is also relevant to college administrators, policy makers and taxpayers. Colleges and universities are facing a crisis of limited resources brought about by increasing pension costs and reduced financial support from state and federal government (Keller, 2010). In the northeast region in which State College is located, the “new normal” consists of fiscal uncertainty and reduced aid to both institutions and students (Sewall, 2010). For college administrators, the design and funding of student support programs require a closer look at the efficacy of these programs and initiatives in light of the limited resources available.

There is also a great deal of public scrutiny of the college readiness of high school graduates. In October 2011, for example, the governor of New Jersey established a 21 member task force through the state Department of Education to determine how high school graduates can be better prepared for college and careers. The task force is composed of representatives from business, k-12 and higher education. It is charged with determining the knowledge content highs school graduates must master to ensure readiness for college level coursework (Hester Sr., 2011). In New York, a recent article focused on the increased percentage of high school graduates who need remediation as they enter the community college systems. The Start program, initiated in 2008 in the City University of New York (CUNY) community colleges, was implemented to address the increased need for remediation (Winerip, 2011).

Institutions of higher education are also undergoing a public examination of their effectiveness in educating students. Recent news articles suggest that the general public is questioning the value and quality of higher education (Hacker, 2010; Nemko, 2008).

“Students, parents, and policy makers are demanding to know just what families are getting for their money” (Glenn, 2010).

Retention and graduation rates are also being scrutinized and used as another means of assessing the quality of institutions of higher education. These outcomes are viewed as institutional indicators of excellence and published in lists ranking institutions. Most of these lists are initiated by the media such as the U.S News and World Report College Rankings. While the validity of these rankings have been contested and debated on grounds of lack of consistency of measures and the inappropriate use of proxy variables, they exert influence on families and the public manifested in the prominence and level of public demand that is posited to be a consequence of the increase in the cost associated with higher education (Richards, 2010; Sanoff, 2007; Usher & Savino, 2007).

The accreditation bodies of colleges and universities also required that institutions of higher education consistently assess student outcomes as part of self-governance and good practice. Assessing student learning and institutional effectiveness is an integral part of the Middle States Commission on Higher Education’s Self Study process required for accreditation of the institution and its programs of study (MSCHE, 2007a, 2009). Retention and graduation rates are used as a measure and an example of evidence of student learning and institutional effectiveness (MSCHE, 2007b).

Study Purpose

The purpose of this study was to conduct an analysis of the transition to college and academic outcomes, including the persistence to the second year of students enrolled in an urban 4-year public institution of higher education designated as a Hispanic Serving Institution (HSI). More specifically, the study focused on examining the effect of remediation and special support programs on the persistence to the second year, grade point average, and credits completed of underprepared college students entering State College between the fall semester of 2006 through the fall semester of 2010. The special support programs examined include the Educational Opportunity Fund Program (EOF) and Student Support Services Program (SSSP). The EOF and SSSP are both special support compensatory programs and administered by different divisions of State College: EOF is administered through the academic division, and the SSSP through the student affairs division. The orientations of these programs are slightly different even as they provide both the academic and student support services for students. The SSSP program is more socially oriented while the EOF program is more academically oriented.

The persistence to the second year, number of credits completed and cumulative grade point averages were used to examine their effectiveness at improving student outcomes. For this study, underprepared students comprised of students who were determined to be college skill-deficient and in need of remediation prior to being allowed to take college level course work in English and Mathematics. The ACCUPLACER test, administered to all incoming freshmen at State College since the fall semester of 2006, was used to make this determination. Students who score above a specific cut point score on each of the four components of the ACCUPLACER were considered to be adequately prepared to take college level courses, and students who scored below these specific points were considered underprepared and in need of remediation in specific areas. Underprepared college students were required to take remedial courses in English or mathematics before being allowed to continue with college level courses in those subjects.

The compensatory education programs at State College are integrative. Students in need of remediation are required to take developmental courses in their first semester while also being integrated and mainstreamed with other college students taking regular college courses.

Research Questions

This research study focused on the following questions:

1. How do underprepared college students of varying skill-levels perform during their first year of college?

2. Does remediation improve student outcomes? Are remediation and EOF or remediation and SSSP more effective than remediation is on its own?

3. Does the treatment effect vary across students from different ethnic and racial backgrounds, generational and socioeconomic status?

CHAPTER II

REVIEW OF THE RELATED LITERATURE

History of compensatory higher education programs

Compensatory higher education programs, also referred to as college remediation, are used to describe services provided by institutions of higher education to help underprepared college students succeed. The concept is not new and can be traced back to the 17th century with Harvard University's assignment of tutors to underprepared students taking Latin (Merisotis & Phipps, 1998). Remediation in the 20th century includes services that range from the most basic coursework covering college preparatory curriculum in math, English and reading, to non-course programs that provide free tutoring and supplemental instruction offered in conjunction with the formal coursework. Remedial courses generally do not confer college level credits that count towards the student's degree. (Martorell & McFarlin Jr., 2010). Over 90 percent of two- year colleges and over 80 percent of four-year institutions of higher education offer some form of remediation (NCES, 2003).

Traditional compensatory higher education programs have their origin in the liberal education reforms of the 1960s and the 1970s which followed the democratization of higher education in post-World War II (Cartney & Morrison, 1970; Sadovnik, 1994; Sherman & Tinto, 1975; Tinto & Sherman, 1974). In 1947, President Truman's Commission on Higher Education published a report that advocated for universal access to higher education in the United States. This report, *Higher Education for American Democracy,* argued that universal access to higher education was vital to American democracy and identified the "social role of education" in ensuring equal opportunity. It specifically spoke of the public benefits of higher education (Bounds, 2005; Rudolph, 1962). The result was a democratization of higher education which allowed for greater access to a college degree for a larger segment of the population, including women, Hispanics and African Americans who had historically not been able to attend college. This led to the development of state systems of community colleges as well as greater access to four year institutions of higher education.

This democratization of higher education brought about by changing public attitudes and expectations, in tandem with the changes in federal policy that included the passage of the Higher Education Act of 1965, helped fuel the growth of enrollments in colleges and universities (Thomas Brock, 2010; Rudolph, 1962; Sadovnik, 1994). College education was long recognized as a means of attaining social and economic mobility. During these decades, it also became central to the philosophy of social justice. The educational reforms of the 1960s and 1970s sought to solve the problems of social and economic inequity by addressing educational inequality. The attempt to solve these problems on the college level led to greater access to higher education for African Americans, Hispanics, women and the working poor as a means of assuring social and financial mobility. Colleges started to admit more students, a large number of whom were considered inadequately prepared for the rigor of college level academic work. Greater access to higher education for the poor and minority students, therefore, was not automatically followed by success in college. The retention and graduation rates of these students from socioeconomically disadvantaged backgrounds were disproportionately lower than those of students from white middle-class families (Adelman, 2007; Thomas Brock, 2010; Engle & Tinto, 2008; Ruppert, et al., 1998; Sadovnik, 1994).

To remedy this situation, compensatory higher education programs with basic skills courses, tutorial services and counseling services were developed “to provide equal educational opportunities for the “educationally and economically” disadvantaged students who previously would not have had the opportunity to attend college”(Sadovnik, 1994). These programs were intended to augment students’ precollege education through remediation (Cartney & Morrison, 1970; Sadovnik, 1994; Tinto & Sherman, 1974).

The integrative model of compensatory programs sought to provide the underprepared college students with remedial and developmental courses while they were also registered for regular college courses in their chosen disciplines. In this model, students are mainstreamed into the regular college classes and not placed in clearly defined cohorts that separate them from non-remediation students. The holistic model of compensatory programs, on the other hand, emphasizes the special placement of students in cohorts that would provide the incorporation of remedial and developmental strategies into all courses that students are taking (Martorell & McFarlin Jr., 2010; Sadovnik, 1994). While both the integrative and holistic models of compensatory programs have their advantages and disadvantages, studies have shown that the quality of instructional and support programs and services are more important than the model of compensatory programs in which students were placed (Sadovnik, 1994).

Critics and Proponents of Compensatory Higher Education Programs and Remediation

Integrative and holistic compensatory higher education programs were eventually institutionalized in colleges and universities (Attewell & Lavin, 2007; Cartney & Morrison, 1970; Sadovnik, 1994), even as they were challenged by both conservatives and radicals (Bracy, 1972; Sadovnik, 1994). One criticism of the democratization of higher education and the institutionalization of compensatory programs is the diminution of the quality of the college education. In accepting a wider array of students and in prioritizing access, institutions of higher education have been perceived to have given up the meritocratic principle of education (W. Bennett, 1998; W. J. Bennett, 1992). Another criticism points to the high costs of remediation which are posited to have led to the cut in state funding for these programs (Bettinger & Long, 2009).

The notion of college-for-all has also been argued to be deleterious to working-class and minority students who find themselves under-prepared for the rigors of college level work (Rosenbaum, 1980, 1998). Attendance in community colleges, in particular, was viewed as the "cooling-out process" for the underprepared college students, with little encouragement and real opportunity for advancement to a four-year institution or the attainment of a bachelor's degree (Clark, 1960). Rosenbaum suggests that students, in assuming that attendance in college is a natural progression from high school graduation, fail to take the more rigorous and academic curriculum in high school. They therefore graduate high school and transition into college without the skills and training needed for higher level work. This in turn limits the progress and success of students in postsecondary education, including determining whether they earn a degree from the two year institutions, transfer to or attend less-selective four year institutions or elite institutions of higher education. Because high schools "offer vague promises of open opportunity for college and fail to specify the actual requirements for successful degree completion", high schools perpetuate the "college-for-all" norm that is theoretically supported by open-admissions policies and remedial programs at the community colleges.

A closer look at the structures and practices in high schools and colleges reveals that while the college-for-all norm in itself is admirable, it can also be deceptive. On the positive side, this norm encourages high expectations in students, discourages premature tracking of students, and supports increased access to a college degree for disadvantaged students. On the other hand, many high schools emphasize high expectations of college attendance as a means of enlisting student cooperation and non-disruptive behavior but these high expectations are not accompanied by the necessary and accurate information of what is required to be successful in college. The resulting student behavior of choosing undemanding and inadequate academic preparation is not discouraged. Hence, students graduate from high school unprepared for college work. Students may be admitted to two year colleges only to find out that they are in need of multiple-remedial courses before they are even allowed to take college level courses. Therefore, while college-for-all has been considered laudable in discouraging the tracking of students prematurely, it has also been argued to foster a false sense of security for students who fail to adequately prepare for college (Rosenbaum, 1998, 2001; Tinto, 1974).

In community colleges, the open admissions policy and the remedial course offerings can be perceived as built in “cooling-out” processes that address this lack of adequate preparation in high school (Clark, 1960; Deil-Amen & Rosenbaum, 2002). Underprepared students entering college are bogged down in taking multiple remedial courses that may carry the stigma of remediation, extend their stay in college and use up their time and resources while failing to accumulate college credits towards a degree. In going through the years of vague promises of open opportunity for college without the adequate information or guidance needed to prepare for college, these students are perceived to have been victims of a swindle, whereby the promise of benefits from a college degree are replaced by a costly delay in the realization of more realistic educational and career options. (Deil-Amen & Rosenbaum, 2002; Rosenbaum, 2001). Even where remediation may have been rendered stigma-free, the more deleterious effect of failure to provide clear information and realistic expectations include the expenditure of time and resources that students from underprivileged backgrounds can ill afford (Deil-Amen & Rosenbaum, 2002).

Attewell, Lavin, Domina and Levy (2006) argue against the premise that remediation reduces the chances of students completing their degrees. Using college transcripts and the U.S. Department of Education's National Educational Longitudinal Study (NELS:88), the authors analyzed the academic progress and success of students who attended college approximately 8 years following high school. Their analyses suggests that it is the weak high school academic preparation that reduces chances of students graduating, not the multiple remedial courses required by the two year college (Attewell, et al., 2006).

In the book called *Passing the Torch,* Attewell, et.al, (2007), contend that students do well in terms of graduation rates and based the labor market benefits of college degree attainment over the long term. The authors conducted a follow-up study thirty years after a cohort of almost two thousand women started attending the City University of New York (CUNY) in the 1970s after the university implemented its open-admissions policy. Many of these women came from poor families, as well as working and middle-class homes. The study focused on female former students because the authors wanted to study how their children were doing and assumed that even with marital disruptions, mothers were more likely than fathers to have custody of children and can provide reliable information about these children. The authors also took the National Longitudinal Survey of Youth (NLSY), the Current Population Survey by the U.S. Census Bureau and the U.S. Department of Education's National Educational Longitudinal Study (NELS) to further validate and extend their findings. The study revealed that disadvantaged women ultimately earn college degrees at a higher rate than has been previously believed. Of the CUNY cohort they studied, 71 percent completed college, and over three-quarters completed a bachelor's degree. Twenty-six percent completed a graduate degree. Attainment of college degrees took a long time, beyond the typical 4 or 6 year period, with almost 30 percent of the women taking over ten years to earn their degrees, and 10 percent taking twenty or more years to earn their degrees. The authors argued that a college education pays off in terms of annual and lifetime earnings even for students who attend but fail to graduate based on comparative analysis of national income data of estimated average earnings of students with similar high school grades who did not go to college, and those who attended college. Students who attended college earned about 13 percent more per year on average, as compared to students who did not attend college at all. College educated mothers passed on educational advantages to their children through parenting practices that were associated with significantly better educational outcomes for their offspring. The authors contend that the more appropriate measure of success of higher education should be whether, "by going to college, students from underprivileged backgrounds break the cycle of disadvantage and lift their children into the middle class". Persistence and degree attainment, financial payoffs, and the educational advantages passed on to children by disadvantaged college students are counter-arguments to the notion that college-for all is deleterious because it fails to help poorly prepared or disadvantaged students from succeeding or completing college. They are also counter-arguments to those who posit that mass education has made a college degree worth less (Attewell & Lavin, 2007).

Other critics question whether placement into remediation is the extension of secondary education stratification to postsecondary education. If access to postsecondary education for minority and working-class students leads to this stratification in higher education, then the social and economic inequalities are simply perpetuated and the promise of education as the means of social and economic mobility is not kept. The inadequacy of higher education, even with compensatory programs in place, to ultimately eliminate the inequalities in society, however, does not imply failure. Neither does it call for the elimination of access to higher education for the underserved student population. Instead, it highlights the need for strengthening K-12 education and other support services prior to college attendance. It also highlights the moral and ethical obligation of institutions of higher education to provide the support and education required to help the underprepared college students they admit to succeed. Sadovnik (1994) argues for the continued support of developmental college education and emphasizes the need for the entire institution to take responsibility for this service, especially if open access to higher education is granted to the inadequately prepared high school graduate.

Increased access to higher education has also been criticized to contribute to the credentialism of education. Randal Collins (1971) notes how the growth and expansion of higher education in the United States, as evidence by the increase in the number of colleges and universities in the country compared to the rest of the world, has outpaced the actual need for technical or professional training in the actual jobs market. He points to the "competition for mobility chances" in a democratic decentralized society as encouraging the widespread education (or credentialization) of the population which inadvertently dilutes the status value of this education (Collins, 1971). Collins contends that in the process of competing for the superior status as represented by the higher level of educational credentials, there is an increased demand for education, and in supplying this demand, there is a decrease in the value of this same commodity. The high school diploma is no longer as valuable as it was in the 1930's, and a college degree is now the expected minimum requirement for jobs needed for upward social and economic mobility.

According to the National Center for Educations Statistics (NCES), the total enrollment in degree-granting institutions of higher education is expected to rise through the fall semester of 2019 (Hussar & Bailey, 2011). Enrollment is expected to increase in both public and private degree-granting institutions. In Fall 2000, 28 percent of entering freshmen enrolled in at least one remedial course (NCES, 2003). By 2007-2008, approximately 36 percent of all first year undergraduate students reported that they had taken at least one remedial course, and 41.9 percent of all undergraduate students in 2-year public institutions reported taking remedial courses (NCES, 2011a). A recent article in the New York Times, focused on the Start Program, which was implemented at CUNY community colleges to address a 15.4 percent increase in students in need of remediation between 2005 and 2010 alone (Winerip, 2011). With the renewed focus on the large percentage of students entering college in need of remediation, the costs associated with taking remediation courses that include costs to the students in the form of tuition and fees as well as opportunity costs of not working, and the institutional costs of offering remedial courses, the debate over the merits of investing in remediation continues.

This debate highlighted the events at CUNY in the late 1990s (Arenson, 1999b; Bettinger & Long, 2005; Gumport & Bastedo, 2001; Marcus, 2000; Richardson, 2005). Since its establishment in 1847 by Townsend Harris as the Free Academy, CUNY has had a history of accepting the children of the working class and immigrants of New York, and providing them with an excellent education free of tuition (Arenson, 1999b; Marcus, 2000; Richardson, 2005). Notable alumni include 11 Nobel Prize winners, Supreme Court Justice Felix Frankfurter (class of 1902), Ira Gershwin (1918), Jonas Salk (inventor of Polio vaccine, class of 1934), Intel founder Andrew Grove, retired General Colin Powel, and entertainers Ben Gazarra, Paul Simon and Jerry Seinfeld (Marcus, 2000; TheEconomist, 2006). Often called “the poor man’s Harvard”, CUNY admissions requirements were academically tough, and with the changes in the surrounding neighborhoods of its flagship City College in Harlem in the 1950s and 1960s, many high school graduates from these neighborhoods could not get in (Marcus, 2000). In 1970, the college began to admit economically disadvantaged minority applicants who would not have otherwise been accepted to senior colleges(Gumport & Bastedo, 2001; Richardson, 2005). The open admission policy that soon followed has been perceived to have lowered the academic standards of the college system (Arenson, 1999b; Marcus, 2000; TheEconomist, 2006). In the mid 1970s, New York City’s fiscal crisis, limited funding and high enrollments forced the college to begin charging tuition (TheEconomist, 2006). By the late 1990s, 87 percent of freshmen at community colleges and 72 percent of freshmen at senior colleges failed one or more of CUNY's remediation placement tests (Schmidt et al., 1999). In 1998, the CUNY was encouraged by then Mayor Rudolph Giuliani to restructure its remedial programs. This attempt to phase out remedial education at the system's four year colleges finally succeeded in 1999 under the leadership of the Chancellor, Matthew Goldstein (Arenson, 1999b; CUNY, 1999). Under the new policy, students who failed any of the remediation placement tests were not admitted to four-year colleges, and were only allowed to attend community colleges within the CUNY system (Gumport & Bastedo, 2001; Richardson, 2005). Critics argued that a policy of restricting remediation only increases stratification, reduces access to participation in postsecondary pursuits, and limits upward mobility for students of color or lower socioeconomic status (Arenson, 1999a; Bastedo & Gumport, 2003; Gumport & Bastedo, 2001; Richardson, 2005).

Attewell and Lavin (2007), while not explicitly arguing against the policy of restricting remediation, lauded the open admissions policy at CUNY in the 1970s for having allowed broad access to a college education for "poor and near-poor" as well as middle-class students. This broad access, they argue, produced multi-generational benefits that include intergenerational upward mobility that was more prevalent in the CUNY sample than in the national data. The multi-generational benefits also extended to better educational outcomes for the children and grandchildren, as well as socioeconomic advantages.

Attewell and Lavin (2007) further argue that "Mass education has not made a college degree worth less" and that on "a national scale, greater access to higher education has been accompanied by growth in the earnings premium for a college degree, rather than a collapse in the value of this credential" (p.5). They point out that critics of "college for all" focus on the college students with weak high school achievement and compare their earnings with college students who had stronger high school GPAs. The authors argue that this comparison does not truly assess the value of the college education and that "the better comparison contrasts weak students who went to college with classmates with identical high school grades who never went beyond high school" (p. 164). The latter compares the similar students with differing experiences of college attendance versus non-college attendance, isolating the college attendance as the factor to be assessed. They go further in their study to show that students who went to college earned approximately 13 percent more per year than those who did not attend college (Attewell & Lavin, 2007). In the epilogue to their book, Attewell and Lavin point to the debate over the legitimacy of remediation in higher education as one more threat to broad access to higher education and the subsequent multi-generational benefits that mitigate the disadvantages posed by race and socioeconomic status.

Proponents of CUNY's policy of restricting remediation point to improved institutional academic credibility and the higher expectations that "students be diligent and clever" resulting in the enrollment of more academically gifted students while still maintaining a largely unchanged racial composition in senior colleges (TheEconomist, 2006). Proponents also cite the University based-collaborative programs such as College Now and Early College Initiative as a positive result of the remediation policy at CUNY (CUNY, 2011; Mogulescu, 2011). Collaboration between the New York City Department of Education and CUNY called *Graduate NYC! College Readiness and Success Initiative* has also focused on the high school to college transition (Mogulescu, 2011). These initiatives are supported by funds from both public and private sources.

Critics of remediation and compensatory higher education programs have also cited the mixed findings of studies that focus on the effect of remediation on student academic outcomes. Bettinger and Long (2009) found positive effects of remediation on college persistence and degree completion. Other studies that include Calcagno and Long (2008) and Martorell and McFarlin (2010) found little evidence of this positive effect. Some of the difficulty in determining the impact of remediation on college student academic outcomes stems from the variation in the assignment of these students to remediation. Students are determined to be college skill deficient and in need of remediation mainly through placement tests. The rules governing the assignment of students to remediation vary widely by state. Florida and pre-2003 Texas require the use of a state-selected test and state-set passing standard to determine the assignment of college students to remediation (Florida_Department_of_Education, 2011; "Texas A&M Basic Skills Placement. 2012,"). In Ohio and New Jersey, colleges are considered independent and autonomous, and allowed to choose the tests and set the cutoff scores to determine students as college skill deficient and needing remediation. There are also variations between institutions as to what constitutes a remedial course. Variations in policies, tests and cutoff scores used to determine college readiness contribute to the difficulty in assessing the impact of remediation on student outcomes (Achieve, 2007; Bettinger & Long, 2004, 2006; Calcagno & Long, 2009; Martorell & McFarlin Jr., 2010). Methodology, selection bias and other data limitations also contribute to the challenges in evaluating the impact of remediation (Martorell & McFarlin Jr., 2010). It is difficult to compare academic outcomes of underprepared and better prepared college students when the criteria for determination can be exploited or bypassed by students, institutions or both. Some students take steps to avoid remediation by retesting, attending colleges known to have no remediation requirements or simply ignoring placement and registering for college level courses. Other students considered college ready and zero skill deficient enroll in remediation courses anyway. Some institutions do not enforce the placement into remediation, while others set higher cutoff scores and mandate completion of remediation courses before allowing students to enroll for any college level courses (Bettinger & Long, 2004). There are also various levels of remediation. Some students can be underprepared in math, but be considered ready for reading and writing. Others are multiple-skill (math, reading and writing) deficient. Colleges and universities address skill-deficiencies in various ways and have on limits to attempts to pass remedial courses, and specific conditions when to require students to take remedial courses. All of these variables contribute to a heterogeneity of students that makes it difficult to assess the impact of remediation on student outcomes.

The Achievement Gap

The debate over remediation is fueled and complicated by the achievement gaps between Black and Hispanic students on the one hand and White and Asian students on the other. These achievement gaps carry over from K-12, and have been attributed to varied factors such as neighborhood poverty and public policy (Anyon, 2005a, 2005b; Massey & Denton, 1993), racism (Lewis, 2007; Massey & Denton, 1993), red-lining and white flight (Massey & Denton, 1993), tracking and poor academic curriculum (Ravitch, 2000), and family environment (Lareau, 2002) . Others have argued that the achievement gap is a function of socioeconomic status and not race or ethnicity. A recent study found that the achievement gap purely from a socioeconomic perspective. His study shows that the achievement gap between children from high and low income families has grown over the past decades and is now considerably larger than the black-white from fifty years ago (Reardon, 2011).

Attempts to reduce these achievement gaps have ranged from the federal policy of *No Child Left Behind* (Sadovnik, O'Day, Bohrenstedt, & Borman, 2008; USDE, 2001), to various forms of educational reform that range from small school reform (V. E. Lee & Ready, 2006) to whole school reform (Borman & Associates, 2005) to improve the urban schools. These achievement gaps do not disappear when students enter college.

As noted by Adelman (2006), in spite of the greater participation in postsecondary education by Black and Hispanic students over the past several decades, the gap in degree completion between whites and Asians, on the one hand, and Hispanic and Black students on the other, remains wide. Among the 18 to 24 year old students enrolled in higher education in 2004, black students comprised 32 percent, and Hispanics comprised 25 percent, as compared to 42 percent for white students (NCES, 2007). The college graduation rates reported by Title IV institutions (institutions of higher education eligible to participate in federal student aid programs) indicate that 39.1 percent of Black students and 48.7 percent of Hispanics graduate with a bachelor's degree, as compared to 60.8 percent of white students (NCES, 2011b).

A report sponsored by the Educational Testing Service presented at the American Association of Hispanics in Higher Education shows that in 2006, the Black college graduation rate for persons ages 25 – 34 was 20.1 percent, as compared to 35.3 percent for white students. In the same year, college graduation rates for persons ages 25 – 34 were 18.3 percent for native born Hispanics, and 10.6 percent for foreign-born Hispanic college students. These numbers are attributed to the disproportionate share of parents without college or high school credentials, large percentage of students raised in homes wherein parents do not speak English fluently, and increasing numbers attending large, segregated and underperforming schools (Tienda, 2009).

A more recent study sponsored by the Higher Education Research Institute at UCLA noted that the achievement gap continues to persist in college, with Asian American and White students being twice as likely to earn a degree as compared to Black students. They also report that regardless of race or ethnicity, degree completion is highest at private universities and lowest at public four-year colleges. When race is taken into consideration, the public four year colleges are the sites for the lowest graduation rates for Black and Hispanic students. The authors also report that a smaller percentage of less academically prepared students are graduating today, when compared to a decade ago (DeAngelo, Franke, Hurtando, Pryor, & Tran, 2011).

Horn (2006) examined data on 6-year graduation rates among four-year colleges and universities with similar selectivity and low-income enrollment. He found an average achievement gap of 18 percentage points in graduation rates of White and Black students as compared to 12 percentage points between Whites and. The achievement gaps also varies substantially by institution, with smaller gaps at the more selective four-year colleges, and larger graduation gaps in less-selective four-year colleges and universities. Black students were more likely to enroll in four-year colleges with large low-income enrollments, and Hispanic students were more likely to enroll in moderately selective doctoral and masters institutions with large low-income enrollments. The smallest gap in graduation rates between White and Hispanic college students was in the category of moderately selective doctoral institutions which enrolled a large percentage of low income students. On average, institutions with large populations of low-income students had a lower median graduation rate compared to institutions with small populations of low income students (Horn, 2006). Baum, et.al (2010) found that even as college enrollment rates have continued to increase, large gaps continue to persist between Black and Hispanic students on the one hand and White students on the other. In addition, enrollment patterns and completion rates varied by institution type as well as by family income and parental educational levels.

The most recent information available from the College Board's College Completion Agenda shows that the current college completion rate for Hispanic students is approximately 20 percent, 30 percent for Black students, and approximately 49 percent for White students (College_Board, 2012).

The state average of college graduation rates between Hispanic and White students in New Jersey, is 9 percentage points (51 percent for Hispanics and 60 percent for White students); in New York, the state average for Hispanics is 52 percent and 61 percent for white college graduates – equivalent to a gap of 9 percentage points. The gap in Ohio is 10 percentage points, 13 percentage points in Minnesota, and 15 percentage points in Kansas (Kelly, Schneider, & Carey, 2010).

A study conducted at Duke University, a private research university in Durham, North Carolina, looked at the achievement gap from the perspective of racial and ethnic differences while attempting to control for status attainment, human capital, and cultural capital. The study is part of a larger, longitudinal study called *Campus Life and Learning Project* which focused on two cohorts of students who started at Duke University in 2001 and 2002. While not representative of the US population of college students, the study affirmed that achievement gaps can be observed as early as the first semester of college (Spenner, Buchmann, & Landerman, 2002).

The achievement gap was observed on an intergenerational level as well. Attewell and Lavin (2007) found that even with the benefits of maternal enrollment in college, race continues to impact the academic achievement of their children. The children of college-educated black women were less likely to be academically successful than children of college-educated White or Hispanic women with similar credentials. Of the parents, a 15 percent gap existed between college completion rates of white women and minority women (Attewell & Lavin, 2007).

The studies cited validate that the achievement gap between Black and Hispanic students on the one hand and White and Asian students on the other, are carried over from elementary and secondary education to postsecondary education. The gap persists from high school graduation rates to college attendance and college completion. This is to be expected when the percentage of students by race/ethnicity in need of remediation is considered. According to a sample survey conducted by the National Center for Education Statistics in 2007-2008 of first-year undergraduate students, approximately 31 percent of White students reported having taken a remedial course, as compared to 45 percent of Black students, and 43 percent of Hispanic students (NCES, 2011a).

College Readiness and Transition to College

The past half century witnessed increased access to college education for African Americans, Hispanics, women, and students from low socioeconomic backgrounds. Access to college, however, is separate and distinct from progress through college. In order for progress to be made, the student has to be ready for the rigor of work required at the college level.

The means for determining college readiness, however, is not easily defined. The process is also tied to the type of institution as well as its mission. For institutions of higher education that have an open-admission policy, the typical assessment is conducted through the use of various placement tests. For institutions that utilize selection criteria to determine admission, the first set of assessments include standardized test scores (typically SAT or ACT scores), high school grade point average, completion of a specified set of academic courses or Carnegie units, and application that may include the requirement of an essay, sample of work, or portfolio. To determine college readiness, use of various placement tests, evaluation of prerequisite coursework such as Advanced Placement courses, International Baccalaureate (IB courses) or A-level courses through the British-based General Certificate of Education are typical. Assessing the student's college readiness after graduation from high school or upon admission to a college or university, however, seems inimical to the process of transitioning to higher education.

Studies have shown that success in college is greatly dependent upon the academic preparation of students in high school (Adelman, 1999, 2006; ASHE, 2007; McDonough, 2004), and yet there are relatively few published studies and research on college readiness as compared to those that focus on student outcomes and persistence (Perna &

Thomas, 2006). Of the published studies and reports on college readiness and the disconnect between high school and college coursework, three will be described briefly in the following section: *The Bridge Project* conducted by Stanford University's Institute for Higher Education Research, *The American Diploma Project* conducted through Achieve, Inc. and the unpublished article by Faith Connolly, Executive Director of the Baltimore Education Research Consortium.

The Bridge Project represents six years of study led by Venezia, Kirst and Antonio from Stanford University's Institute of Higher Education Research in collaboration with the Pew Charitable Trust, the Office of Educational Research and Improvement, and the U.S. Department of Education. The study found a lack of connection between K-12 and higher education which fostered student misconceptions about college. The study also found that high school teachers and college professors differed in their assessment of what high school students should learn in order to succeed in college. They recommend a reorganization of the educational system to incorporate K-12 with higher education (a K-16 model), and the establishment of a dependable system of communication for parents, students and educators that would improve accountability and support the collaboration between high school and college (Kirst & Venezia, 2006; Venezia, et al., 2003).

The American Diploma Project was first launched at the National Education Summit on High Schools in 2005 by Achieve, Inc., a Washington based nonprofit organization created by state governors and business leaders. Since then, research and reports on efforts to align the "standards, graduation requirements, assessments and accountability systems with the expectations of colleges and employers" have been published, and participation by states continues to increase (Achieve, 2010). The project provides support for participating states and school systems through research and development, advocacy, tools and benchmarks and technical assistance.

Another report produced through the American Diploma Project, *Aligned Expectations? A closer look at college admissions and placement tests* (2007), reiterated that while college faculty across the country have a relatively consistent view of the expected level of skill required for reading, writing and mathematics in college, the admissions and placement tests used in these colleges vary considerably. Of greater concern is the finding that the process for determining college readiness and the scores used to determine this readiness using the placement tests vary so much from one college to the next (Achieve, 2007) . Recommendations of the study for the higher education sector include clear definition of expectations for incoming students, closer collaboration with K-12 on the development of high school tests that more accurately reflect the rigor of college-level work, and scrutiny of placement tests administered to incoming students to ensure alignment with expectations of college faculty and the rigor of college level work.

Similarly, a report by the American Council on Education's Center for Policy Analysis emphasized the importance of developing college awareness and aspirations as early as the middle-school years. The report also emphasized the importance of taking mathematics "gate-keeping courses" early in order to be ready to take the high school coursework that is needed to be admitted and succeed in college (McDonough, 2004).

Adelman (2006), in *The Toolbox Revisited: Paths to Degree Completion from High School to College,* identified the minimum Carnegie units of English, mathematics, science, foreign languages, history and social studies, and computer science needed for a high school graduate to successfully complete in order to be ready for college. The highest level of mathematics in high school was one of the key markers for both precollege momentum and college success. Algebra II was identified as the minimum for successfully earning college-level math credits (not remedial math credits) by the end of the second year in college and one of the best predictors for degree completion. The gap in college-level math credits earned between students who eventually earned a degree and those who did not was 71 to 38 percent (Adelman, 2006).

An unpublished article by Faith Connolly of the Baltimore Education Research Consortium takes a slightly different view of college readiness. Instead of accepting the de facto definition of college readiness as lack of need for postsecondary remediation determined through the students' performance on standardized tests used by colleges and universities, the author advocates for an alternative approach that incorporates known predictors of academic success which include non-cognitive skills (Connolly, et al., 2012). The premise of this advocacy is rooted in the argument that focusing on "the presence or absence of "basic skills" coupled with inconsistent and volatile standards used to determine the need for remediation within and across institutions of higher education to determine college readiness is flawed. The author highlights the fact that even within a single region within a state (Baltimore Region in Maryland), variations in the cut-scores for the placement exam (ACCUPLACER) exist in spite of attempts to establish a common standard across like institutions of higher education. This is further complicated by the accepted use of other standardized tests (SAT) instead of, or in conjunction with, ACCUPLACER to determine readiness for college and placement into college-level courses. In essence, a remedial student in one college may not necessarily be a remedial student at another college.

The assignment to remediation courses is far from consistent or strict, even in states like Florida wherein one placement test (the College Entry-Level Placement Test) with one set of standard passing scores is required for all students seeking to earn a college degree in any of the state's 2 and 4 year public colleges (Calcagno & Long, 2008, 2009; Connolly, et al., 2012; Florida_Department_of_Education, 2011). In Texas, the Texas Higher Education Assessment (THEA) test is required of all students who enroll at public colleges in the state. Formerly known as the Texas Academic Skills Program (TASP) test, the THEA took precedence in 2005 and is now used to determine college readiness based on standard scores set by the state. In spite of the uniform test and the set standard for passing scores, students in one institution can change their college readiness status by retesting, completing college courses at private or out- of- state colleges, or by serving or having served in the military ("Texas A&M Basic Skills Placement. 2012,").

To complicate further, placement into remediation is not restricted to nor strictly required of students found to be basic skill deficient. Attewell et.al. (2006) found that many skilled students took remedial courses in college. Analyses of high school and college transcript data from the National Educational Longitudinal Study (NELS:88) found 14 percent of students who were in the first quartile took the most advanced curriculum in high school, and 32 percent of the students in the second quartile took fairly demanding courses in high school also took some remedial coursework in college (Attewell, et al., 2006). The findings highlight the fact that enrollment into remediation courses is not limited to students with low academic skills in the 12th grade, and placement into remediation per se should not be the only determining factor for identifying college readiness.

Recent studies conducted through the Community College Research Center at Columbia University Teachers College show that there are “severe error rates” in the placement of students into remedial courses when using score cut-offs on two of the most commonly used placement exams: the ACCUPLACER and COMPASS (Belfield & Crosta, 2012; Scott-Clayton, 2012). The error rates were as high as 27 to 33 percent for English and 17 to 24 percent in Math. The authors suggest the alternative of using high school grade point averages (and the information provided on the high school transcripts) in combination with placement tests or as a single criterion, to better identify and place students in need of remediation.

Other organizations have stepped forward to help develop an operational definition for college readiness that goes beyond the performance of students in a placement exam. ConnectEd suggested a framework for defining college and career readiness as reflecting a “variety of knowledge, skills, dispositions and behaviors” that will transcend the traditional organization and categorization of students. They called for new curriculum, instructional strategies, assessments and new teacher preparation and professional development. This framework not provided an operational definition of college readiness (ConnectEd, 2012).

David Conley (2007) states a truism that is often forgotten - college readiness is fundamentally different from high school competence “because college is genuinely different from high school” (page6). Conley asserts that the current operational definition of a remedial student as one who fails to meet the standards required for enrollment into a college-level course in English, composition and math lacks specificity and benchmarking. This lack of specificity is due in part to the fact that even the standardized tests (ACCUPLACER, ASSET, COMPAS) requires individual institutions to set their own cut point scores which results in a variety of operational definitions of remedial-level in spite of using the same instrument or test. Conley identified several disconnects existing between the alignment of the test content and entry level courses, as well as between the challenge level and content coverage of a college's entry level courses in math and English as compared to that of another college. To address these challenges in assessing college readiness through cut scores on standardized tests, Conley proposes a four-dimension comprehensive readiness model. The four dimensions include the development of key cognitive strategies, mastery of key content knowledge, proficiency with a set of academic behaviors, and a sufficient level of what college education requires (Conley, 2007, 2010). This model allows for the evaluation of non-cognitive skills that include academic behavior, self management skills, goal setting, resiliency and persistence. These four dimensions of readiness guide students through high school and provide them with interventions supportive of success in college.

Inconsistencies in the definition of college readiness and the errors in assignment of students into remediation make the analysis of the effect of remediation more difficult. Lack of standards can be traced to variations in the tests used, interpretation of the test results, selection of the cut scores, irregularities in actual placement into remediation, and exemptions allowed by departments, institutions or state agencies. The definition of college readiness becomes more relevant to individual institutions than to higher education as a whole, less useful to the k-12 system which prepares students for college, as well as students and families that ultimately pay the price for this lack of preparedness for college.

The recommendations from the projects, reports and articles described above can only help the transition of students from high school to college, a transition that is even more challenging for at-risk high school students who are disproportionately represented by black and Hispanic youth.

Studies on the Effect of Remedial Education

There continues to be considerable uncertainty surrounding the efficacy of remedial education (Bailey, 2009; Martorell & McFarlin Jr., 2010; Moore & Shulock, 2009). Some of this uncertainty stems from the difficulty in assessing the impact because students in need of remediation are expected to have poorer academic outcomes in the absence of remedial intervention (Martorell & McFarlin Jr., 2010). Simply comparing the outcomes in students in need of remediation with those of academically better prepared students does not lead to the identification of the causal effects of remediation and unbiased estimates of the impact of remediation due to selection (Bettinger & Long, 2009; Boatman & Long, 2010; Calcagno & Long, 2008; Martorell & McFarlin Jr., 2010). Recent studies have used new methodologies and strategies to isolate this selection bias.

Bettinger and Long (2004) in their study titled "*Shape Up or Ship Out: The effects of remediation on students at four-year colleges,*" looked at the effects of remediation on student academic outcomes in non-selective colleges in Ohio. They noted that one of the difficulties in analyzing the effect of remediation on college students stems from lack of data. They addressed this in their study by looking at a longitudinal dataset from the Ohio Board of Regents that includes information on the application of the tests that determine college-readiness, standardized test scores and questionnaires, and college transcripts of approximately 8,000 first-time, full-time college students. The study used a two-part instrumental variables approach to address selection bias. The proximity in college choice was used as the first exogenous variable to address the issue of selection bias due to student skill level and preferences about remediation. The authors used variations in remediation policies in similar non-selective four-year colleges in Ohio as the second instrumental variable. The authors also used student background information to predict the likelihood of remediation at each of the colleges in the sample. They contended that the interaction of these two variables exogenously predicted placement into remediation. By comparing academically similar students who had different experiences with remedial courses, the authors estimated the effects of remediation on students' academic outcomes. The students in the study were all of traditional age (18 to 20 years of age) and attended Ohio non-selective four-year colleges between fall 1998 and spring 2002. The study was limited to public colleges in the state of Ohio. The study analyzed two effects: the impact of being placed into remediation (or "intent to treat"), and the impact of completing remediation (or "treatment on the treated"). Students placed in remediation were more likely to transfer to less-selective colleges or drop out as compared to students who were not placed in remedial courses, suggesting that remediation becomes a re-sorting mechanism that provided early signals of difficulties for college students. Students heeded this signal and re-evaluated their college decisions, resulting in either dropping out or transferring to less-selective institutions. The impact of remediation differed by plan of study. Students with intended majors in mathematical fields were found to be more likely to complete their degree. Among students who completed the coursework, remediated students were more likely to persist towards their degree. However, students also took longer to complete their degrees and were slightly more likely to transfer to less selective colleges. The authors concluded that remediation not only served as a re-sorting mechanism, but was also used by institutions to control entry into upper level coursework allowing institutions to maintain their research focus (Bettinger & Long, 2004).

Attewell, Lavin, Domina and Levey (2006) examined the effect of taking college remediation on graduation rates and time to degree completion using the National Educational Longitudinal Study (NELS:88 Study) which was a project of the U.S. Department of Education's National Center on Educational Statistics (NCES). The authors used a counterfactual model of causal inference and propensity scoring with caliper matching to address issues of selection bias. They determined the propensity scores for assignment to treatment based on available variables and matched the students who received treatment with students with similar propensity scores but did not get treatment (remediation). They found that two year colleges were more likely to require remediation than four-year colleges, public colleges were more likely to require remediation than private institutions for similar, equivalently skilled students and more selective colleges required less remediation for similar, equivalently skilled students. The authors noted that public institutions appeared to have created higher hurdles than their private sector equivalents resulting in the observation that students are also less likely to graduate from the public college than from the private institution. Black students were more likely required to take remediation than similarly prepared white students, students from urban high schools were most likely to take remediation, followed by students who attended rural high schools, and students from suburban high schools were the least likely to take remediation. Students from private institutions were more likely to graduate than those from public colleges and universities. Taking remedial courses increased time to degree completion and slightly lowered the likelihood of degree completion in students attending four year colleges. Taking remedial courses in reading at four year colleges to lowered students chances of graduation. The effect of taking remedial courses in math on graduation was ambiguous. Taking remedial courses in writing had no significant effect on graduation for students attending four year colleges, after controlling for academic background. In contrast, students at two year colleges who took reading remediation were more likely to graduate within 8 years of high school with an associate's or bachelor's degree while students who took math remediation were less likely to graduate. Remediation in reading, writing and math were all positively associated with degree completion in two year colleges but not in four year colleges (Attewell & Lavin, 2007; Attewell, et al., 2006).

Fike and Fike (2008) analyzed predictors of first year student retention in community colleges and found that taking remedial education programs and internet-based courses were strong predictors of student retention. In particular, passing remedial reading courses was associated with academic success that is contingent upon persistence. Students involved in structured student support programs and who were required to meet regularly with their advisors and completed long-term plans of study had higher persistence rates than those who were not involved. While Fike and Fike focused on community college students, their study is relevant to State College because of similar key student characteristics, including first generation college attending status, minority status, low socioeconomic status and average age.

Calgano and Long (2008) conducted a study of almost 100,000 degree seeking first-time community college students in Florida to examine the effects of remediation on their educational outcomes using a regression discontinuity design to analyze the term-by-term enrollment information for all students in the sample, for a period of six years for each cohort relevant to their course-taking patterns. Short-term outcomes were based on whether students enrolled and completed first year college-level courses in Math and English, and their fall-to-fall persistence. Long-term educational outcomes included completion of degrees or certificates, total credits earned, and total credits in remedial coursework earned. The main variable used in their study was assignment to remedial coursework in math and reading. The authors also addressed concerns about endogenous sorting around the cutoff scores and non-compliance with the assignment of treatment. The study results showed that students on the margin of being required to take remedial courses in math were more likely to persist to the second year. Students taking math and reading remedial courses were found to have higher total number of credits (college level and remedial) completed over six years. Students who took remedial reading courses were slightly less likely to pass college-level English composition courses. Similar effects were not observed on future math course performance for students who took remedial math. Required remediation did not lead to an increase in the completion of college level credits or eventual degree completion. The authors posited that remediation in Math and Reading might promote early persistence in college but not necessarily help students within the bandwidth of the cut point score to persist and complete their degrees (Calcagno & Long, 2008).

Building on previous studies, Bettinger and Long conducted another study in 2009 that focused on the effect of both math and English remediation on academic outcomes using instrumental variables strategy based on variation in placement policies and importance of proximity in college choice. Data from over 28,000 students attending public colleges in Ohio who took the ACT or the SAT were used. Educational outcomes of students who took remedial courses were compared with the outcomes of students with similar backgrounds and preparation who were not required to take remedial courses. This study showed that students who took remedial courses had better educational outcomes than students with similar backgrounds and preparation who were not required to take remedial courses. Remediation reduced the likelihood of students dropping out after five years (Bettinger & Long, 2009). The authors cautioned, however, that this was observed only for students who were on the margin of needing remediation.

Boatman and Long (2010) conducted an analysis of the effect of mathematics, reading and writing remedial education on academic outcomes of underprepared students attending two and four year public colleges and universities in Tennessee. The study also examined the effects of multiple levels of remediation (one remediation course versus several remediation courses per student). A regression discontinuity design was used to analyze longitudinal data on students at multiple points on the academic preparedness scale which was also used to assign students to remediation based on a specified cutoff score. Due to inconsistencies in compliance with the assignment of placement, the regression discontinuity design was considered "fuzzy" and the authors had to use instrumental variables estimation on assignment to remediation based on the cutoff as an instrument for enrollment in remedial or developmental course. The authors examined academic outcomes that included persistence, degree completion, number of total and college-level credits completed, and college grade point average. The study showed that the effect of remedial courses differed according to students' level of preparation. Remediation was found to have negative effects on students on the margins of needing any remediation. These students were found to be less likely to complete a college degree in six years, and completed less college level courses within three years. Less negative effects with occasional positive effects were observed among students with much lower levels of college preparedness. Students with lower level math skills performed only marginally worse than students in the next level of remedial math. Students with lower level writing skills performed better than students in the next level of remedial writing. The authors argued that while remediation for students on the margin of the cutoff seems to have no positive effect on outcomes, remediation for students further below the cutoff seem to have positive effects on persistence and academic outcomes (Boatman & Long, 2010).

Martorell and McFarlin (2007, 2010) examined the impact of remediation on the academic and labor market outcomes among students in Texas who entered college in the 1990s. The study looked at the effect of placement into remediation on academic outcomes using fuzzy regression discontinuity design. A large longitudinal dataset of students who attended two and four year public colleges was used. In the course of their study, the cut point scores used to assign participation in remediation changed, and the authors examined the effects of placement into remediation at different points of the skill distribution. The number of credits attempted in the first year and within six years, transfer-up to a four year college from a two year college, transfer down to a two year college from a four year college, highest grade students completed, and degree attainment represented academic outcomes. The students included in the analysis were limited to those who were not exempt from the placement test and took the test, had no missing data for date of birth and race/ethnicity, were degree-seeking, took the placement test by the end of their first term in college, and had placement test scores for all three subject areas of math, reading and writing. The study found little evidence of positive effects of placement into remediation on academic outcomes of underprepared college students. To the contrary, remediation had a small negative effect on the number of academic credits attempted and the likelihood of completing at least one year of college. The estimated effects of placement into remediation were statistically insignificant on degree completion and transferring up to a four year college (Martorell & McFarlin Jr., 2010). There was little evidence that remediation provided labor market benefits in the form of higher earnings. The authors noted that because the study focused on students scoring close to the cut point (the "marginal" group) on the assignment variable, the findings may not be valid for students scoring far away from this cut point. They argued, however, that the observed effect was still of great interest because a large percentage of students in need of remediation was considered "marginal" and scored close to the cut point. Since the cutoff point changed in the period of their study, the authors were able to examine the effects at various points of the skill distribution. Martorell and McFarlin Jr. further argue that since there were no observed positive effects under the various cutoffs used in the study, the findings had greater external validity than is typical with a regression discontinuity design. While these findings were consistent with some of the findings in the study conducted by Boatman and Long (2010), the findings differed from studies conducted earlier by Bettinger and Long (2009) and Calcagno and Long (2008).

Attewell, Heil and Reisel (2010) conducted an analysis of longitudinal data from a nationally representative panel of entering college students to examine multiple factors associated with degree completion. Multiple variables were combined using the sheaf coefficient to estimate the effect of these variables on degree completion. One of these combinations was centered on remediation. The study suggested that while remediation had a significantly larger positive effect on college completion for students attending least selective four-year colleges, remediation was not a statistically significant predictor of college completion for students attending two-year colleges, moderately selective four-year colleges and highly selective four-year colleges. The study findings supported an earlier study by Attewell, et.al. (2006) which found that students taking remedial courses in four-year colleges were less likely to complete their program and earn a degree (Attewell & Lavin, 2007; Attewell, et al., 2006).

Another study by Martorell, McFarlin and Xue (2011) focused on the effect of being required to take remediation on college enrollment behavior. Unlike previous studies, the authors examined the "discouragement effect" of assignment to remediation on actual college attendance because students are provided with new information about their academic skills, increased college costs from tuition and fees for courses that do not count towards the degree, and the stigma attached to being academically skill-deficient. The authors concluded that assignment to remediation had little effect on the actual enrollment behavior of college-going students. Students who were informed of their need to first take remediation courses before taking college level coursework were neither less likely to enroll in college nor delay college enrollment to avoid remediation, compared to similar students. The psychic and financial costs of remediation were "not sufficiently high enough to offset the large returns to college" and students were not surprised to learn that they had graduated high school with insufficient academic skills for college. The authors cautioned that the findings were limited to students who scored close to the cut point on the placement test, and those who scored further below the cut point or were placed into multiple levels of remediation (versus just one level) may present different results (Martorell, McFarlin Jr., & Xue, 2011).

Lesik (2006) looked at the effect of participation in a math developmental program. Developmental math consisted of intermediate algebra – a pre-requisite course for all college-level math courses. Remedial math consisted of elementary algebra – a math course that focused specifically on the level of math taught in high school. Using a regression discontinuity design with instrumental variables strategy to model selection bias, the author analyzed the performance of students close to the cut point on the placement test who participated in math developmental courses. The study findings suggested that participation in math developmental program significantly increased the odds of successfully completing college level math courses on the first try (Lesik, 2006). In a separate analysis, the author embedded a regression discontinuity approach within a discrete-time hazard model to determine the causal impact of math developmental programs on when students drop out of college for the first time (Lesik, 2007). The results from this subsequent study suggested that participation in the developmental math course had a positive impact on student retention. The author argued that participation gave students the opportunity to learn math they were supposed to learn in high school and provided an atmosphere where "students can begin to feel connected and integrated with the university" (p605). Lesik found that students who did not participate in the developmental math program were approximately 4.4 times more likely to drop out of the university in the first three years, when compared to similar students who participated. According to Lesik (2008) the regression-discontinuity design is an effective means of assessing the extent to which participation in developmental programs help increase student retention. Compared to studies conducted in Texas, Ohio and Florida, Lesik's studies used smaller samples and the author needed to make strong assumptions that have been criticized to be less reliable (Bailey, 2009). A summary table of the studies and their results is included in Appendix A.

Theories on Student Retention and Degree Completion

The persistence in college pre-requisite to a college degree has been the subject of a large volume of studies. Some studies have focused on the academic and social aspect of the college experience (Allen, Robbins, Casillas, & Oh, 2008; Astin, 1977; Astin & Panos, 1967; Bail, Zhang, & Tachiyama, 2008; Jamelske, 2009; Kuh, et al., 2008; Pascarella, Terenzini, & Wolfe, 1986; Robbins et al., 2009; Smart & Pascarella, 1987; Tinto, 1987, 1993; Tinto & Cullen, 1973; Tinto & Sherman, 1974). Other studies have focused on the financial aspect of college attendance, persistence and retention (Thomas Brock & Richburg-Hayes, 2006; Dynarski, 2003; Gurley-Alloway, 2009; Hauptman, 2007; Hu & St. John, 2001; Jensen, 1981; Johnson, 2008; Paulsen & St. John, 1997, 2002b; Paulsen, St. John, & Carter, 2005; St. John, Paulsen, & Carter, 2005a; Titus, 2006).

Several studies found that social and academic integration affect the persistence of students in both two and four year institutions of higher education (Allen, et al., 2008; Engle & Tinto, 2008; Kuh, et al., 2008; Tinto, 1987, 1997; Tinto & Cullen, 1973). Vincent Tinto's (1975) student integration model of retention emphasizes the fit between the student and the institution. Tinto posits that students enter college with a range of pre-entry characteristics and initial commitments to the institution and the goal of graduating which influence how successfully students will integrate in the academic and social systems of the institution, as well as their academic outcomes and persistence. Tinto's model emphasizes that the academic and social integration of students affect their level of commitment to the institution and to their educational goals, and the progress they make as they "transition from (being) first-time in college to mature students" (Fike & Fike, 2008; Tinto, 1987, 1997; Tinto & Cullen, 1973; Tinto & Sherman, 1974). Academic integration - defined as the perceived congruence between the individual's intellectual capabilities and aspirations and the intellectual climate at the institution, partnered with social integration - defined as the sense of connectedness through peer relationships and college social life, are critical to the retention of students at an institution (Kulm & Cramer, 2006; Strauss & Volkwein, 2004; Tinto, 1987, 1997; Tinto & Sherman, 1974). Tinto's model, comes in part, from the application of Durkheim's sociological theory of suicide (Tinto & Cullen, 1973)which posits that individuals with little or weak integration into the fabric of social institutions experience anomie, and are more likely to commit suicide (Durkheim, 1951). Tinto's model of student integration argues that colleges are social systems to which students need to be integrated socially and academically in order to persist and succeed. Student drop-out is compared to suicide wherein students leave because of a “lack of consistent and rewarding interaction with others in the college (e.g. friendship support) and the holding of value patterns that are dissimilar from those of the general social collectivity of the college” (Tinto & Cullen, 1973, p. 37).

Tinto’s theory has been modified, criticized and expanded over the decades, and Tinto himself identified several weaknesses in his original model (Tinto, 1982). According to him, the model does not provide “sufficient emphasis on role of finances in student decisions concerning higher education persistence” (p. 689) nor does it distinguish between transfer to other institutions and permanent withdrawal. Tinto’s model also fails to emphasize the critical differences in groups of students based on age, gender, race, social status and type of institution in which they are enrolled. Tinto later examined the longitudinal process of student persistence, and turned to social anthropologist Arnold Van Gennep and his work on rites of membership in tribal societies o help explain the stages of separation, transition and incorporation (Tinto, 1988). Tinto posited that college students, in their move from the community of high school to that of college, must “separate themselves, to some degree, from past associations in order to make the transition to eventual incorporation in the life of college” (p.442).   Tierney (1992) focused on the limitation of Tinto’s model with respect to the racial and social status background differences between students. Tierney argues that the model has “the effect of merely inserting minorities into a dominant cultural frame of reference that is transmitted within dominant cultural forms, leaving invisible cultural hierarchies intact” (p.611), and advocates for the use of critical and feminist theories to improve the student attrition model (Tierney, 1992).

Alexander Astin's student involvement model took the missing finance component of the college experience, and suggests that other variables such as forms of financial aid influence student persistence (Astin, 1977, 1993). His model has also been referred to as the input-environment-output model. Astin proposes that outputs must always be evaluated in terms of inputs within the context of the environment on campus (Astin, 1991; Fike & Fike, 2008). The inputs can be represented by student characteristics that include skill, gender, age or parental education, while outputs can be represented by persistence in college and degrees earned. The environment is the third critical component of this model, and is represented by the courses offered, academic programs, facilities, and faculty and peer groups.

John Bean's (1990) student attrition model takes a slightly different approach. Bean integrated academic variables, student intent, goals and expectations, and internal and external environmental factors into his model. In introducing factors external to the institution, Bean expands on Tinto's earlier model. By taking into consideration the role of family approval of institutional choice, finance attitudes, and perceptions about opportunity to transfer to other institutions, Bean addresses some of the criticism leveled at Tinto's student integration model. Bean also emphasized the psychological and personality factors in addition to the sociological factors discussed by previous models (Cabrera, Castañeda, Nora, & Hengstler, 1992; Cabrera, Nora, & Castaneda, 1993).

The financial nexus model of college persistence presented by Paulsen and St. John (1997) look at persistence from the perspective of student choice. The authors argue that a sequence of student choices made in "situated" contexts lead to various stages of educational attainment or persistence. Some of these critical contexts involve the financial reasons for choosing a college and the actual costs of attendance and the aid received. The students' perceptions of financial factors are examined vis-à-vis their valuation of the college experience. Paulsen and St. John argue that financial barriers for economically and educationally challenged students need to be removed in order for these students to succeed (ASHE, 2007; Fike & Fike, 2008; Gurley-Alloway, 2009; Paulsen & St. John, 1997, 2002a, 2002b; St. John, Paulsen, & Carter, 2005b).

Pascarella and Terenzini examined Tinto's model in the context of non-traditional or commuter institutions of higher education. They offer a reconceptualization of Tinto's model that takes into consideration the more limited opportunities for social and academic integration at commuter institutions, limitations created by the fact that commuter students spend less time on campus as compared to students at a residential institution (Pascarella, Duby, & Iverson, 1983). Pascarella and Terenzini emphasize the students' pre-entry characteristics (academic aptitude, race, gender, affiliation needs) as strong, direct mediators on persistence. These characteristics dominate over the effect of social integration and are equal to the strength of the student's intent to continue, a new variable that they suggest should be part of retention models in commuter institutions.

Predictors of Academic Progress and Success

The theories discussed above provided for the conceptual framework used by studies that focus on identifying predictors of persistence and academic success in college. Studies have focused on pre-college student characteristics as well as high school characteristics and variables (Allen, et al., 2008; ASHE, 2007; Choy, Horn, Nunez, & Chen, 2000; Fike & Fike, 2008; Ishitani, 2006; Johnson, 2008; Sewell & Shah, 1967;

Venezia, et al., 2003; Wells, 2008). Students who complete college preparatory courses, including taking algebra in the 8th grade are more likely to persist and succeed in college (Allen, et al., 2008; Choy, et al., 2000; Ishitani, 2006; Johnson, 2008). High school grades as well as high school rank have long been accepted as predictors of college persistence and success (Bean & Bradley, 1986; Geiser & Santelices, 2007; Ishitani, 2006; Jamelske, 2009; Johnson, 2008). Other individual-level student background characteristics that have been found to be predictors of persistence and academic success in college include student socioeconomic status and family income (Ishitani, 2006; Johnson, 2008; Sewell & Shah, 1967; Wells, 2008), parents' having some college education or a college degree (ASHE, 2007; Choy, et al., 2000; Fike & Fike, 2008; Ishitani, 2006; Pascarella, Pierson, Wolniak, & Terenzini, 2004; Wells, 2008), age (Jacobs & King, 2002), and gender (Goldin, Katz, & Kuziemko, 2006). Women were found to have higher college completion and graduation rates than men, and this was attributed to several factors that include the increase in age of marriage over years, the increase in pecuniary returns to women's investment in higher education and participation in the labor force, the shift in expectations of women and their roles in the family and the increased access to higher education for women (Goldin, et al., 2006).

An analysis of data from the Beginning Postsecondary Students Longitudinal Study conducted by Attewell, Heil and Reisel (2010) compared several of the theoretical explanations of persistence and degree completion discussed above. The 36 factors examined were grouped into eight higher level constructs that include high school preparation, nontraditional status, financial aid, race/ethnicity/gender, socioeconomic status, integration, working hours and remediation. They also examined the effect of these factors in four types of institutions that were categorized as two-year or community colleges, least selective four-year colleges, moderately selective four year colleges and highly selective four-year colleges. Their findings show that there is not a single dominant factor associated with degree completion. Instead, they argue that each of the factors plays an independent role even as the effect sizes of these factors varied in importance across types of institution. Financial aid was found to be statistically significant for students who enter two-year colleges, while having significantly smaller impact on students who enter four-year colleges. Academic preparation was found to be the strongest determinant of degree completion in four year colleges, while not being statistically significant for student entering two-year colleges. Differences in socioeconomic status were not a significant factor only in the most selective four year colleges. They also found remediation to have a significantly larger effect on students who enter the least selective four-year colleges as compared to moderately to highly selective colleges (Attewell, Heil, & Reisel, 2010).

Johnson (2008) found a correlation between aggregate level high school characteristics and students' college going and persistence behaviors. Johnson examined data from a public research university with approximately 11,000 to 12,000 students and found that students who attended high schools within sixty miles of the institution were more likely to persist in college. Also, students who came from high schools with a higher percentage of students receiving free lunch were less likely to stay in college, suggesting that the high school's socioeconomic characteristics play a role in the retention of college students. The percentage of students taking the SAT at the high school was also a predictor of persistence in college: students from high schools with high percentage of SAT takers are more likely to persist and graduate from college (Johnson, 2008).

Choy et al. (2000) conducted an investigation of factors that facilitate the high school to college transition of at-risk students and students whose parents did not attend college. Their study looked at data drawn from the National Educational Longitudinal Study (NELS) of 1988 which began with a survey of eighth graders, followed up with surveys in two year intervals. Their study found that high school graduates whose parents did not attend college were less likely to have access to, be encouraged in, or participate in a mathematics curriculum that lead to college enrollment. Taking algebra in the 8th grade was strongly associated with taking advanced math in high school, which was also strongly associated with the higher probability of attending college. Of students who took advanced math and whose parents attended college, 85 percent went to college as compared to 64 percent of those whose parents did not attend college. Parents who did not attend college also participated less in their children's activities that involved planning for and applying to college, even if their child was qualified and encouraged to attend college. The role of school teachers and counselors was emphasized as critical in compensating for lack of parent participation or knowledge of the higher education system. For at-risk high school students, defined as those from lower socioeconomic status, coming from single-parent families or having a sibling who had dropped out of high school, student engagement in high school, parent engagement with student learning, peer engagement with learning and participation in college preparation activities such as Upward Bound and Talent Search were all positively associated with attending college (Choy, et al., 2000).

Other studies have focused on the experiences and behaviors of students while in college. Bean and Bradley (1986) examined the relationship between student satisfaction, academic performance, institutional fit academic integration and social life. They found that institutional fit, "defined as the extent to which a student feels that he or she belongs at the institution" (p. 395), and academic integration, "defined as being interested, motivated and confident as a student, and perceiving that one "thinks like faculty" (p.395) were the two strongest predictors of satisfaction for both men and women, with men being more affected by academic integration than women, and women more affected by institutional fit than men (Bean & Bradley, 1986). Institutional fit and academic integration also had positive effects on academic performance as measured by GPA.

Other studies have found faculty interaction, as a specific component of academic integration, to be a positive predictor of persistence and academic progress (Blanc, DeBuhr, & Martin, 1983; Kulm & Cramer, 2006; Suhre, Jansen, & Harskamp, 2007; Tinto, 1982). Students who had frequent meaningful faculty contact were more committed to the institution and demonstrated greater persistence (Pascarella, 1984; Pascarella & Terenzini, 1977, 1979, 1980; Pascarella, Terenzini, & Hibel, 1978; Suhre, et al., 2007; Tinto, 1982) and higher grades (Fischer, 2007) . Meaningful faculty contact require teachers to be approachable and easily accessible for course relevant activities and guidance that would include providing clear information on content and expected student behavior (Suhre, et al., 2007).

The emphasis on providing students with clear information is also made by Deil-Amen and Rosenbaum (2002) as they argue against the "unintended consequences of stigma-free remediation" in the community colleges they studied. According to the authors, these institutions of higher education emphasize the social "mission of providing opportunities to disadvantaged students" (p. 254) and providing remedial courses that carry no college credit is part of this mission. However, in order to avoid stigmatizing students who needed to take these courses, "the term remedial is rarely used in conversations between staff and students…instead the term developmental is usually used" (p. 255). The authors argue that this reluctance to clearly inform students of their need to take remedial courses by using vague language "led to confusion, particularly for students who were not familiar with the college environment" (p. 257). They also argue that structured guidance and advisement from faculty and staff is needed to help the students "make timely and informed decisions through their path in college" (p. 260).

A study by Person, Rosenbaum and Deil-Amen (2006) also advocate for presenting students with clear information, structured programs and advising, and structured peer support to provide "information, support and a normative reference point for students to judge their own progress" (p.386). While their study focused on public and private 2 year colleges, the authors suggest that the lessons may extend beyond these institutions (Person, Rosenbaum, & Deil-Amen, 2006).

Structured guidance also comes in other forms. Escobedo (2007) suggests "intrusive advising, which includes intervening early, following up with a plan of regular contacts, and getting to the heart of what is causing difficulty" (p. 120) for college students. She also suggests mandatory orientation sessions, classroom presentations, student success classes, and learning communities that encourage ongoing communication between faculty and academic advisors (Escobedo, 2007). Engstrom and Tinto (2008) suggest for learning communities to require faculty and staff to collaborate and create environments that encourage students to participate and learn (Engstrom & Tinto, 2008; Tinto, 1982).

Scholars have also argued that students with realistic expectations, grounded in clear information and feedback, are more likely to persist and graduate from college (Deil-Amen & Rosenbaum, 2002; Ishitani, 2006; Suhre, et al., 2007; Tinto, 1982).

Suhre, Jansen and Harskamp (2007) explored the impact of degree program satisfaction on persistence by examining Dutch student dropout behavior. The authors used Tinto's (1975) student integration model of retention as part of their conceptual framework. They focused primarily on faculty contacts and tutorial attendance for the social integration component of the integration/interaction model. The authors also looked at the student traits that include academic skill, satisfaction with the degree program, motivation and discipline to maintain regular positive study habits. Their study concludes that the combination of student traits and the positive interaction between faculty and students were predictive of persistence and academic progress . They also found that degree program satisfaction had a positive influence on academic progress and retention (Suhre, et al., 2007).

Bail, Zhang and Tachiyama (2008) conducted a study on the effects of self-regulated learning on academic performance and graduation rates of students participating in an academic support program. Their study found that student participation in self-regulated learning courses (or learning-to-learn courses) showed significant positive impact on grade point average and long term academic performance, including graduation. This was especially true for the underprepared student. They were less likely to go on academic probation, suspension or dismissal. The study also found that increasing students' sense of agency in their college career had a positive effect on academic performance. Learning to learn strategies, where students were taught to be more aware of their resources and to monitor and control their behavior, affect and cognition contributed to the increased sense of self-agency. They posit that the psychologically safe classroom environment where underprepared students were not stigmatized also contributed to the positive impact on academic performance (Bail, et al., 2008).

Burlison, Murphy and Dwyer (2009) conducted a study that looked at self-efficacy as a predictor of academic performance in students of varying scholastic aptitude as determined by ACT scores. The study shows self-efficacy to be a positive predictor for academic performance only for students who had high to mid ACT scores but had no effect on those who had low ACT scores (Burlison, Murphy, & Dwyer, 2009). Time-on-task behaviors and study environment however, continued to be a positive predictor for academic performance, and the authors suggest that structured learning environments are more beneficial for the lower performing students. Frequent testing and required attendance were examples of learning environments that were considered helpful to students with less academic qualifications.

Kuh et al. (2008) studied data from 18 four-year institutions of higher education that included predominantly white institutions, Historically Black Colleges and Universities and Hispanic Serving Institutions. This data included gender, race/ethnicity, family income, parent educational attainment, pre-college performance indicators, number of credit hours attempted and taken and number of hours worked per week. Their study showed that "net of a host of confounding pre-college and college influences, student engagement in educationally purposeful activities had a small but statistically significant effect on first year grades" (Kuh, et al., 2008). Student engagement also had a positive association with persistence between the first and the second year of college. They also found that once college experiences are taken into account, the effect of pre-college characteristics and experiences diminish considerably. Of note in their study is their finding that student engagement had a compensatory effect on first year grades and persistence through the second year of college. This implies the greater relevance of engagement for lower-skill or underprepared students as well as minority students, students who are the first in their families to attend college or students who come from low income backgrounds. The authors suggest that institutions invest in teaching practices and programs that include first year seminars, learning communities, peer-tutoring and mentoring, early warning systems, orientation programs and service learning courses to support their students from the first year.

Robbins et al. (2009) studied student utilization of resources and services that include academic, social, recreational and advisement services. Their findings showed positive association between grade point averages and the utilization of academic, social and recreational services. A positive association between retention and student utilization of academic, recreational and advisement services was also observed, with the largest increase in retention associated with utilization of academic services and advising sessions, even as the a lower GPA was associated with increased use of advising sessions. These associations were even more pronounced for underprepared and lower socioeconomic status students. The utilization of social resources was not positively associated with retention in this study, and the authors suggest that this may be due to a flaw in the collection and measurement of this particular variable (Robbins, et al., 2009). Other studies have found student's social life to have a negative relationship to GPA (Bean & Bradley, 1986) but a positive relationship to retention (Allen, et al., 2008; Fike & Fike, 2008; Fischer, 2007; S. A. Woosley & Miller, 2009) and possible re-enrollment after a period of stopping out (S. Woosley, Slabaugh, Sadler, & Mason, 2005).

Woosley and Miller (2009) examined whether academic integration, social integration and institutional commitment in the first semester of college had impact on the retention of new students. Academic and social integration information were gathered through survey instruments administered to first-time, first year students at a public, largely residential university. Institutional commitment data was also gathered using survey instruments and refers to the student's intent to stay at that institution or transfer out. The results indicate that early transition experiences of academic integration, social integration and institutional commitment predict retention and academic performance. This was consistent with past studies (Allen, et al., 2008; Beil, Reisen, Zea, & Caplan, 1999; Zea, Reisen, Beil, & Caplan, 1997). In this study, the strongest predictor of persistence was institutional commitment, followed by academic integration and then social integration. The authors also suggest that students who do not successfully integrate and transition into college life early begin to think and plan on leaving the college even as they finish out their semester or year. This emphasizes the need for early adjustment to academic life in order for students to persist and succeed in college. The adjustments can be facilitated through mandatory orientation and freshman year seminars (Escobedo, 2007; S. A. Woosley & Miller, 2009). Just as important is the need to identify students at risk early, and to understand and assess new student experiences early (S. A. Woosley & Miller, 2009).

Jamelske (2009) likewise emphasizes the importance of augmenting core courses in the first year of college with added curricular and extra-curricular components. The author examined the impact of the First Year Experience (FYE) program at a medium sized four year public university on student grade point average and retention. The goals of the FYE program included increases student performance, persistence and graduation by providing opportunities for students to interact with peers and work closely with faculty. The study distinguished between regular FYE courses and Goal Compatible FYE courses. Goal Compatible FYE courses were intentionally structured to include mentoring and social and academic integration activities, as well as include the clear statement of the goals of the course in the syllabus. The study suggested that taking goal compatible FYE courses had positive effect on retention and grade point average, especially for lower skill students, and especially female lower skill students. The study also found that living on campus for incoming freshmen was a predictor of persistence and academic performance as measured by GPA (Jamelske, 2009).

Allen, Robbins, Casillas and Oh (2008) examined the effects of academic performance, motivation, and social connectedness on third-year retention, transfer and dropout behavior of 6,872 students from 23 four-year colleges and universities. Their study found that college commitment and social connectedness have a direct positive association with long term persistence and retention, even where social connectedness is measured at the start of the freshman year. First year academic performance was also found to be a strong indicator of retention and commitment to the university, highlighting the prominent role that first-year academic performance plays in long-term persistence and emphasizing the need for preparing students for their first year of college coursework and helping them through this critical first year through tutoring and supplemental instruction. This finding was consistent with those of other studies that emphasize the role of student perception towards achieving academic goals (Beil, et al., 1999; Blanc, et al., 1983; Zea, et al., 1997), college grades and academic achievement (Zea, et al., 1997) in the retention of students.

A closer look at studies that focus primarily on first generation college students is warranted. Studies have shown that first generation college students, as compared to students whose parents graduated college, are more likely to leave four year colleges by the end of the first year, are less likely to persist after three years, and are less likely to earn a bachelor's degree after five years (ASHE, 2007; Choy, et al., 2000; Ishitani, 2006; Pascarella, et al., 2004).

Pascarella, Pierson, Wolnak and Terenzini (2004) conducted a study of first generation college students and found that by the second and third year, "first generation students completed significantly fewer credit hours and worked significantly more hours than their peers whose parents had a high level of postsecondary education" (p. 265). These students were also significantly less likely to live on campus as compared to other students, and more likely to attend less selective institutions than other students. The authors also found that in spite of the fact that first-generation college students were less likely to be involved in extracurricular activities, they were observed to derive stronger positive benefits from these involvements than other students. The exceptions to the positive effects centered around involvement in volunteer work, employment and participation in intercollegiate athletics which all had a more negative impact on first generation students. The authors posit that this negative effect is due to reduced time for involvement in academic and non-academic involvement systems. This is consistent with findings by Mangold, Bean and Adams (2003) in their study of the impact of intercollegiate athletics on graduation rates. This finding also prompts the authors to strongly endorse stronger academic and non-academic involvement for first generation students, as well as "greater programmatic and structural integration and for broader thinking and greater collaboration across structural boundaries" (p.279), specifically between the academic and student affairs areas that exist in most colleges, when programming and policies are being developed. Last but not the least, the authors found that first-generation college students derived greater educational benefits from engagement in academic activities that include term paper or report writing and hours studied.

Ishitani (2006) had also conducted a study of the attrition and degree completion behavior of first generation college students using the National Education Longitudinal Study (NELS:88) sponsored by the National Center for Educational Statistics. NELS:88 followed the educational characteristics of 8^{th} graders over 12 years beginning in 1988, and NELS:1988-2000 included transcript information of participants of NELS:88. In this study, the author found that students who receive grants or work-study jobs were more likely to persist. Consistent with previous studies, the author also found first generation students more likely to leave college between the first and third year (with the highest risk for departure in the second year), less likely to graduate in their fourth or fifth year, and first generation students enrolled in private institutions were more likely to graduate as compared to students enrolled in public institutions of higher education. Ishitani calculates that being a first generation college student reduces the likelihood of graduating within four and five years by 51% and 32% respectively.

There is also a need to examine research conducted on the predictors of persistence and academic success of ethnic minority college students. Zea, Reisen, Beil and Caplan (1997) conducted a study of the intention of ethnic minority and nonminority students to remain in college at a large, predominantly white, private coeducational northeastern institution of higher education. They found social integration in the university community to influence institutional commitment for all students, even as white students indicated higher levels of social identification with the university. The authors also found that academic achievement had a more significant impact on the institutional commitment of the ethnic minority students. Students who perceived their college environment to be unwelcoming (due to race, ethnicity or religion) or who experienced rude or disrespectful behavior were less likely to persist. This was consistent with findings by Fischer (2007) who observed that a negative campus racial climate had a negative impact on grades and retention of minority college students.

Receiving financial aid was also predictor of retention (Dynarski, 2003; Ishitani, 2006; Jensen, 1981; Johnson, 2008), as was the number of semester hours for which students enroll in their first fall semester (Fike & Fike, 2008; Jamelske, 2009).

Conceptual Framework: the Nested Factors Model

The conceptual model proposed to describe the factors that might impact persistence and degree completion of underprepared college students at a four-year public institution of higher education is shown below. This nested factors model is based on the attempt to conceptualize the complex and dynamic interplay of individual and environmental factors with the student's academic and social integration and interactions within the college experience.

The model integrates the factors identified in the various theories described above and posits that no one factor alone has a significant impact on persistence and degree completion. The individual, institutional and environmental factors are nested within the student college experience. The strength and effect of each factor varies according to the needs of the student at any given time.

The core of the nested model focuses on the student and his/her abilities (aptitudes, college preparedness, skill-proficiency/deficiency), socioeconomic status (financial need, necessary work hours), human capital (first-generation college student status, experience and knowledge of how to navigate higher education processes and structures), and demographic characteristics (age, gender, race/ethnicity). While most of these traits can be considered pre-college traits, others such as knowledge of how to navigate higher education processes and structures can be influenced by the college experiences of the student. The financial nexus models of Paulsen and St. John (1997), and Becker's (1993) human and social capital model of retention as well as the critical race theory can be rooted in this level of the nested model. The student's characteristics also represent the inputs of Astin's (1991) input-environment outcome model.

The second level of the nested model focuses on the academic experience of the student. This includes the classroom experience, engagement with faculty, research opportunities, and access to academic support programs and tutoring. The academic integration in Tinto's (1975) model of retention and the academic environment in Astin's (1991) model occur most at this level.

The third level of the nested model focuses on the social experience of the student. This includes the student activities, athletics, peer and mentoring groups, lecture series and conferences, workshops, symposium, convocation and other collegiate rites and rituals that create the social environment component of the student's college experience. As with the second level in the nested model, the social integration in Tinto's (19750 and the social environment in Astin's (1991) models of retention occur most at this level. This level, however, also offers excellent opportunities for academic integration, depending on the structure and design of the social experiences. A movie night at the Residence Halls, for example, can offer the opportunities for academic integration when it is tied to curriculum requirements for a history, literature, or media arts course.

The fourth level of the nested model focuses on the college's ability to provide an environment that allows for the expanded experiences of the student. This includes the organizational and financial structures that allow for the existence and robustness of the second and third levels of the nested model. These structures also provide for the services needed by the students with limited human or financial capital. These structures also ensure the professional development and academic research needs of the faculty and staff of the college.

The various levels are not mutually exclusive, nor are they as perfectly nested as they appear to be in the model below. The model emphasizes the interconnectedness of all the facets within the levels. They interact with each other extensively, and for students to persist and succeed in college, each component must both influence and be influenced by the others. The frequency and strength of linkages between the various levels of the model is the key to predicting the persistence and academic progress and success of students.

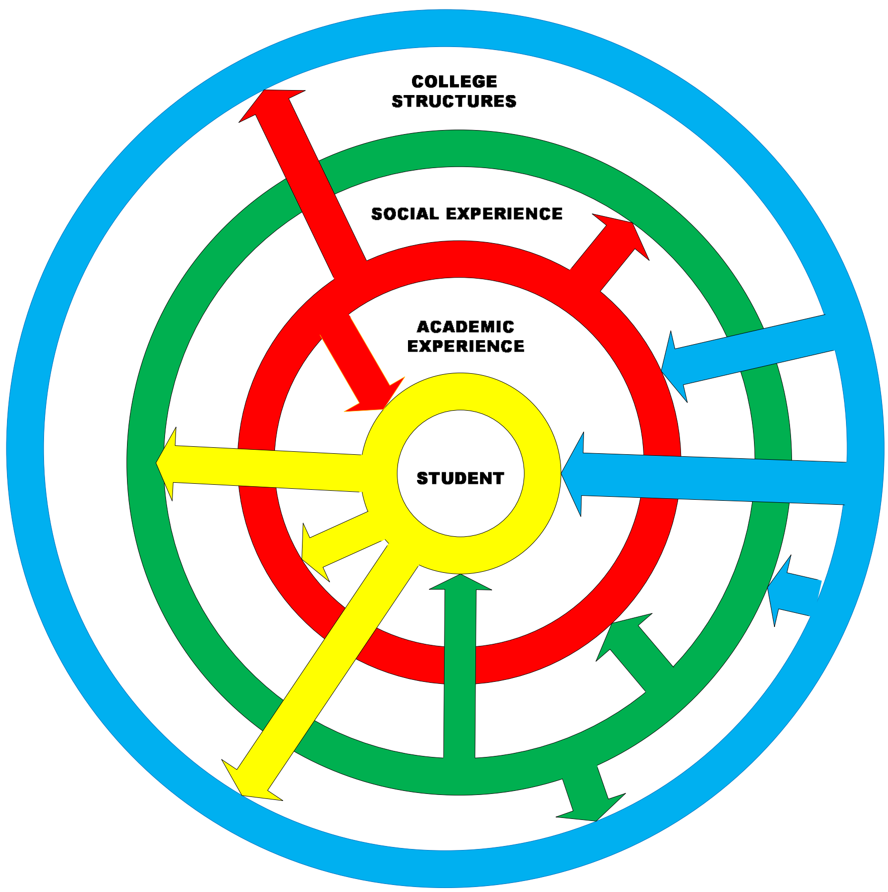


Figure 1: Nested Factors Model

CHAPTER III: RESEARCH DESIGN AND METHODOLOGY

Purpose of study

The purpose of this study is to examine the transition to college and the subsequent enrollment patterns and academic outcomes of underprepared freshmen at a four-year, minority- serving public institution of higher education. The study will also examine the efficacy of remediation and special support programs provided at this institution to assist these underprepared students succeed.

Study Design

This was a quantitative study using secondary analysis of data. Secondary analysis involves the use of existing data collected and used for a prior purpose (Heaton, 1998; Hutchinson & Lovell, 2004). The data that was analyzed for this study was originally collected and used for purposes of enrollment management at State College. The analysis of this existing data involved the use of regression discontinuity (RD) design as well as multiple regression analysis. Regression discontinuity design is a "before-and-after two group design" wherein participants are assigned to groups solely based on a cutoff score on a preprogrammed measure or assignment variable (Imbens & Lemieux, 2007; Schochet et al., 2010; W. Trochim, 1994, 2006; W. M. K. Trochim & Spiegelman, 1980). Unlike the randomized control trial, the regression discontinuity design deliberately assigns subjects to treatments based on need or worthiness measured on a non-random assignment rule (H. Lee & Munk, 2008; W. Trochim, 2006). The effect of the treatment is then analyzed by looking at the increase or drop in the regression line at the cut point. The estimated size of the increase or drop (discontinuity) is used to estimate the effect of the treatment(H. Lee & Munk, 2008). The regression discontinuity design is increasingly used by researchers to study effects of education-related interventions (Calcagno & Long, 2008, 2009; Jacob & Lefgren, 2004; H. Lee & Munk, 2008; Lesik, 2006; Mealli & Rampichini, 2002; Schochet, et al., 2010).

Regression discontinuity design lends itself to studies wherein random assignment of treatment is neither ethical nor warranted. Randomized research designs require that treatment be randomly assigned to participants, regardless of need of treatment. With the regression discontinuity design, the assignment of treatment is deliberately targeted towards participants with greater perceived need. The ethical goal of getting treatment or program benefits to those most in need is not in conflict with the goal of conducting a scientific test to evaluate treatment or program effect. The design is also easy to administer using existing measurements and protocols that regularly collect statistical data typically provided by management information systems (W. Trochim, 2006).

Regression discontinuity was especially useful for this study because the determination of which students required remediation was based on specific cut point scores on the ACCUPLACER test administered to all incoming freshmen at State College. The selection process was completely known and uniformly measured. This greatly mitigated selection bias, and allowed for an unbiased estimate of the treatment effects (Shadish, Cook, & Campbell, 2002). Further, threats to internal validity from instrumentation change (changing the test used to determine skill deficiency or the method by which it is administered), selection bias and history were minimal with the strict assignment of treatments by the College's Advisement Center, based on prescribed cut point scores. In allowing for variations from the basic design, the approach lent itself to extending the study to also analyze the effect of adding support through special compensatory programs for students requiring remediation. By applying this approach to the Reading and Arithmetic components of the ACCUPLACER test administered to the cohorts of incoming freshmen from the fall of 2006 through fall 2010, and by allowing us to identify discrete groups of students with scores close to the cut point specified for each of these test components, a robust set of student-level data was collected and analyzed.

The regression discontinuity analysis was expected to better investigate the effect of remediation on students' semester-to-semester persistence rates, number of credits completed and CGPA. This quasi-experimental design compared the outcomes of students just above the cut point scores (who are not required to enroll in remedial courses) with students who scored just below the cut point scores (who are required to enroll in remedial courses). These outcomes were also compared to students who require remediation but do not receive special support from EOF or SSSP, as well as to students who do not require remediation at all. Because the groups were similar at the baseline, the differences in their outcomes were credibly attributed to participation in remediation, or remediation plus special support.

Regression discontinuity design takes advantage of the discrete cut point scores for components of ACCUPLACER exam. The regression sample included students who scored within a narrow bandwidth of the discontinuity score of 92 and 68 in reading and arithmetic respectively, as well as those who scored further away (wider bandwidth) from the cut point score. Sensitivity analysis used at the cut point helped determine if remediation had varying effect on students based on skill.

There are two main types of regression discontinuity design: sharp design or fuzzy design (Hahn, Todd, & Van der Klaauw, 1999, 2001; Imbens & Lemieux, 2007; Jacob &

Lefgren, 2004; H. Lee & Munk, 2008; Marmer, Feir, & Lemieux, 2011; W. Trochim, 1994; W. M. K. Trochim & Spiegelman, 1980). The sharp regression discontinuity design assumes the strict, consistent and deterministic assignment of treatment based on the cut point score on the assignment variable. The assignment of the treatment in a fuzzy regression discontinuity design is only partially determined by a value on the assignment variable. Additional variables, observed and unobserved, determine the assignment of treatment to subjects in the fuzzy regression discontinuity design. Noncompliance due to retesting, failure to take the assigned courses, or students leaving or dropping out after being placed into remediation will turn a sharp regression-discontinuity design into a fuzzy regression discontinuity design.

To turn the fuzzy RD design into a sharp RD design, the samples included in the analysis were restricted only to the students who fully comply with the assignment rules. Students who failed the test but did not enroll in remedial courses and students who passed the test but took remedial courses were dropped from the sample. The sample was also restricted only to students with valid ACCUPLACER reading scores (READ) or valid ACCUPLACER arithmetic (ARIT) scores. Because of a previous version of a placement test used in the past, some students may have scores that correspond to the older (different) test with a different set scale for scores. These students have been excluded from the sample as well.

The sample size value in a regression discontinuity design is given in terms of desired minimum detectable (standardized) effect size (MDES) and a MDES value between 0.2 and 0.4 is used most frequently in education (H. Lee & Munk, 2008). RD requires a larger sample size compared to randomized control trials.

A graphical representation of the linear regression line representing the scores below and above the cut point with no treatment effect is shown in Figure 2.

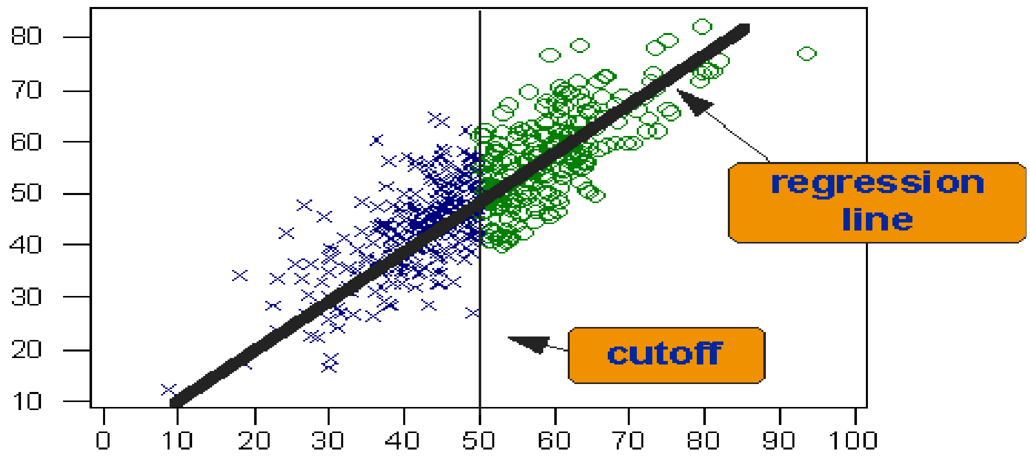


Figure 2: Distribution of scores without treatment effect (Trochim,W., 2006; p.3)

A graphical representation of the distribution of positive post-test (outcomes) of participants after treatment is shown in Figure 3.

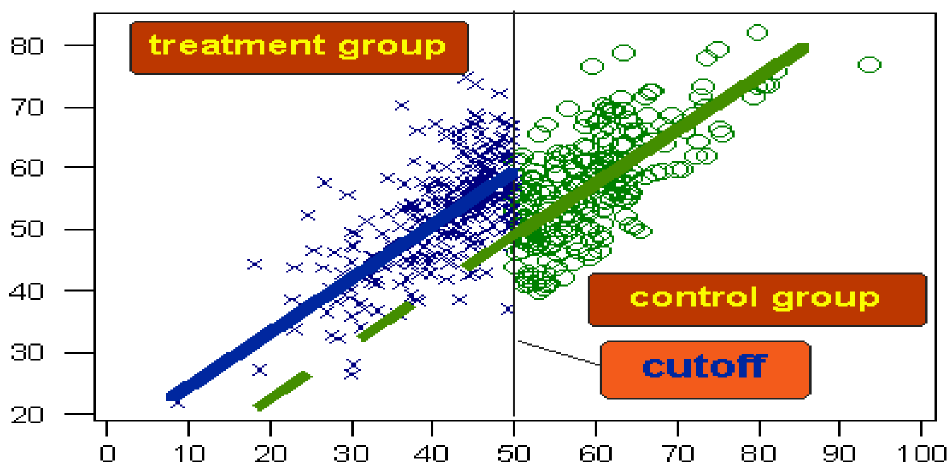


Figure 3: Regression Discontinuity Design with treatment effect (Trochim, W., 2006; p.4)

A graphical representation of the linear regression line discontinuous at the point of cut point is shown in Figure 4.

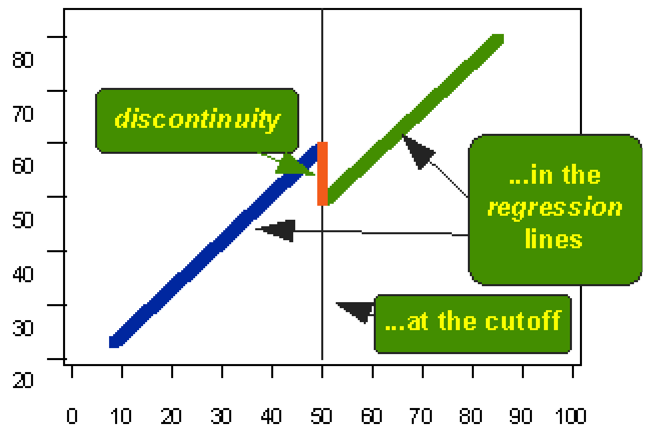


Figure 4: Linear regression line discontinuous at the cut point (Trochim, 2006; p.4)

Limitations of the Regression Discontinuity Design

One of the limitations to the regression discontinuity design, however, is that it only identifies treatment effects for a small sub-group of the population and only at points close to the point of discontinuity (Battistin & Rettore, 2003; Calcagno & Long, 2008, 2009; Hahn, et al., 1999, 2001). Estimates of causal effects cannot be extrapolated to students who score far below or above the cut point scores (Calcagno & Long, 2008, 2009). Another limitation to the regression discontinuity design is the need for larger sample sizes. Compared to the randomized control trials, regression discontinuity design requires as much as 2.75 times the number of participants (H. Lee & Munk, 2008).

The assignment variable for this regression discontinuity design was the State College administered ACCUPLACER test. The ACCUPLACER was administered to all incoming freshmen regardless of their SAT or ACT scores, and regardless of admission status (full-time or part-time). The State College Advisement Center determined the specific cut point scores used to determine whether a student is placed in remedial courses or in college level courses.

The treatment in this RD analysis refers to remediation requirements for Math and English for all students considered to be underprepared or college skill-deficient according to the ACCUPLACER scores.

The effect (if any) of special support provided to underprepared college students was also examined. Type-one special support referred to special support provided by the Educational Opportunity Fund program (EOF) and type-two special support referred to Title Three Grant program (SSSP) program. Each year therefore had four comparison groups: Group 1 consisted of students who were required to take developmental courses and who also received type-one special support; Group 2 consisted of students required to take developmental courses and who also received type-two special support; Group 3 consisted of students required to take developmental courses but did not receive any special support, and Group 4 consisted of students not required to take developmental courses. Groups 4, students not required to take remediation, were considered the control groups of the study.

Table 1: Group Description, by treatment and support programs

Groups	**Group Description**
Group 1	Remediation required and type one (EOF) special support provided
Group 2	Remediation required and type two (SSSP) support provided
Group 3	Remediation required, no special support provided
Group 4	Remediation not required (Control)

The director of the College Advisement Center responsible for the advisement and course registration of incoming freshmen indicated that adherence to the cut point and assignment to remediation courses as needed is a protocol that is strongly enforced. However, there were still instances of non-compliance. As noted above, these instances of non-compliance with the assignment to remedial courses and were dropped from the RD sample. In order to guard against selection bias that could compromise the validity of the main regression discontinuity estimates, verification of student assignment to remediation courses was conducted for the students in groups 1, 2 and 3 for all four components of the ACCUPLACER test.

The outcomes used as a measure of the effect of remediation and remediation plus support programs included the students' CGPA, number of college level credits completed after each year of attendance, semester-to-semester persistence rates, and degree completion.

MULTIPLE LINEAR AND LOGISTIC REGRESSIONS

The study also used multiple linear and logistic regressions to answer the research questions. Pre-college variables as well as student demographic characteristics were regressed against assignment to remediation and college outcomes. To determine which pre-college variables were predictors of academic success in the first year for students with varying skill, the multiple linear regression test was applied on the following variables used to identify student skill: SAT VERBAL, SAT MATH, Arithmetic Score on the ACCUPLACER, Read score on the ACCUPLACER, and high school grade point average. Regression analysis of pre-college and demographic variables with other independent variables was also conducted. Separate analyses that looked at participation in the support programs provided at State College and successful completion of remediation courses was also done.

The logic models that attempt to outline the various cohorts, the treatments and interventions available to them, and the program intended outcomes and results from these treatments are provided in Appendices B – E. These models are used to depict the four groups described in Table 1, as well as the treatments and support programs available to these groups.

Sample Data

This study was a secondary analysis of data collected at State College, a four–year Hispanic Serving institution located in a densely populated area in the northeast region of the United States. The study looked at data collected over five years, beginning in the fall semester of 2006. This data was collected and maintained at State College for enrollment management purposes and was part of operational procedures and protocol at the institution. Various offices and departments on State College campus contributed to the effort of collecting and maintaining this information, starting with the admissions and recruitment office (student applicant information) through to the college registrar's office (enrollment status, GPA, graduation or dismissal). While the collection and data entry process remained a departmental responsibility, the college's information technology department was responsible for maintaining the integrity of the student record database itself, and the retrieval of information from this database. The original information was stored in the College's student record database and retrieved with permission for use in this study from the IRB of the College as well as permission from senior administrators at the institution.

The administrative records that comprise the data contain rich information on student pre-college information, bio-demographics as well as several measures of student success. The data include student level information on enrollment per semester, credits earned and completed, years of college completed, cumulative grade point average, ACCUPLACER test scores, enrollment in remedial coursework, participation in compensatory education programs, and progress towards degree completion. Other data available include race/ethnicity and gender (where reported), the attendance status (full-time or part-time), SAT scores, high school grade point average, participation in federal student aid programs, percentage of financial aid need met, intended majors and declared majors, and first-generation in college status as reported on the Free Application for Federal Student Aid form.

This study specifically examined student-level information on 3,848 new freshmen over the course of the study. There were five cohorts of freshmen who started at State College between the fall semesters of 2006 through to the fall semester of 2010. The fall 2006 cohort was followed for five and a half years (11 semesters), the fall 2007 cohort was followed for four and a half years (9 semesters), the fall 2008 cohort followed for three and half years (7 semesters), the fall 2009 cohort followed for two and half years (5 semesters), and the fall 2010 cohort followed for only one and half years (3 semesters).

Summary statistics describing the sample of 3,849 new freshmen who started at State College between the fall semesters of 2006 through to the fall semester of 2010 are provided in the next chapter.

Study Questions and Operational Definition of Terms

The general questions that guided this research include 1) How do underprepared college students of varying skill perform during their first year of college? (2) Does remediation improve student outcomes? Are remediation and student support programs more effective than remediation is on its own? (3) Does the treatment effect vary across students from different ethnic and racial backgrounds, generational and socioeconomic status?

Operational definition of underprepared college students: ACCUPLACER test and scores

Students were considered underprepared based on the scores they earned on the ACCUPLACER placement test which was administered to incoming freshmen at State College. Students who scored at or above a specified passing score were considered to be adequately prepared to take college level courses. Students who scored below specified passing score were considered underprepared and in need of remediation before being allowed to register in college level courses. The passing scores for each of the four components of the test are shown in Table 2. Three of the four components of the test - Reading, Arithmetic and Algebra - are scored automatically by the computer-based testing program using protocols setup by the State College testing office. The cut point score for Reading represents the 68th percentile and the cut point score for Arithmetic and Algebra represent the 81st percentile and 76th percentile respectively (College_Board, 2003). The fourth component, English, was scored by a panel of readers composed of State College English department faculty.

Table 2: Passing score for the four components of the ACCUPLACER test

Component of ACCUPLACER	Passing Score
English	**3 out of 5**
Reading	**92 out of 120**
Arithmetic	**68 out of 120**
Algebra	**77 out of 120 and passing score in Arithmetic**

The scoring protocol used by the College for the English component of the ACCUPLACER did not lend itself to the regression discontinuity design for analysis. The determination of skill-deficiency in the Algebra component of the ACCUPLACER, as used at the College, ultimately depended on the Arithmetic component score of the test. For the purposes of this study, the ACCUPLACER scores used to determine college readiness were limited to Arithmetic (to represent the math skills of the student) and Reading (to represent the English skills of the student). The cut point scores for these two components of the ACCUPLACER were used as assignment variables in the regression discontinuity design. These cut points were determined and set by the State College staff and faculty.

The final data set analyzed for the regression discontinuity design was restricted only to students with valid READ or ARIT scores on the ACCUPLACER test. While there actually were four components to the ACCUPLACER test, only the ARIT and READ scores were examined because these were the minimum requirements to pass the ACCUPLACER test and place out of remediation. Also, the scores on the Writing component only took on a few values (1 to 5), and as noted by Martorell and McFarlin (2010), were inappropriate for use in a regression discontinuity design. The sample was also restricted to students who were matriculated in a degree program (pursuing a degree) and were placed into the correct course (remediation versus college level course) in the first two semesters. The last restriction allowed for a sharper regression discontinuity design.

Remediation at State College

Remediation is defined as enrollment in courses below college level at State College. Remedial courses include the following: Reading for College, Reading and Writing Across the Disciplines (RWAD) I and II, College Writing, Basic College Math, and Algebra for College. These courses are offered using semester hours but do not carry college level credit nor count towards the 128 credit hour requirement for graduation. Students are allowed two attempts at passing these remedial courses. Students who fail to pass any of the remedial courses after two attempts are academically dismissed from State College. The assignment to remediation (enrollment in courses below the college level) in English and Math is determined through the ACCUPLACER test based on the institution's pre-determined cut-points on the test.

Performance in the first year of college was measured by the number of credits completed after the first year and persistence into the second year in college. Cumulative grade point average was also available, but was not isolated to the GPA earned only after the first year of college. The READ and ARIT scores on the ACCUPLACER test were used to define under-prepared students They were also examined, in addition to other pre-college characteristics that included Verbal SAT score, Math SAT score and high school grade point average, as predictors of college performance in the first year.

Data Collection and the Role of the Researcher

The data analyzed in this study were retrieved from State College's integrated student record database using existing enrollment management reports and queries. The records were de-identified and coded to maintain confidentiality and anonymity of student participants.

The researcher played the role of researcher- participant in this study. As an administrator at State College, she has access to data and resources to complete the quantitative analysis needed for this study. Approval for the study was obtained from the Institutional Review Boards at State College and Rutgers University. Permission to use the student-level data was also obtained from the President and the senior Vice President of State College.

The researcher's interaction with personnel at State College relevant to this study was limited to retrieval of student level data from the College's integrated student data management system using existing reports and queries. The researcher's initial concerns about anonymity of students in the cohorts being examined were addressed by the thorough de-identification of all data before these were loaded and analyzed in the SAS program. Since the researcher's administrative role at State College encompassed enrollment management, retention and strategic planning, she was concerned with the potential impact of the study on existing retention programs and staff. The review of literature and data analysis, helped assure that the study findings can potentially help these programs by providing a more current and thorough analysis of outcomes that could inform these programs. The study findings can guide recommendations for improvement, expansion or adjustment of existing retention and remediation programs.

The research questions were of personal and professional interest to the researcher as a higher education administrator and as a scholar as these represent a logical intersection among her academic work, personal interest and passion, and professional career expectations. This research has great relevance in providing insight on business processes, policy decisions, and data collection.

As noted by Semel (1994, 1995), the challenges in conducting research as a participant-observer are not limited to the issues of "bracketing out" personal experiences and distancing oneself from these experiences. The researcher's role as researcher participant, while not strictly that of participant-observer, was close enough to warrant concerns of over-identification and bias. This insider role posed ethical dilemmas over the question of including potentially sensitive information accessible to the researcher as an administrator at State College. The researcher has taken great strides to maintain objectivity and confidentiality as well as balance her enthusiasm for the data and eagerness of her colleagues regarding the study findings with potential impact of the findings on her colleagues' expectations and concerns.

This role of research-participant can be valuable because of the importance of access to data and information that only an insider would have. By balancing the "subjective understanding of an insider" with the critical self-examination and reflection that would address methodological concerns over bias and over-identification, the researcher participant role brings value to the study of the organization of which they are a part (Semel, 1994, 1995).

Data Analysis

The data retrieved from State College was analyzed using SAS 9.3 TS Level 1M1 software running on Windows Version 5.1. Remediation was the primary independent variable of interest in this study. At State College, a student is assigned to remediation for different and possibly multiple subjects. The study focused on remediation in Reading and remediation in Arithmetic. The remediation (or enrollment in remedial coursework) took place in the first or second semester of college because students took the placement test before they were allowed to register or take college level courses in those subjects. Students in the sample data retrieved from State College systems were grouped into the following categories: all students, students in the EOF program, students in the SSSP program, students with no special support, students who dropped out after their first year of college, students who earned a CGPA of zero. Students were also categorized into the remediation (under-prepared college students) and non-remediation group.

The student level data were grouped into the following categories: pre-college student characteristics, student demographic characteristics, remediation variables, and student outcomes. Assessment of student outcomes were limited to the credits earned in the first year, cumulative college grade point average (CGPA), and persistence to second year because of limitations imposed by the sample size. The sample size for special support programs required combining of all five years (Fall 2006 to Fall 2010) into one database to obtain sufficient sample sizes of EOF and SSSP groups for statistical analyses in SAS to generate meaningful results. In order to use all five years in the same analysis, the dependent outcome measures had to be restricted to outcomes that all five years had in common which included credits earned in the first year, CGPA and persistence to the second year of college.

The following section provides a brief description of the variables used and examined in this study.

Input/Independent Variables: Pre-College Student Characteristics

High school grade point average (also referred to as HS GPA) , a pre-college student characteristic, is an interval variable that informs us of the academic achievement of the student at the point of high school graduation. This variable has a maximum value of 4.0.

SATI_ MATH (also referred to as MATH) represents the highest SAT I Math component score reported by the student to the college at time of application for admission. It is an interval variable with a minimum value of 200 and a maximum value of 800. According to the College Board, the score is indicative of the student's proficiency in mathematics, including Geometry, Algebra I and Algebra II. It is considered a predictor of first-year academic performance in college math.

SATI_ VERBAL score (also referred to as VERB) represents the highest SAT I Critical Reading component score reported by the student to the college at time of application for admission. It is an interval variable with a minimum value of 200 and a maximum value of 800. According to the College Board, the score is indicative of the student's proficiency in understanding reading passages, sentence structure and organization and vocabulary. It is considered a predictor of first-year academic performance in college English.

ACCUPLCER READ score (also referred to as READ) is a pre-college student characteristic that is derived from the ACCUPLACER test administered by State College. ACCUPLACER is a computer adaptive placement testing program. READ is an interval variable that represents the Reading Comprehension score on the placement test, and is used to determine whether students need remediation in English. The minimum value is 0 and the maximum value is 120. The cut-point is 92 and all students with this score or higher are considered to have passed this component of the placement test.

ACCUPLACER Arithmetic score (also referred to as ARIT or ACCUPLACER Math) is a pre-college student characteristic that is derived from the ACCUPLACER test administered by State College. ACCUPLACER is a computer adaptive placement testing program. ARIT is an interval variable that represents the Arithmetic score on the placement test, and is used to determine whether students need remediation in Math. The minimum value is 0 and the maximum value is 120. The cut-point is 68 and all students who score this or higher are considered to have passed this component of the placement test.

Input/Independent Variables: Students Demographic Characteristics

High school grade point average (also referred to as HS GPA), a pre-college student characteristic, is an interval variable that speaks to the academic achievement of the student at the point of high school graduation. This variable has a maximum value of 4.0.

SATI_ MATH (also referred to as MATH) represents the highest SAT I Math component score reported by the student to the college at the time of application for admission. It is an interval variable with a minimum value of 200 and a maximum value of 800. According to the College Board, the score is indicative of the student's proficiency in mathematics, including Geometry, Algebra I and Algebra II. It is considered a predictor of first-year academic performance in college math.

SATI_ VERBAL score (also referred to as VERB) represents the highest SAT I Critical Reading component score reported by the student at the time of application for admission. It is an interval variable with a minimum value of 200 and a maximum value of 800. According to the College Board, the score is indicative of the student's proficiency in understanding reading passages, sentence structure and organization and vocabulary. It is considered a predictor of first-year academic performance in college English.

ACCUPLCER READ score (also referred to as READ) is a pre-college student characteristic derived from the ACCUPLACER test, a computer adaptive placement testing program, administered by State College. READ is an interval variable that represents the Reading Comprehension score on the placement test, and used to determine whether students need remediation in English. The minimum value is 0 and the maximum value is 120. The cut-point of 92 or higher scores are required to pass this component of the placement test.

ACCUPLACER Arithmetic score (also referred to as ARIT or ACCUPLACER Math) is a pre-college student characteristic derived from the ACCUPLACER test administered by State College. ARIT is an interval variable that represents the Arithmetic score on the placement test used to determine whether students need remediation in Math. The minimum value is 0 and the maximum value is 120. The cut-point of 68 or higher scores are required to pass this component of the placement test.

<u>Input/Independent Variables: Students Demographic Characteristics</u>

Gender (also referred to as sex) is a demographic characteristic represented by the dichotomous variables of female or male. This information is taken from data reported by students at the time of application for admission to State College.

Race/Ethnic Origin is represented by a set of nominal variables that include Black, Hispanic, Asian, White and Unknown taken from the data reported by students during application for admission to State College. This information is not required by the College for admission purposes, and students report it on a voluntary basis.

First Generation In College is a dichotomous demographic variable that indicates that neither parent graduated from a two or four year college. This information is volunteered by students during application for admission or on the student's Free Application for Federal Student Aid, reported by the U.S. Department of Education.

FINAID is a dichotomous demographic variable that indicates whether or not the student reported a need for student financial assistance on the application for admission. Because the College does not collect family income information from applicants, the question of whether an applicant had an interest or need for financial aid also served as a proxy for socioeconomic status, in combination with %NeedMet.

%NeedMet is an interval demographic variable that indicates how much of the student's tuition and fees were met by financial aid. This variable, in combination with FINAID, served as a proxy variable for socioeconomic status. Since federal student aid needs analysis only allowed the maximum financial aid to be awarded to students with the lowest family incomes, the assumption was made that only students in the low socioeconomic status families could be awarded full financial aid packages that met the cost of their tuition and fees. A student was considered poor if he/she indicated FINAID =1 and %NeedMet = 1.

Remediation Variables

REMEDIATION is a dichotomous independent variable that indicates whether or not the student is in need of remediation and is not part of the EOF or SSSP. REM_ARIT refers to a status of remediation in arithmetic/mathematics and REM_READ refers to a status of remediation in reading or English.

EOF is a dichotomous independent variable that indicates whether or not the student is in need of remediation and is also receiving EOF special support. This support includes grant funds in addition to academic and social support.

SSSP is a dichotomous independent variable that indicates whether or not the student is in need of remediation and also receiving SSSP special support which provides social and dedicated advisement support and no additional grant funds

Output/Dependent Variables

Persistence into second year is a variable that indicates whether the student returned for the second year of college. Because data were limited to 3 semesters for students who started in Fall 2010, return into second year of college was used to determine persistence. This dependent variable was used to determine academic outcomes for all students because of the sample size limitations for special student support groups that needed the combination of all five years (Fall 2006 to Fall 2010) into a larger sample.

Cumulative college grade point average (also referred to as CGPA) is an interval variable that indicates the student's cumulative college grade point average up to the fall semester of 2011. This variable is based on a 4.0 scale.

Credits Earned in First Year is an interval variable that sums up the credits earned by the student in the first year (fall and spring term) of college.

Statistical Analyses of Data

Several analyses were used for this study. First, various student group characteristics were examined using descriptive statistics and presented in Table 3. An analysis by cohort year was also conducted to verify that relationships between observable characteristics and dependent variables were not masked or hidden by combining all five years into one large database. Second, relationships between dependent and input variables were examined using Spearman Rho, independent samples t-test, and Chi-square test. Spearman rank order coefficients were calculated for Cumulative GPA, Credits Earned in First Year, and %Need Met. The Spearman rho was the most appropriate statistic to determine the valence and the magnitude of the relationship between these variables because the measures correlated were categorical variables and the measures did not have a linear relationship and were not normally distributed which are the requirements for using the Pearson Correlation. The two-independent samples t-test was used to compare the means of the Cumulative GP and Credits Earned in First Year for students by gender and by first generation in college status primarily because the independent variables were assumed to be normally distributed and interval type measures, while the independent variables were categorized into separate groups. The Chi-square test was used to compare the relationships between categorical variables including persistence to second year, gender, %Need Met, Ethnic Origin. In order to conduct these analyses, a re-coding of variables was done as shown in Appendix G.

Third, the relationship between students' pre-college and demographic variables and assignment to remediation was examined using logistic regression. The overall regression equation used was as follows:

$$Yi = \alpha + \beta_1 X_1 + \beta_2 X_2 + \varepsilon_i$$

where Y is assignment to remediation, α is the slope of the regression line, and β is the parameter estimate of independent variables X and ε is the residual. Three models were used to conduct these analyses. The first model limited the input variables to the student pre-college academic and test score characteristics. The second model limited the input variables to the student demographic characteristics. The third model included the pre-college academic/test score characteristics as well as the demographic characteristics of students in the various groups. Logistic regression was also used to examine academic outcome of persistence to second year and the effect of student characteristics on this outcome.

Ordinary least squares regression was then used to examine the dependent variables representing academic outcomes for under-prepared college students in their first year and the effect of the student characteristics on these outcomes. As in previous regression analyses, three models were used with the first limited input variables to student pre-college academic and test score characteristics, the second limited input variables to student demographic characteristics and the third included both sets of characteristics.

The same dependent variables were examined using regression discontinuity design with remediation as the treatment. The key assumptions underlying the regression discontinuity approach included the continuous distribution of test scores across a cut-point for both pre-test and post test, and the unobservable determinants of enrollment being similar for students who scored just above or just below the cut-point in order to assume random assignment to treatment. Regression discontinuity controls for both observable and unobservable traits.

The equation for the regression discontinuity model used to analyze the effects of remediation was as follows:

$$Y = \alpha + \beta X + PD + \varepsilon$$

where Y as the dependent variable, A as the slope of the regression line, and B as the parameter estimate of independent variable X, P as the causal effect of interest, and D as the deterministic function of X. D was designated as 0 if the ACCUPLACER score was passing or higher and 1 if the ACCUPLACER score was failing (below the cut point). The RD models only looked at students with CGPA, ACCUPLACER math and reading scores and high school GPA greater than zero. Regression discontinuity was used to look at three groups of students: students who received EOF support, students who received SSSP support and students who received no special support.

Chapter IV: Quantitative Findings

The primary focus of this study was on the effects of remediation and student support services on academic performance of underprepared college students. In order to assess the effects of remediation and student support services, a closer examination and understanding of the characteristics and abilities of the students at State College was needed.

Quantitative Description of Student Sample

Nearly four thousand students started as freshmen at State College between the fall semester of 2006 and the fall semester of 2010. Of these students, 55 percent were female and, 45 percent were males. The students comprised of 40 percent Hispanics, 21 percent Blacks, and 22 percent Whites. Fifty-four percent identified themselves to be the first in their family to attend college. Figure 5 below illustrates the distribution of students by gender, race/ethnicity and first generation in college. While the distribution of males and females was typical of most colleges and universities, the distribution and composition by race/ethnicity and by first generation status are not typical. The student population at State College is highly diverse and a large percentage of these students are the first in their families to attend college.

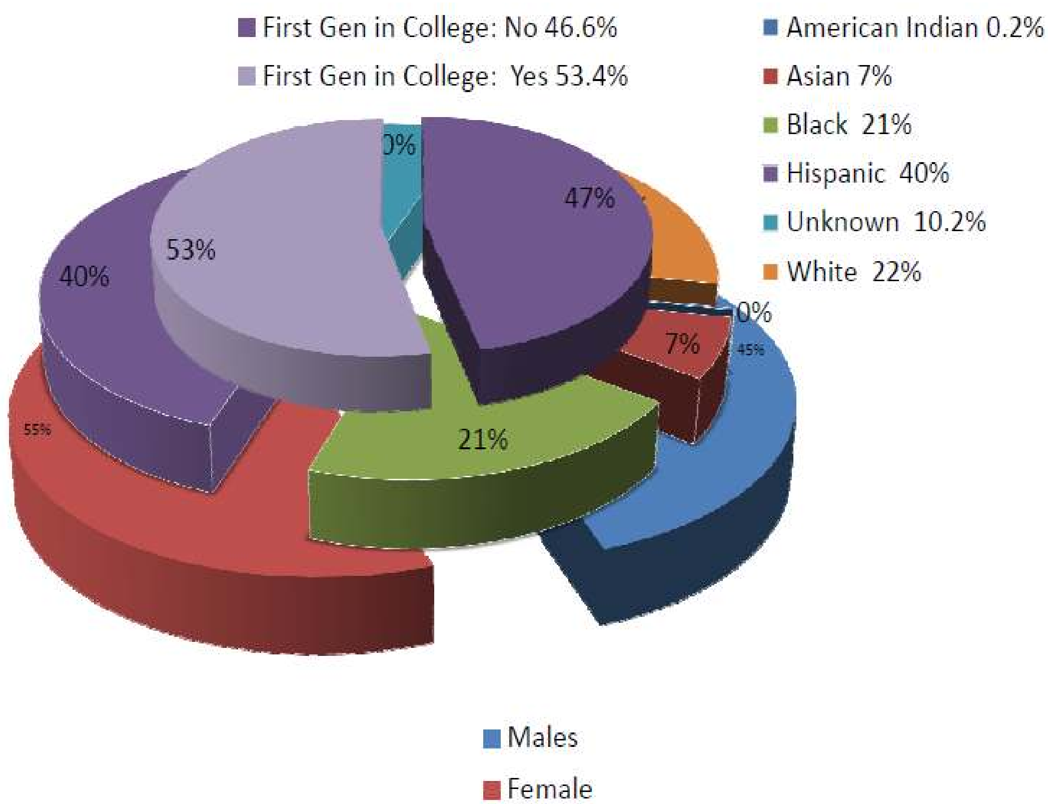


Figure 5: Distribution of student sample by gender, ethnicity/race and first generation status

The socioeconomic status of the students was more difficult to ascertain because information that asked for family income was not collected directly from the students by the College. Students were asked, however, at the point of application to the College, if they were going to apply for financial aid, and 95 percent indicated yes. Information from the financial aid office on the percentage of need met was used as a proxy for socioeconomic status and 63 percent received financial aid covering 75 to 100 percent of their tuition and fees for attending the College.

The pie-chart on the right in Figure 6 illustrates the distribution of students by remediation status. Eighty-five percent of all students in the sample were found to be in need of remediation while 15 percent were considered college ready. Of the students who were found to require remediation, 5% required remediation in math only, 38% in English only, and 57% required remediation in both math and English (pie-chart to the left of Figure 6).

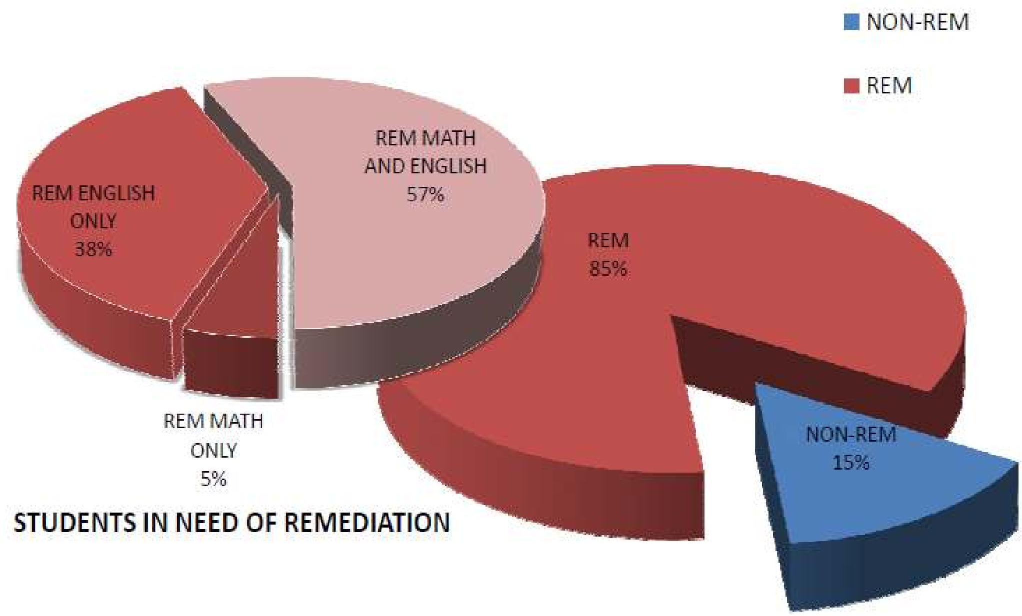


Figure 6: Distribution by remediation status

The distribution of students by remediation status can also be examined in terms of the support programs to which they have access. Figure 7 illustrates the distribution of students in remediation by support program. Ninety-eight percent of all EOF students are in need of remediation and 95 percent of all SSSP students are in need of remediation.

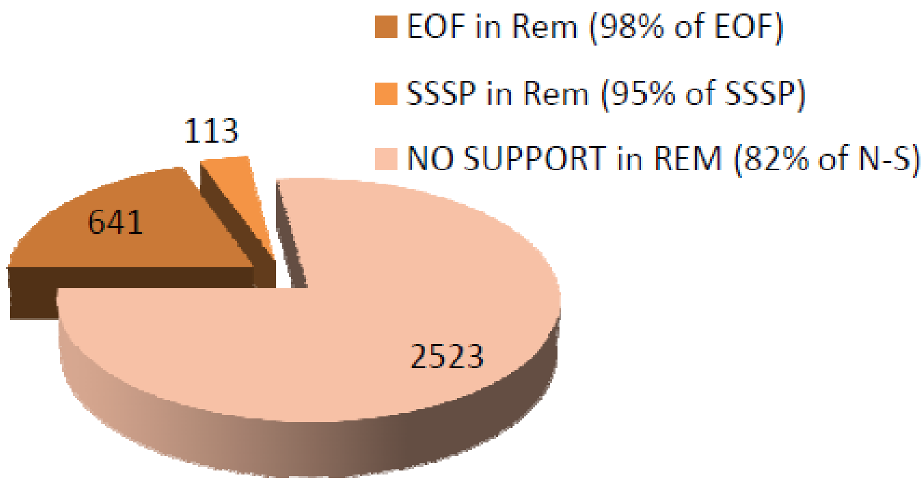


Figure 7: Students in need of remediation by support program

The pre-college academic characteristics of incoming freshmen are summarized in Table 3. The average high school grade point average was 2.84, the average SAT Math score was 445 and the average SAT Verbal score was 433. The distribution of high school grade point average and the cumulative college grade point average were slightly skewed to the right. The skewness of high school grade point average (0.225) and cumulative college grade point average (-0.66) were not significant and the values of these measures were assumed to be normally distributed in most of this study. The distribution of values for the ACCUPLACER Reading and Arithmetic scores were also skewed at 0.19 and -0.23 respectively.

Figure 8 below presents a visual comparison of academic outcomes by student group with the ACCUPLACER Reading and Arithmetic scores superimposed for illustrative purposes. The bar charts are not to scale because the measures for each of the outcomes are different. The group of “All” is included to provide a starting point or basis for this visual comparison. The students in the SSSP group consistently outperform all other student groups, followed by students in the EOF group, in spite of having the lowest ACCUPLACER reading and arithmetic scores.

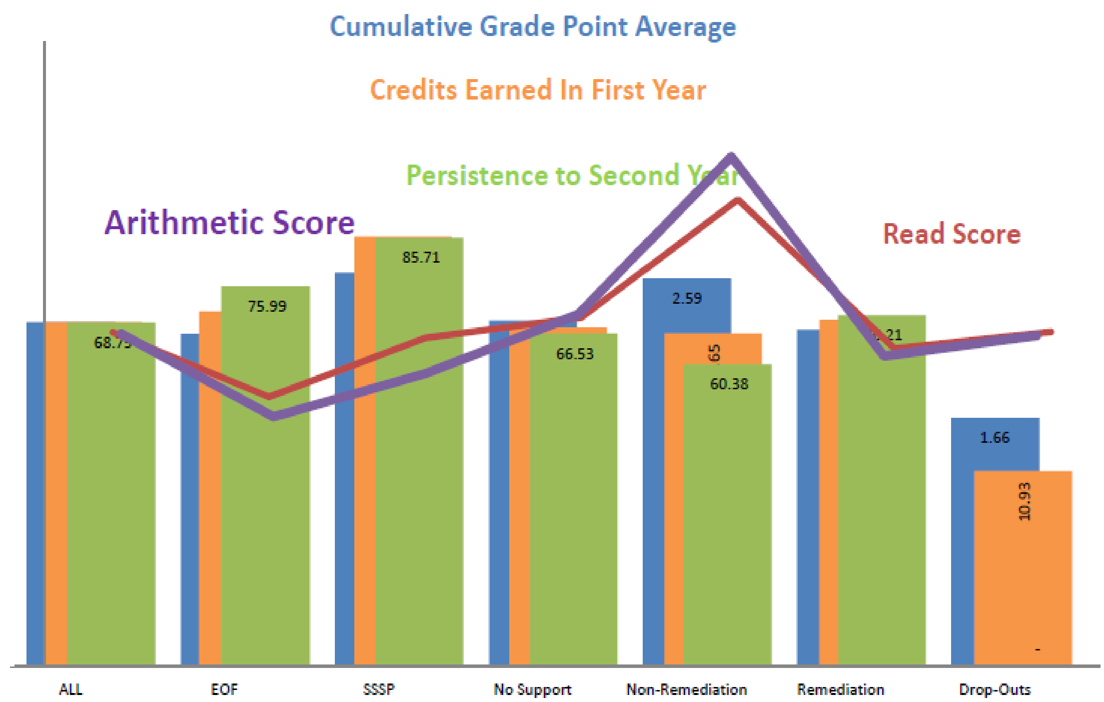


Figure 8: Visual comparison of academic outcomes (bar graphs) with ACCUPLACER reading and arithmetic scores, by student group

Statistical sample size limitations required the combining of all five cohort years into one large database in order to conduct statistical analyses of student support programs and remediation. However, analysis by cohort year was also conducted and the descriptive statistics for these cohorts are presented in Tables 3-A to 3-E in order to demonstrate the consistency of relationship between observable characteristics through the five years of the study. The gender distribution has been consistent through-out the five years of the study with variances between 6 and 17 percentage points, with females consistently outnumbering males. The distribution of students by race and ethnicity has also been consistently diverse, with the total percentage of Black and Hispanic students constantly higher than the total percentage of white and Asian students. Over 52% of all freshmen were first generation for all the five cohort years, and between 62 and 74 percent of students in three of the five years received financial aid to cover 76 to 100 percent of tuition and fees. Fall 2009 had the lowest percentage of students starting with no skill-deficiency (83% in need of remediation) and Fall 2007 had the highest percentage of students starting college in need of remediation (88%). Between 68 and 70 percent persisted to the second year of college for all five years of the cohort. Between 121 and 144 students are admitted through the EOF program each year, representing approximately 17 percent of entering freshmen each year. Between 16 and 35 students become part of SSSP each year, representing approximately 3 percent of entering freshmen each year. The SAT Math scores ($\bar{X}$=445, SD= 76) had been consistently higher than SAT Verbal scores ($\bar{X}$ =433, SD= 74) over the five years of the study.

Special Support Program Participants - EOF and SSSP:

State College has two special support programs (EOF and SSSP) that accept students in their freshman year. The EOF program admits students who would otherwise not qualify for regular admissions. These EOF students have academic credentials lower than the prescribed admissions criteria, but are allowed admission to the college under a special admit category that considers state residency, a high school diploma or GED, historic poverty and motivation to complete a university program of study demonstrated at an interview with professional staff at the College. Applicants to the EOF program undergo a separate vetting process that includes interviews and providing supporting document to prove that they meet the income eligibility criteria. The EOF program is administered through the Division of Academic Affairs and provides academic support for these students in the form of intrusive advisement, counseling, mentoring, a summer bridge program, and an annual grant to supplement federal and state financial aid.

The SSSP program is primarily a student support services program, with an emphasis on the social support it provides low-income, first-generation college students. It also provides academic support in the form of peer tutoring and course advisement but does not provide additional grant funding to supplement federal and state student financial aid. The primary requirement for participation is the SSSP is for students to be first-generation college students. The SSSP program gives preference to those who come from low-income families or those who have a federally recognized disability.

The total student sample of EOF students was 654 and the total student sample for SSSP was 119. The proportion of female students in the EOF and SSSP programs were higher than that of the non-remediation student population (65% and 71% , respectively, versus 44%). The proportion of Black (31% vs. 13.4%) and Hispanic students (45% vs. 32%) in the EOF program was also higher. The proportion of first generation college students in EOF was also higher than that of the non-remediation student population by over 15 percentage points (70% vs. 42%). There were more poor students in the EOF (95% vs. 50.8%) and SSSP (72% vs. 51%) programs than in the non-remediation student population.

The pre-college academic characteristics of students in the EOF program were expected to be lower than those of the general population because these students would not have been accepted into State College had it not been for the special admissions program through EOF. The average high school grade point average was 2.74 on a 4.0 scale, 0.28 point lower than that of the non-remediation student population. The average scores in SAT Math score and SAT Verbal were also lower than the average for the non-remediation student population at 383, or 134 points lower and 363 or 152 points lower, respectively. The combined SAT Math and SAT Verbal score for EOF students was lower by 286 points, as compared to that of the non-remediation student population. The ACCUPLACER scores for Math and Reading were also lower, and 98 percent of EOF students were placed into remediation.

While EOF students had the poorest pre-college academic and test score characteristics, their college academic performance was almost the same as the non-remediation student population. Their mean cumulative GPA is only slightly lower ($\bar{X}$ = 2.2, SD= 0.86 vs. $\bar{X}$=2.59, SD=1.26) but the average credits earned in the first year of college is slightly higher than the non-remediation students ($\bar{X}$ = 19.88, SD=8.67 vs. $\bar{X}$ =18.65, SD=11.75). EOF students had more credits earned in the first year of college as compared to non-remediation students (19.9 vs. 19.41), students who did not receive any support (19.9 vs. 18.9) and the general student population (19.9 vs. 19.3). EOF students had higher rates of persistence to second year of college as compared to non-remediation students (76% vs. 60%), the general student population (76 % vs. 69%), and students who received no special support (76 % vs. 67%).

Unlike the EOF program, students are first admitted to the College before being accepted into the SSSP program. The SSSP program provides special support for freshmen who are considered first generation college students or have disabilities. The proportion of female students in the SSSP program was higher than that of the non-remediation student population (71% vs. 44%) and the general student population (71% vs. 55%). The proportion of Black students in the SSSP program was higher than the non-remediation student population (22% vs. 13%), and the proportion of Hispanic students was also higher than the non-remediation student population (59% vs. 32%). The proportion of first generation college students in SSSP was also much higher than the general student population (76% vs. 53%) and non-remediation students (76% vs. 42%) which was be expected because SSSP was designed specifically to accommodate them. The proportion of students with financial need met was also higher than the general student population (72% vs. 63%) and non-remediation students (72% vs. 51%), indicating a lower socioeconomic status for SSSP students.

The pre-college academic characteristics of students in the SSSP program were not expected to be lower than those of the general population because these students were accepted into State College before they were accepted into the SSSP program. The average high school grade point average was 2.88 on a 4.0 scale, higher than the general student population but lower than the non-remediation students (2.88 vs. 3.02). The average SAT Math score for SSSP students was lower at 428, or 18 points lower than the average for the general student population and 88.9 points lower than the non-remediation students. The average SAT VERBAL score was also lower than the general student population at 424 by 9.7 points, and lower than the non-remediation students by 91.9 points. The combined SAT Math and SAT Verbal score for SSSP students was lower by 27.7 points, as compared the general student population, and lower by 180.8 points as compared to non-remediation students. The ACCUPLACER scores for Math and Reading were also lower, and approximately 95 percent of SSSP students were placed into remediation.

The college outcomes for students who receive SSSP support were the highest amongst the groups. Their mean cumulative grade point average was higher than the non-remediation students ($\bar{X}$=2.63, SD0.83 vs. $\bar{X}$=2.59, SD=1.26) and the general student population ($\bar{X}$=2.63 vs. $\bar{X}$=2.30, SD=1.08). Students in the SSSP group had the highest average credits earned in the first year of college, as compared to EOF and Non-remediation students ($\bar{X}$=24.1, SD=8.31 vs. $\bar{X}$=19.9, SD=8.67 and $\bar{X}$=18.65, SD=11.75 respectively). The SSSP students persisted the most into the second year of college as compared to the non-remediation students, (86% vs. 60%), the general student population (86 % vs. 69 %), and to the EOF students (86 % vs. 76%).

Table 3: Descriptive Statistics For Entering Freshmen (Fall 2006 to Fall 2010: N=3849)

Variables	ALL (N=3849)		EOF (N=654)		SSSP (N=119)		No Special Support (N=3077)		Non-Remediation (N=573)		Remediation (N=3276)		Drop-Outs (N=1202)		Zero Cum GPA (N=256)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Gender																
Males	1719	44.7	231	35.3	35	29.4	1453	47.2	322	56.2	1395	42.6	568	47.2	129	50.4
Female	2130	55.3	423	64.7	84	70.6	1624	52.8	251	43.8	1879	57.4	635	52.8	127	49.6
Race/Ethnic Origin																
American Indian	7	0.2	2	1.0	0	0.0	5	0.2	2	0.4	5	0.2	3	0.3	0	0.0
Asian	260	6.8	50	8.0	7	6.0	203	6.6	32	5.6	228	7.0	70	5.8	8	3.1
Black	788	20.5	200	31.0	26	22.0	562	18.3	77	13.4	711	21.7	304	25.3	74	28.9
Hispanic	1540	40.0	296	45.0	70	59.0	1175	38.2	183	31.9	1357	41.4	446	37.1	96	37.5
Unknown	394	10.2	47	7.0	9	8.0	338	11.0	65	11.3	329	10.0	122	10.1	28	10.9
White	860	22.3	59	9.0	7	6.0	794	25.8	214	37.4	646	19.7	258	21.5	50	19.5
First Generation In College																
No	1794	46.6	194	29.7	29	24.4	1571	51.1	330	57.6	1464	44.7	575	47.8	116	45.3
Yes	2055	53.4	460	70.3	90	75.6	1506	48.9	243	42.4	1812	55.3	628	52.2	140	54.7
SES Status (%Need Met by Financial Aid as Proxy)																
Interested in Financial Aid: No	176	4.6	6	0.1	2	1.7	168	5.5	54	9.4	122	3.7	68	5.7	15	5.9
Interested in Financial Aid: Yes	3673	95.4	648	99.1	117	98.3	2909	94.5	519	90.6	3154	96.3	1135	94.4	241	94.1
%Need Met (in Categories)																
NeedMet1 = 1 to 25%	783	20.3	5	0.8	7	5.9	771	25.1	186	32.5	597	18.2	351	29.2	110	43.0
NeedMet2 = 26% to 50%	317	8.2	7	1.1	12	10.1	299	9.7	47	8.2	270	8.2	148	12.3	44	17.2
NeedMet3 = 51% to 75%	326	8.5	20	3.1	15	12.6	291	9.5	49	8.6	277	8.5	136	11.3	42	16.4
NeedMet4 = 76% to 100%	2423	63.0	622	95.1	85	71.4	1716	55.8	291	50.8	2132	65.1	568	47.2	60	23.4
Persistence to Second Year	2646	68.8	497	76.0	102	85.7	2047	66.5	346	60.4	2300	70.2	0	0.0	11	4.3
Required Remediation	3276	85.1	641	98.0	113	95.0	2523	82.0	0	0.0	3276	100.0	976	81.1	199	77.7

Variables (2006 to 2010)	ALL	EDF	TTG	No Support	Non-Remediation	Remediation	Drop-Outs	Zero Cum GPA
High School GPA								
N	2721	251	91	2379	373	2347	810	180
Mean	2.84	2.74	2.88	2.85	3.02	2.81	2.77	2.7
Std Dev	0.51	0.44	0.53	1.3	0.58	0.49	0.49	0.47
Median	2.8	2.7	2.8	2.6	3	2.8	2.73	2.7
Arithmetic ACCUPLACER Score								
N	3640	630	117	2894	407	3233	1088	232
Mean	63.99	48.1	56.4	67.76	98.08	59.71	63.66	61.38
Std Dev	28.2	23.7	25.2	27.9	14.95	26.49	28.4	28.36
Median	63	41	53	68	101	58	64	60
Reading ACCUPLACER Score								
N	3675	645	117	2914	404	3271	1089	233
Mean	72.03	58.1	70.8	75.2	100.6	68.5	72.1	72.96
Std Dev	19.1	16.6	16.2	18.3	6.72	16.99	19.63	20.83
Median	73	59	72	76	99	71	74	74
SAT Math Score								
N	3226	429	112	2686	435	2791	950	196
Mean	445.4	383	428	456.2	516.51	434.35	443	435.7
Std Dev	76	63.6	70.6	73.1	77.1	69.68	78.2	72.15
Median	440	390	425	450	510	430	440	430
SAT Verbal Score								
N	3226	429	112	2686	435	2791	950	196
Mean	433.5	363	424	445	515.7	420.69	443.1	431.5
Std Dev	74.6	57.6	65.8	71.1	78.5	65.18	74.2	71.5
Median	430	370	430	440	510	420	430	430
Cumulative College GPA								
N	3849	654	119	3077	573	3276	1203	256
Mean	2.3	2.22	2.63	2.31	2.59	2.25	1.66	0
Std Dev	1.08	0.86	0.83	1.12	1.26	1.04	1.3	0
Median	2.54	2.42	2.75	2.58	3	2.47	1.63	0
Credits Earned First Year								
N	3849	654	119	3077	573	3276	1203	256
Mean	19.29	19.9	24.1	18.98	18.65	19.41	10.93	0.375
Std Dev	9.98	8.67	8.32	10.25	11.75	9.64	62	1.15
Median	22	22	26	21	22	21	9	0

Table 3-A: Descriptive Statistics For Entering Freshmen - Fall 2006
(N=818)

Variables	ALL (N=818)		EOF (N=133)		SSSP (N=23)		No Special Support (N=662)		Non-Remediation (N=122)		Remediation (N=696)		Drop-Outs (N=250)		Zero Cum GPA (N=53)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Gender																
Male	339	41.4	39	29.3	6	26.1	294	44.3	67	54.9	272	39.1	110	44.0	26	49.1
Female	479	58.6	94	70.7	17	73.9	368	55.7	55	45.1	424	60.9	140	56.0	27	50.9
Race/Ethnic Origin																
American Indian	1	0.1	0	0.0	0	0.0	1	0.2	1	0.8	0	0.0	1	0.4	0	0.0
Asian	46	5.6	12	9.0	0	0.0	34	5.1	6	4.9	40	5.8	10	4.0	1	1.9
Black	174	21.3	42	31.6	5	21.7	127	19.2	18	4.8	156	22.4	60	24.0	14	26.4
Hispanic	317	38.8	55	41.4	15	65.2	247	37.3	42	34.4	275	39.5	98	39.2	22	41.5
Unknown	83	10.1	11	8.3	1	4.4	71	10.7	14	11.5	69	9.9	28	11.2	6	11.3
White	197	24.1	13	9.8	2	8.7	182	27.5	41	33.6	156	22.4	53	21.2	10	18.9
First Generation In College																
No	388	47.4	46	34.6	6	26.1	336	50.8	69	56.6	319	45.8	126	50.4	29	54.7
Yes	430	52.6	87	65.4	17	73.9	326	49.2	53	43.4	377	54.2	124	49.6	24	45.3
SES Status (%Need Met by Financial Aid as Proxy)																
Interested in Financial Aid: No	35	4.3	1	0.8	0	0.0	34	5.1	12	9.8	23	3.3	17	6.8	0	0.0
Interested in Financial Aid: Yes	783	95.7	132	99.3	23	100.0	628	94.9	110	90.2	673	96.7	233	93.2	53	100.0
% Need Met (in Categories)																
NeedMet1 = 1 to 25%	198	24.2	1	0.8	2	8.7	195	29.5	50	40.9	148	21.3	82	32.8	22	41.5
NeedMet2 = 26% to 50%	75	9.2	2	1.5	2	8.7	71	10.3	11	9.0	64	9.2	30	12.0	12	22.6
NeedMet3 = 51% to 75%	73	8.9	3	2.3	4	17.4	66	9.9	12	9.8	61	8.8	31	12.4	7	13.2
NeedMet4 = 76% to 100%	472	57.7	127	95.5	15	65.2	330	49.9	49	40.2	423	60.8	107	42.8	12	22.6
Persistence to Second Year	568	69.4	106	79.7	23	100.0	439	66.3	71	58.2	497	71.4	NA	NA	2	3.8
Required Remediation	696	85.1	128	96.2	22	95.7	546	82.5	na	na	na	na	199	79.6	44	83.0

Variables – Fall 2006	ALL	EOF	SSSP	No Support	Non-Remediation	Remediation	Drop-Outs	Zero Cum GPA
High School GPA								
N	616	92	19	505	72	544	172	37
Mean	2.78	2.8	2.8	2.8	2.9	2.8	2.7	2.6
Std Dev	0.513	0.4	0.4	0.5	0.6	0.5	0.5	0.5
Median	2.7	2.7	2.7	2.7	2.9	2.7	2.7	2.71
Arithmetic ACCUPLACER Score								
N	754	128	22	604	65	689	218	47
Mean	61.44	48.4	49.5	64.6	99.6	57.8	60.7	54.53
Std Dev	28.19	25.5	18.7	28.1	15.1	26.4	29.1	26.54
Median	59.5	40	46.5	63.5	101	55	57	49
Reading ACCUPLACER Score								
N	758	129	22	607	65	693	219	47
Mean	70.96	58.2	69.9	73.7	100	68.2	71.6	67.79
Std Dev	18.49	16.6	14.7	17.9	5.9	16.9	19.7	20.05
Median	72	59	71.5	75	99	70	74	70
SAT Math Score								
N	696	114	22	560	88	608	204	44
Mean	436.2	381	401	448.8	498.8	427.1	434.5	434.1
Std Dev	81.06	81.4	65.8	76.4	79.6	77.2	86.4	70.49
Median	430	385	420	440	500	420	430	435
SAT Verbal Score								
N	696	114	22	560	88	608	204	44
Mean	428	360	420	442.1	495.8	418.2	431.3	412.5
Std Dev	74.62	58.3	53.5	70.6	69.9	70.1	74.9	64.74
Median	430	360	415	440	495	420	430	425
Cumulative College GPA								
N	818	133	23	662	122	696	250	53
Mean	2.3	2.36	2.64	2.27	2.55	2.26	1.64	0
Std Dev	1.06	0.91	0.63	1.1	1.13	1.05	1.28	0
Median	2.55	2.59	2.77	2.52	2.86	2.46	1.56	0
Credits Earned First Year								
N	818	133	23	662	122	696	250	53
Mean	19.26	21.6	24.9	18.6	17.99	19.5	10.5	0.98
Std Dev	10.15	9.6	6.3	10.3	11.7	9.8	9.2	1.77
Median	21	24	27	20	18	22	9	0

Table 3-B : Descriptive Statistics For Entering Freshmen -Fall 2007 (N=804)

Variables	ALL (N=804)		EOF (N=142)		SSSP (N=21)		No Special Support (N=641)		Non-Remediation (N=96)		Remediation (N=708)		Drop-Outs (N=256)		Zero Cum GPA (N=67)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Gender																
Male	376	46.8	58	40.9	4	19.1	314	49.0	55	57.3	321	45.3	132	51.6	39	58.2
Female	428	53.2	84	59.1	17	81.0	327	51.0	41	42.7	387	54.7	124	48.4	28	41.8
Race/Ethnic Origin																
American Indian	2	0.3	0	0.0	0	0.0	2	0.3	0	0.0	2	0.3	2	0.8	0	0.0
Asian	55	6.8	15	10.6	3	14.3	37	5.8	4	4.2	51	7.2	11	4.3	1	1.5
Black	152	18.9	36	25.4	5	23.8	111	17.3	14	14.6	138	19.5	62	24.2	19	28.4
Hispanic	353	43.9	69	48.6	10	47.6	274	42.8	33	34.4	320	45.2	111	43.4	28	41.8
Unknown	74	9.2	10	7.0	2	9.5	162	9.7	5	5.2	69	9.8	21	8.2	4	6.0
White	168	20.9	12	8.5	1	4.8	155	24.2	40	41.7	128	18.1	49	19.1	15	22.4
First Generation In College																
No	374	46.5	46	32.4	4	19.1	324	50.6	59	61.5	315	44.5	110	43.0	25	37.3
Yes	430	53.5	96	67.6	17	81.0	317	49.5	37	38.5	393	55.5	146	57.0	42	62.7
SES Status (%Need Met by Financial Aid as Proxy)																
Interested in Financial Aid: No	26	3.2	1	0.7	0	0.0	25	3.9	4	4.2	22	3.1	6	2.3	5	7.5
Interested in Financial Aid: Yes	778	96.8	141	99.3	21	100.0	616	96.1	92	95.8	686	96.9	250	97.7	62	92.5
% Need Met (in Categories)																
NeedMet1 = 1 to 25%	193	24.0	1	0.7	0	0.0	192	30.0	24	25.0	169	23.9	80	31.3	36	53.7
NeedMet2 = 26% to 50%	80	9.9	2	1.4	2	9.5	76	11.9	12	12.5	68	9.6	41	16.0	13	19.4
NeedMet3 = 51% to 75%	67	8.3	6	4.2	3	14.3	58	9.1	9	9.4	58	8.2	25	9.8	9	13.4
NeedMet4 = 76% to 100%	464	57.7	133	93.7	16	76.2	315	49.1	51	59.1	413	58.3	110	43.0	9	13.4
Persistence to Second Year	548	68.1	107	75.4	18	85.7	423	66.0	58	60.4	490	69.2	0	0.0	2	3.0
Required Remediation	708	88.1	139	97.9	20	95.2	549	85.7	0	0.0	708	100.0	218	85.2	56	83.6

Variables FALL 2007	ALL	EOF	SSSP	No Support	Non-Remediation	Remediation	Drop-Outs	Zero Cum GPA
<u>High School GPA</u>								
N	461	50	9	402	61	400	160	47
Mean	2.8	2.76	2.9	2.81	3.07	2.76	2.76	2.64
Std Dev	0.5	0.41	0.7	0.51	0.6	0.47	0.5	0.44
Median	2.76	2.78	2.8	2.73	3.1	2.7	2.7	2.6
<u>Arithmetic ACCUPLACER Score</u>								
N	773	133	20	620	78	695	242	65
Mean	65.2	48.6	66	68.72	99.18	61.38	65	64.51
Std Dev	28.1	23.3	30.3	27.7	14.72	26.61	29.12	30.1
Median	65	42	70	68	103	60	67	65
<u>Reading ACCUPLACER Score</u>								
N	786	139	20	627	79	707	244	65
Mean	71.1	55.5	68.4	74.6	101.47	67.67	71.35	69.76
Std Dev	18.9	15.7	16.6	17.86	7.06	16.63	20.2	21.9
Median	72	57	73	76	100	70	73	72
<u>SAT Math Score</u>								
N	679	86	19	574	88	591	214	56
Mean	450	386	440	459.74	530.3	437.82	443.74	435.7
Std Dev	72.9	61.2	65.5	69.82	69.47	65.42	73.4	69.12
Median	450	395	430	460	520	440	440	440
<u>SAT Verbal Score</u>								
N	679	86	19	574	88	591	214	56
Mean	439	360	412	451.03	531.14	424.53	437.1	435.2
Std Dev	76.6	62.2	82	70.94	88.32	64.08	75.63	74.66
Median	439	365	420	440	530	430	440	430
<u>Cumulative College GPA</u>								
N	804	142	21	641	96	708	256	67
Mean	2.22	2.33	2.72	2.17	2.53	2.18	1.42	0
Std Dev	1.1	0.91	0.84	1.14	1.36	1.05	1.24	0
Median	2.5	2.52	2.97	2.47	3.06	2.45	1.26	0
<u>Credits Earned First Year</u>								
N	804	142	21	641	96	708	256	67
Mean	18.5	19.6	23	18.1	19.35	18.37	9.78	0.36
Std Dev	10	8.13	8	10.39	12.22	9.67	9.42	1.12
Median	21	22	24	20	23.5	20	8	0

Table 3-C: Descriptive Statistics For Entering Freshmen - Fall 2008 (N=678)

Variables	ALL (N=678)		EOF (N=121)		SSSP (N=16)		No Special Support (N=542)		Non-Remediation (N=94)		Remediation (N=584)		Drop-Outs (N=208)		Zero Cum GPA (N=42)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Gender																
Males	308	45.4	45	37.2	7	43.8	256	47.2	54	57.5	254	43.5	94	45.2	20	47.6
Female	370	54.6	76	62.8	9	56.3	286	52.8	40	42.6	330	56.5	114	54.8	22	52.4
Race/Ethnic Origin																
American Indian	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Asian	38	5.6	6	5.0	1	6.3	31	5.7	3	3.2	35	6.0	13	6.3	1	2.4
Black	135	19.9	31	25.6	5	31.3	99	18.3	15	16.0	120	20.6	60	28.9	18	42.9
Hispanic	307	45.3	62	51.2	10	62.5	236	43.6	37	39.4	270	46.2	76	36.5	15	35.7
Unknown	69	10.2	10	8.3	0	0.0	59	10.9	9	9.6	60	10.3	18	8.7	3	7.1
White	129	19.0	12	9.9	0	0.0	117	21.6	30	31.9	99	17.0	41	19.7	5	11.9
First Generation in College																
No	312	46.0	34.0	28.1	3	18.8	275	50.7	55	58.5	257	44.0	91	43.8	15	35.7
Yes	366	54.0	87.0	71.9	13	81.3	267	49.3	39	41.5	327	56.0	117	56.3	27	64.3
SES Status (%Need Met by Financial Aid as Proxy)																
Interested in Financial Aid: No	23	3.4	1	0.8	0	0.0	22	4.1	5	5.3	18	3.1	6	2.9	2	4.8
Interested in Financial Aid: Yes	655	96.6	120	99.2	16	100.0	520	95.9	89	94.7	566	96.9	202	97.1	40	95.2
% Need Met (in Categories)																
NeedMet1 = 1 to 25%	121	17.9	1	0.8	3	18.8	117	21.6	23	24.5	98	16.8	54	26.0	16	38.1
NeedMet2 = 26% to 50%	64	9.4	2	1.7	3	18.8	60	11.1	12	12.8	52	8.9	22	10.6	3	7.1
NeedMet3 = 51% to 75%	67	9.9	5	4.1	3	18.8	59	10.9	10	10.6	57	9.8	28	13.5	10	23.8
NeedMet4 = 76% to 100%	426	62.8	113	93.4	7	43.8	306	56.5	49	52.1	377	64.6	104	50.0	13	31.0
Persistence to Second Year	470	69.3	92	76.0	13	81.3	365	67.3	62	66.0	408	69.9	0	0.0	2	4.8
Required Remediation	584	86.1	121	100.0	13	81.3	451	83.2	0	0.0	584	100.0	176	84.6	33	78.6

Variables Fall 2008	ALL	EOF	SSSP	No Support	Non-Remediation	Remediation	Drop-Outs	Zero Cum GPA
High School GPA								
N	496	58	14	424	63	433	139	27
Mean	2.8	2.7	2.77	2.9	3.1	2.8	2.7	2.65
Std Dev	0.5	0.5	0.5	0.5	0.6	0.5	0.6	0.48
Median	2.8	2.7	2.8	2.8	3.1	2.8	2.7	2.6
Arithmetic ACCUPLACER Score								
N	657	120	16	522	76	581	193	40
Mean	63.8	47.4	60.1	67.6	96.3	59.5	62.3	60.42
Std Dev	28.3	24.9	27.2	27.8	15.8	26.8	29.3	31.36
Median	63	39	58	68	98	58	60	56
Reading ACCUPLACER Score								
N	658	121	16	522	74	584	193	41
Mean	72.2	58.4	74.9	75.3	100.8	68.5	71.2	73.76
Std Dev	19.1	16	16	18.4	6.99	16.9	19.2	22.01
Median	74	59	72.5	76.5	100	71	72	76
SAT Math Score								
N	570	82	16	473	74	496	154	23
Mean	451.3	387	448	462.6	519.5	441.1	451.7	444.4
Std Dev	73.8	57.2	56.2	71.1	69.3	69	79.3	70.2
Median	450	390	440	460	510	440	440	440
SAT Verbal Score								
N	570	82	16	473	74	496	154	23
Mean	437.1	371	424	448.6	522	424.4	438.2	428.3
Std Dev	70.1	54.9	75	66.3	65.8	61.4	68	68.67
Median	440	370	430	440	510	420	440	420
Cumulative College GPA								
N	678	121	16	542	94	584	208	42
Mean	2.33	2.17	2.26	2.36	2.54	2.29	1.59	0
Std Dev	1.08	1.02	0.95	1.09	1.25	1.04	1.26	0
Median	2.55	2.38	2.4	2.6	2.88	2.48	1.52	0
Credits Earned First Year								
N	678	121	16	542	94	584	208	42
Mean	19.5	19.9	18.6	19.4	19.5	19.4	11	0.26
Std Dev	9.7	9.5	8.6	9.8	11.5	9.4	9.5	0.96
Median	22	23	19	22	22	22	9	0

Table 3-D: Descriptive Statistics For Entering Freshmen - Fall 2009 (N=759)

Variables	ALL (N=759) N	%	EOF (N=129) N	%	SSSP (N=24) N	%	No Special Support (N=606) N	%	Non-Remediation (N=133) N	%	Remediation (N=626) N	%	Drop-Outs (N=238) N	%	Zero Cum GPA (N=47) N	%
Gender																
Males	346	45.5	50	38.8	7	29.2	289	47.6	81	60.9	265	42.2	122	51.3	21	44.7
Female	413	54.5	79	61.2	17	70.8	317	52.4	52	39.1	361	57.8	116	48.7	26	55.3
Race/Ethnic Origin																
American Indian	1	0.1	1	0.8	0	0.0	0	0.0	0	0.0	1	0.2	0	0.0	0	0.0
Asian	60	7.9	7	5.4	0	0.0	53	8.8	6	4.5	54	8.6	20	8.4	4	8.5
Black	173	22.8	54	41.9	5	20.8	114	18.9	13	9.8	160	25.6	62	26.1	10	21.3
Hispanic	261	34.4	45	34.9	16	66.7	200	33.0	40	30.1	221	35.3	74	31.1	19	40.4
Unknown	73	9.6	10	7.8	3	12.5	60	9.9	16	12.0	57	9.1	21	8.8	4	8.5
White	191	25.2	12	9.3	0	0.0	179	29.5	58	43.6	133	21.3	61	25.6	10	21.3
First Generation in College																
No	360	47.4	41	31.9	10	41.7	309	51.0	73	54.9	287	45.9	131	55.0	22	46.8
Yes	399	52.6	88	68.2	14	58.3	297	49.0	60	45.1	339	54.2	107	45.0	25	53.2
SES Status (%Need Met by Financial Aid as Proxy)																
Interested in Financial Aid: No	47	6.2	3	2.3	1	4.2	43	7.1	17	12.8	30	4.8	18	7.6	4	8.5
Interested in Financial Aid: Yes	712	93.8	126	97.7	23	95.8	563	92.9	116	57.2	596	95.2	220	92.4	43	91.5
%Need Met (in Categories)																
NeedMet1 = 1 to 25%	137	18.1	1	0.8	2	8.3	134	22.1	45	33.8	92	14.7	72	30.3	16	34.0
NeedMet2 = 26% to 50%	66	8.7	0	0.0	4	16.7	62	10.2	6	4.5	60	9.6	30	12.6	8	17.0
NeedMet3 = 51% to 75%	81	10.7	2	1.6	5	20.8	74	12.2	14	10.5	67	10.7	30	12.6	11	23.4
NeedMet4 = 76% to 100%	475	62.6	126	97.7	13	54.2	336	55.5	68	51.1	407	65.0	106	44.5	12	25.5
Persistence to Second Year	521	68.6	100	77.5	20	83.3	401	66.2	75	56.4	446	71.3	0	0.0	1	2.1
Required Remediation	626	82.5	126	97.7	24	100.0	476	78.6	0	0.0	626	100.0	180	75.6	31	66.0

Variables Fall 2009	ALL	EOF	SSSP	No Support	Non-Remediation	Remediation	Drop-Outs	Zero Cum GPA
High School GPA								
N	576	31	20	525	94	482	173	35
Mean	2.8	2.6	2.79	2.8	3.06	2.79	2.74	2.68
Std Dev	0.5	0.5	0.56	0.5	0.6	0.5	0.5	0.44
Median	2.8	2.5	2.8	2.8	2.9	2.8	2.7	2.7
Arithmetic ACCUPLACER Score								
N	721	126	24	571	100	621	208	39
Mean	65.3	45.8	53.1	70.1	98.4	60	65.7	62.92
Std Dev	28.8	20.5	28.1	28.4	14.6	26.9	28.9	27.3
Median	65	40	49	74	99.5	58	67	63
Reading ACCUPLACER Score								
N	725	127	24	574	99	626	211	39
Mean	73.8	58.1	69.4	77.4	100.6	69.5	74.9	81.02
Std Dev	19.8	16.9	20.4	18.6	6.8	17.7	19.8	17.94
Median	75	59	70	79	99	72	76	81
SAT Math Score								
N	627	70	21	536	99	528	185	36
Mean	445.4	371	429	455.7	508.4	433.5	445.7	432.8
Std Dev	76.1	53.5	84.4	72.8	82.3	68.8	79.8	51.54
Median	440	380	420	450	500	430	440	425
SAT Verbal Score								
N	627	70	21	536	99	528	185	36
Mean	434.2	358	438	443.99	507.9	420.3	437.4	447.8
Std Dev	74.4	57.6	60.5	71.1	85.5	63.3	79.3	66.42
Median	430	365	430	440	510	420	440	445
Cumulative College GPA								
N	759	129	24	606	133	626	238	47
Mean	2.25	1.88	2.5	2.32	2.51	2.2	1.76	0
Std Dev	1.09	0.8	0.96	1.11	1.3	1.02	1.34	0
Median	2.45	1.9	2.8	2.59	2.84	2.39	1.79	0
Credits Earned First Year								
N	759	129	24	606	133	626	238	47
Mean	19.5	18.6	23.5	19.5	18.3	19.7	11.3	0.06
Std Dev	9.99	8.3	8.9	10.3	11.8	9.6	9.8	0.43
Median	22	21	26	22	22	22	10	0

Table 3-E: Descriptive Statistics For Entering Freshmen - Fall 2010 (N=790)

Variables	ALL (N=790)		EOF (N=129)		SSSP (N=35)		No Special Support (N=626)		Non-Remediation (N=128)		Remediation (N=662)		Drop-Outs (N=251)		Zero Cum GPA (N=47)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Gender																
Males	350	44.3	39	30.2	11	31.4	300	47.9	65	50.8	285	43.1	110	43.8	23	48.9
Female	440	55.7	90	69.8	24	68.6	326	52.1	63	49.2	377	57.0	141	56.2	24	51.1
Race/Ethnic Origin																
American Indian	3	0.4	1	0.8	0	0.0	2	0.3	1	0.8	2	0.3	0	0.0	0	0.0
Asian	61	7.7	10	7.8	3	8.6	48	7.7	13	10.2	48	7.3	16	6.4	1	2.1
Black	154	19.5	37	28.7	6	17.1	111	17.7	17	13.3	137	20.7	60	23.9	13	27.7
Hispanic	302	38.2	65	50.4	19	54.3	218	34.8	31	24.2	271	40.9	87	34.7	12	25.3
Unknown	95	12.0	6	4.7	3	8.6	86	13.7	21	16.4	74	11.2	34	13.6	11	23.4
White	175	22.2	10	7.8	4	11.4	161	25.7	45	35.2	130	19.6	54	21.5	10	21.3
First Generation In College																
No	360	45.6	27	20.9	6	17.1	327	52.2	74	57.8	286	43.2	117	46.6	25	53.2
Yes	430	54.4	102	79.1	29	82.9	299	47.8	54	42.2	376	56.8	134	53.4	22	46.8
SES Status (%Need Met by Financial Aid as Proxy)																
Interested in Financial Aid: No	45	5.7	0	0.0	1	2.9	44	7.0	16	12.5	29	4.4	21	8.4	4	8.5
Interested in Financial Aid: Yes	745	94.3	129	100	34	97.1	582	93.0	112	87.5	633	95.6	230	91.6	43	91.5
% Need Met (in Categories)																
NeedMet1 = 1 to 25%	134	17.0	1	0.8	0	0.0	133	21.3	44	34.4	90	13.6	63	25.1	20	42.6
NeedMet2 = 26% to 50%	32	4.1	1	0.8	1	2.9	30	4.8	6	4.7	26	3.9	25	10.0	8	17.0
NeedMet3 = 51% to 75%	38	4.8	4	3.1	0	0.0	34	5.4	4	3.1	34	5.1	22	8.8	5	10.6
NeedMet4 = 76% to 100%	586	74.2	123	95.4	34	97.1	429	68.5	74	57.8	512	77.3	141	56.2	14	29.8
Persistence to Second Year	539	68.2	92	71.3	28	80.0	419	66.9	80	62.5	459	69.3	0	0.0	4	8.5
Required Remediation	662	83.8	127	98.5	34	97.1	501	80.0	0	0.0	662	100.	203	80.9	35	74.5

Variables – Fall 2010	ALL	EOF	SSSP	No Support	Non-Remediation	Remediation	Drop-Outs	Zero Cum GPA
High School GPA								
N	572	20	29	523	84	488	166	34
Mean	2.9	2.8	3.1	2.9	3.1	2.9	2.9	2.9
Std Dev	0.5	0.4	0.5	0.5	0.6	0.5	0.5	0.5
Median	2.9	2.7	3.1	2.9	3.1	2.9	2.8	2.9
Arithmetic ACCUPLACER Score								
N	735	123	35	577	88	647	219	41
Mean	64.2	49.9	55.9	67.8	97.3	59.8	64.3	61.4
Std Dev	0.2	24.2	22.0	27.4	14.9	25.8	25.45	25.9
Median	63.0	44.0	53.0	67.0	100.5	58.0	65.0	58.0
Reading ACCUPLACER Score								
N	748	129	35	584	87	661	222	41
Mean	72.4	60.6	71.9	75.0	100.1	68.7	71.5	75.5
Std Dev	18.9	17.5	14.1	18.5	6.6	16.9	19.1	19.3
Median	72.0	62.0	72.0	75.0	98.0	71.0	71.0	72.0
SAT Math Score								
N	654	77	34	543	86	568	193	37
Mean	445.6	388.6	427.4	454.9	527.3	433.3	441.8	434.9
Std Dev	75.1	49.7	72.0	74.6	0.6	66.3	71.3	73.7
Median	440.0	390.0	430.0	450.0	520.0	430.0	440.0	420.0
SAT Verbal Score								
N	654	77	34	543	86	568	193	37
Mean	430.6	369.6	424.7	439.6	523.5	416.5	422.6	434.6
Std Dev	76.0	54.0	63.9	75.3	74.2	65.7	71.1	83.9
Median	430.0	380.0	425.0	440.0	510.0	420.0	420.0	420.0
Cumulative College GPA								
N	790	129	35	626	128	662	251	47
Mean	2.4	2.4	2.8	2.4	2.8	2.4	1.9	0.0
Std Dev	1.1	0.9	0.8	1.1	1.2	1.0	1.3	0.0
Median	2.6	2.5	3.1	2.7	3.2	2.6	2.1	0.0
Credits Earned First Year								
N	790	129	35	626	128	662	251	47
Mean	19.8	19.7	27.0	19.5	18.5	20.1	12.0	0.1
Std Dev	9.9	7.7	8.1	10.3	11.6	9.6	10.0	0.7
Median	22.0	20.0	28.0	22.0	22.0	22.0	11.0	0.0

Correlations and Comparisons:

Table 3 depicts a highly diverse, high need and relatively low skill student population. To determine whether these characteristics have any effect or correlation to each other, pre-college academic and demographic variables were examined using: Spearman Rho, independent samples t-test, and Chi-square test. The results are presented in Table 4.

Table 4: Spearman Correlations of Variables (Under-Prepared New Freshmen, Fall 2006 to Fall 2010, N=3276)

	CUM GPA	CRED EARNED 1ST YR	% NEED MET (SES)
CUM GPA	--	0.63**	0.05*
CRED EARNED 1ST YR	0.63**	--	.02**
% NEED MET (SES)	0.05*	0.21**	--

Note: *p<.05, **p<.001

Table 4 shows the Spearman coefficients for cumulative grade point average, credits earned in the first year, and socioeconomic status. There was a strong and positive association (Spearman Rho=0.63, p<.0001) between the credits a student earned in the first year of college and cumulative grade point average suggesting that students who enrolled in both remediation courses and college level courses earned better grades than students enrolled only in remediation courses (and therefore did not earn as many credits). A relatively weak positive correlation (Spearman rho=0.05, p=.001) was observed between socioeconomic status (%Need Met as a proxy) and cumulative grade point average, suggesting that once enrolled in courses, underprepared college students' socioeconomic status had less impact on grades.

Table 5: Chi Square Test Statistics (N=2647)

OUTCOME/VARIABLES	ALL STUDENTS		EOF STUDENTS		SSSP STUDENTS		NO SUPPORT STUDENTS		ALL REMEDIATION	
	(N=3849)		(N=654)		(N=119)		(N=3077)		(N=3276)	
	$\chi2$	P	$\chi2$	P	$\chi2$	P	$\chi2$	P	$\chi2$	P
<u>OUTCOME: PERSISTENCE</u>										
ASIAN	2.435	0.119	0.000	0.999	1.240	0.266	2.346	0.126	1.416	0.2340
BLACK	24.736	<.0001**	8.869	.0029*	4.339	0.0372*	20.574	<.0001**	23.379	<.0001**
HISPANIC	6.287	0.0122*	1.685	0.194	0.284	0.595	2.308	0.129	2.2365	0.1348
UNKNOWN	0.017	0.896	1.354	0.245	0.080	0.777	0.000	0.986	0.1470	0.7014
% Need Met	187.718	<.0001**	55.177	<.0001**	1.935	0.586	1.366	<.0001**	128.159	<.0001**
Gender	4.726	.0297*	2.089	0.148	1.322	0.250	1.495	0.222	2.6682	0.1024
1st Gen in College	0.992	0.319	1.247	0.264	0.486	0.486	0.153	0.696	0.2241	0.6359

Note: *p<.05, **p<.001

Table 5 shows results of chi-square tests of independence on the relationship between the input variable of pre-college student characteristics and the dependent variable of persistence to second year. Socioeconomic status was significantly associated with persistence ($X^2 = 187.72$, $p < .0001$). Poorer students were less likely to persist to the second year. This association was significant for all students except those who received support from SSSP. The relationship between first generation in college and persistence to second year was not statistically significant ($p = .319$).

The association between race of Black and persistence was statistically significant for the entire student population ($p < .0001$) with the exception of students who received EOF and SSSP support. Black and Hispanic students were less likely to persist to the second year of college than students from other races/ethnic origins.

Among students who received SSSP support, the relationship between socioeconomic status and persistence to college was not statistically significant. Race of Black and persistence to second year was statistically significant ($p = .04$).

The two-independent sample t-test was used to compare the means of the Cumulative GPA and Credits Earned in First Year for students by gender, by first generation in college status and race/ethnic origin. The means of CGPA of the EOF, SSSP and No Support groups were also compared. The results are presented in Table 6.

Table 6: T-test Statistics for CGPA and Credits Earned in First Year

Variables	**Cumulative College GPA**			**Credits Earned First Year**		
	t value	P	Mean Difference	t value	P	Mean Difference
1st Gen In College	3.90	<.0001**	0.1366	2.07	.0381*	0.6702
Gender	-4.14	<.0001**	-14.57	-4.65	<.0001**	-1.5022
EOF	2.33	.0201*	0.0967	-1.82	0.0687	-0.7002
SSSP	-4.32	<.0001**	-0.3379	-6.33	<.0001**	-4.9419
No Support	-0.50	0.6143	-0.0197	4.25	<.0001**	1.5496
Remediation	6.10	<.0001**	0.3393	-1.45	0.1468	-0.7535
Asian	-7.51	<.0001**	-0.449	-5.72	<.0001**	-3.4022
Black	12.25	<.0001**	0.5199	9.6	<.0001**	3.7075
Hispanic	1.01	0.3148	0.0355	-0.02	0.9831	-0.00691

Note: *p<.05, **p<.001

First generation in college was a statistically significant variable associated with cumulative grade point average in college, and credits earned in the first year. Students who were not first in their families to attend college had slightly higher grade point averages ($\bar{X}$=2.375, SD=1.08, p<.0001) than first generation in college students ($\bar{X}$=2.24, SD=1.08, p<.0001) and earned slightly more credits in the first year of college ($\bar{X}$=19.65, SD=10.14 vs. $\bar{X}$=18.98, SD=9.8, p=.0381).

Students who received SSSP services and support had the strongest academic performance based on cumulative college grade point average ($\bar{X}$=2.63, SD=1.09 vs. $\bar{X}$ =2.29, SD=0.83, p=<.0001) and credits earned in the first year ($\bar{X}$=24.08, SD=8.32 vs. $\bar{X}$ =19.14, SD=9.99, p<.0001) than those students who were not in the program. While first generation in college was associated with lower CGPA in the general student population, the SSSP group comprised of 76% first generation in college earned higher grades in college.

Black students earned significantly lower CGPA ($\bar{X}$=1.89, SD1.06 vs. $\bar{X}$=2.41, SD=1.07, p<.0001) and fewer credits than students from other race/ethnic origins. Males were also less likely to earn higher CGPA and credits in the first year than females.

Underprepared Students – In Need of Remediation

The incoming freshmen took an ACCUPLACER placement test before they were allowed to register for courses. Of the sample of 3,849 students who entered State College from Fall 2006 to Fall 2010, 3,705 had ACCUPLACER scores in the College's integrated student database. Of these students, 15 percent were found to be sufficiently prepared to take college courses and needed no remediation. The remaining 85 percent were found to be college skill deficient and in need of remediation in math, English or both. At State College, underprepared college students were defined as students in need of remediation in Math, English or both. Forty-eight percent were in need of remediation in both math and English, 32% were in need of remediation in English, and 5% were in need of remediation in Math. These were higher than averages reported by most four year public colleges.

There were fewer first generations in college among students who did not require any remediation than in the general population (42% vs. 53%); the percentage of Black students (13% vs. 21 %) and Hispanic students (32% vs. 40%) were lower in the non-remediation group than in the general student population. The average high school grade point average was essentially the same with only a 0.18 point difference on a 4.0 scale for remediation students (3.02 vs. 2.84).

While there were more females in both the general student population and the non-remediation group, there were more males in the remediation group. There were also more Black (22% vs. 20.5%) and Hispanic (42% vs. 40%) students in the remediation group as compared to the general student population. As compared to the non-remediation group, there were more Black students (22% vs. 13%), and more Hispanic students (41% vs. 32%) in the remediation group. There were less white students in the remediation group, as compared to the non-remediation group (20% vs. 37%). The students in the remediation group were also poorer than those in the non-remediation group (65% vs. 51%), and a larger proportion are first generation college students (55% vs. 42%).

Logistic Regression of Assignment to Remediation

Logistic regression was used to further examine the pre-college academic and demographic characteristics of students against assignment to remediation. The ACCUPLACER scores were not used as independent variables in this analysis because ACCUPLACER was the instrument used to determine placement into remediation. The reference category for race/ethnic origin was White, the reference category for gender was males and the reference category for first generation in college was non-first generation in college. Percentage need met, high school GPA, and SAT scores were all interval variables. Three models were used: Model 1 included only the student pre-college academic and score characteristics. Model 2 included only the student demographic characteristics. Model 3 included both academic and demographic student characteristics. The results summarized in Table 7 indicate that the overall models were statistically significant with p values at $p<.001$ for the inferential statistical tests. The Likelihood Ratio, Score Test and Wald test comprised the three inferential statistical tests used to evaluate the overall model fit (Peng, Lee, & Ingersoll, 2002).

Results of the logistic regression analysis of assignment to remediation for all students (Table 7) show that the likelihood that State College freshmen will be assigned to remediation was related to both their pre-college academic and test score characteristics and demographic characteristics (including race/ethnicity, gender and socioeconomic status). The odds of a student being assigned to remediation decreases 1.02 times for every unit increase in SAT Verbal score (B=-.0165), with all the other variables held constant. In other words, there was a 2% decrease in the odds of being assigned to remediation for students who increased their SAT Verbal score by one unit, with all other variables held constant. The odds of a student being assigned to remediation increases .38 times if they were Black (B=-0.9682), and .62 times if they were poor (B=-.3156). In other words, there was a 62% increase in the odds of being assigned to remediation if the student was Black, and a 38% increase in the odds of being assigned if the student was poor, with all other variables held constant.

Students with strong pre-college academic characteristics (high school grade point average and SAT Math and SAT Verbal scores) and were of higher socioeconomic status were less likely to be assigned to remediation. If only demographic characteristics were examined, Black and Hispanic students who were also poor and the first in their family to go to college were the most likely to be assigned to remediation. Males were also more likely to be assigned to remediation. When all the student traits were examined, however, only SAT scores ($p<.0001$) were statistically significant predictors of assignment to remediation. These observations were true for the general student population and students who received no special support.

Table 8 presents the logistic regression statistics for EOF students only. The only statistically significant variables were Math SAT score ($p=.0371$) and socioeconomic status ($p=.019$). The odds of an EOF student being assigned to remediation decreased .013 times for every unit increase Math SAT score ($B=.0130$), when all other variables were held constant. For logistic regression of assignment to remediation for EOF the student group, the validity of the model fit for Model 3 was questionable. When this analysis was attempted, the memory resources of the dedicated computer could not accommodate the memory requirements and the SAS program was stopped. This was attributed to the large number of variables and observations involved in the analysis. Although the SAS program guidelines suggested running the Proc Logistic Exact process, the Exact Logistic Models were memory intensive and could exceed the memory capacity of the computer (UCLA, 2012).

The logistic regression statistics for SSSP students are presented in Table 9. For SSSP students, none of the demographic or pre-college academic characteristics were found to be statistically significant predictors of assignment to remediation. For the logistic regression of assignment to remediation for this student group, the validity of the model fit of Model 2 and Model 3 was questionable. When this analysis was attempted, the memory resources of the dedicated computer could not accommodate the memory requirements and the SAS program was stopped. This was attributed to the large number of variables and observations involved in the analysis. Although the SAS program guidelines suggested running the Proc Logistic Exact process, the Exact Logistic Models were memory intensive and could exceed the memory capacity of the computer (UCLA, 2012).

The logistic regression statistics for student who received no special support are presented on Table 10. Math and Verbal SAT scores were statistically significant predictors of assignment to remediation ($p<.0001$) when only pre-college academic and test characteristics were examined (Model1). In Model 2, wherein only demographic variables are considered, race/ethnic origin of Black and Hispanic were the strongest predictors of assignment to remediation. Socioeconomic status and first generation in college were also statistically significant variables. When both demographic and pre-college academic traits were considered, only Math and Verbal SAT scores were found to be significant predictors of assignment to remediation.

Figure 9 below summarizes the flow of students through the process of getting placed into remediation/non remediation groups. Of the almost four thousand students who started as freshmen at State College, 3,705 were administered the ACCUPLACER exam prior to starting their first semester. Of these, only 32 percent were found to be college ready and zero skill deficient, while an overwhelming majority were found to be at least one skill deficient. Of the skill-deficient students, a very small percentage (3.34 percent) were found to be math-only skill-deficient, and a much larger percentage (38.48 percent) were skill-deficient in both math and English.

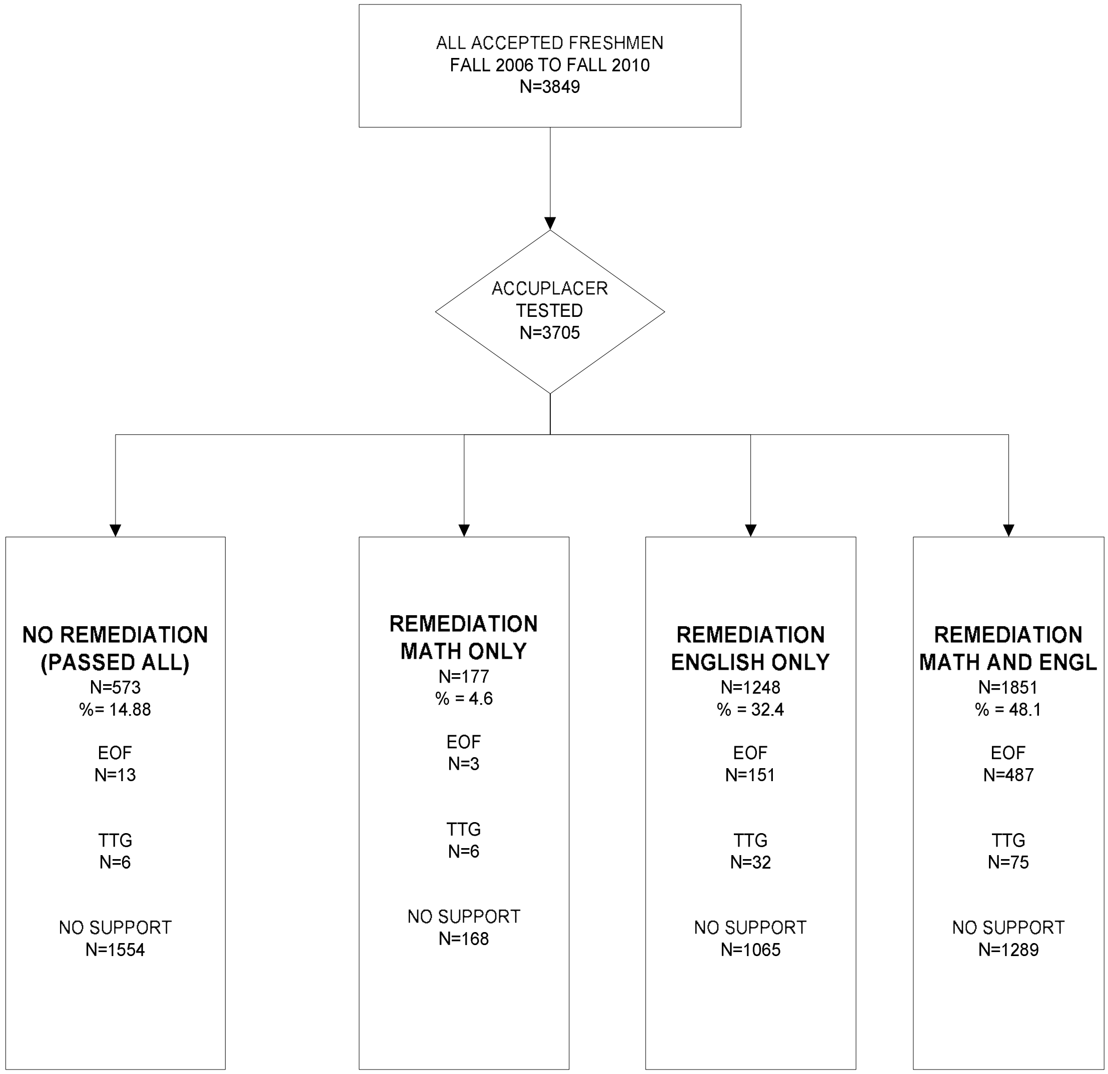


Figure 9: Distribution of Remediation and Non-Remediation Students

Table 7: Logistic Regression Statistics for Assignment to Remediation: All Students (N=3226)

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	1.069	0.967-1.181	0.1908				1.05	0.949-1.164	0.3395
SAT Math	0.991	0.989-0.993	<.0001**				0.99	0.989-0.993	<.0001**
SAT Verbal	0.984	0.981-0.986	<.0001**				0.98	0.982-0.986	<.0001**
Asian				2.366	1.577-3.549	<.0001**	1.63	0.926-2.867	0.0905
Black				2.633	1.974-3.513	<.0001**	0.84	0.567-1.239	0.3766
Hispanic				2.177	1.741-2.723	<.0001**	1.05	0.778-1.417	0.7502
Unknown				1.637	1.198-2.239	0.0020*	0.89	0.581-1.377	0.6118
First Generation in College				1.371	1.133-1.659	0.0012*	0.98	0.766-1.260	0.8895
%Need Met				1.624	1.297-2.034	<.0001**	1.10	0.803-1.508	0.5507
Gender (Female)				1.504	1.249-1.810	<.0001**	1.28	0.996-1.638	0.0534
Overall Model Evaluation									
Likelihood Ratio (p)			<.0001**			<.0001**			<.0001**
Score Test (p)			<.0001**			<.0001**			<.0001**
Wald (p)			<.0001**			<.0001**			<.0001**

Note: *p<.05, **p<.001

Table 8: Logistic Regression Statistics for Assignment to Remediation: EOF (N=654)

Variables	Model 1 Odds Ratio	Model 1 95% Confidence Intervals	Model 1 Pvalue	Model 2 Odds Ratio	Model 2 95% Confidence Intervals	Model 2 P value	Model 3*** Odds Ratio	Model 3*** 95% Confidence Intervals	Model 3*** Pvalue
High School GPA	0.913	0.55-1.53	0.7284				0.975	0.556-1.711	0.9310
SAT Math	0.987	10.98-0.99	0.0371*				0.984	0.970-0.998	0.0249*
SAT Verbal	0.989	0.97-1.004	0.1489				0.993	0.977-1.008	0.3573
Asian				0.981	.056-17.09	0.989	>0.001	<.001->99.999	0.9525
Black				1.050	.106-10.45	0.966	>0.001	<.001->99.999	0.9521
Hispanic				0.777	.090-6.695	0.818	>0.001	<.001->99.999	0.9489
Unknown				0.446	.038-5.263	0.521	>0.001	<.001->99.999	0.9504
First Generation in College				1.100	.323-3.748	0.878	1.509	0.302-7.537	0.6159
%Need Met				14.55	1.54-137.4	0.019*	34.03	2.363-490.010	0.0095*
Gender (Female)				1.924	.624-5.935	0.255	1.519	0.315-7.327	0.6024
Overall Model Evaluation									
Likelihood Ratio (p)			0.023*			0.415			0.047*
Score Test (p)			0.036*			0.081			0.003*
Wald (p)			0.026*			0.228			0.1342

Note: *p<.05, **p<.001, *** validity of model fit is questionable

Table 9: Logistic Regression Statistics for Assignment to Remediation: SSSP (N=119)

Variables	Model 1			Model 2***			Model 3***		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	0.763	.332-1.755	0.525				.933	0.389-2.237	0.8761
SAT Math	0.995	0.982-.008	0.457				.994	0.980-1.008	0.4108
SAT Verbal	1.000	.985-1.015	0.989				1.008	0.990-1.026	0.4014
Asian				1.133	<.001->99.999	0.999	3.096	<.001->99.9	0.9955
Black				1.419	<.001->99.999	0.998	2.439	<.001->99.9	0.9957
Hispanic				>0.001	<.001->99.999	0.965	>0.001	<.001->99.9	0.9543
Unknown				0.996	<.001->99.999	1.000	1.792	<.001->99.9	0.9975
First Generation in College				>0.001	<.001->99.999	0.9226	>0.001	<.001->99.9	0.8838
%Need Met				0.740	0.045-12.219	0.8333	0.769	0.033-17.89	0.8700
Gender (Female)				1.974	0.335-11.613	0.4521	4.351	0.448-42.24	0.2048
<u>Overall Model Evaluation</u>									
Likelihood Ratio (p)			0.7775			0.1428			0.3617
Score Test (p)			0.7714			0.3857			0.6624
Wald (p)			0.7743			0.9990			0.9965

Note: *p<.05, **p<.001
***Validity of model fit is questionable

Table 10: Logistic Regression Statistics for Assignment to Remediation: NO SUPPORT (N=3077)

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	1.099	0.990-1.221	0.0759				1.081	0.971-1.204	0.1559
SAT Math	0.991	0.989-0.993	<.0001**				0.991	0.989-0.993	<.0001**
SAT Verbal	0.983	0.981-0.985	<.0001**				0.983	0.981-0.986	<.0001**
Asian				2.160	1.424-3.277	.0003*	1.643	0.917-2.945	0.0951
Black				2.264	1.685-3.044	<.0001**	0.808	0.543-1.203	0.2938
Hispanic				2.038	1.620-2.564	<.0001**	1.071	0.788-1.456	0.6603
Unknown				1.601	1.163-2.203	0.0039*	0.895	0.577-1.388	0.6202
First Generation in College				1.312	1.078-1.596	0.0067**	0.972	0.753-1.256	0.8301
%Need Met				1.239	0.985-1.557	0.0670*	1.035	0.749-1.429	0.8348
Gender (Female)				1.429	1.181-1.729	.0002*	1.222	0.946-1.579	0.1241
Overall Model Evaluation									
Likelihood Ratio (p)			<.0001**			<.0001**			<.0001**
Score Test (p)			<.0001**			<.0001**			<.0001**
Wald (p)			<.0001**			<.0001**			<.0001**

Note: *p<.05, **p<.001

Student Drop Out

Student drop out is defined in this study as students who did not persist into their second year of college. A relatively large number of students at State College fail to return for their second year. Figure 10 below shows the enrollment trend through the semesters for students who started in fall 2006 through fall 2010. Of the 3,849 students who started at State College between Fall 2006 and Fall 2010, a total of 1,202 or 31.2 percent dropped out after their first year.

Some of these students were voluntary drop-outs and others were dismissed. Studies have argued that the requirement to take remediation courses discourages students from continuing with college (Calcagno & Long, 2009; Clark, 1960; Deil-Amen & Rosenbaum, 2002; Martorell, et al., 2011). Students may be required to take as many as two semesters of remedial coursework during which they earn no college level credits that help them progress towards a degree. It is possible for students to enroll for the first two semesters and earn a cumulative grade point average of zero.

State College has a policy of academically dismissing any student who fails to pass remediation courses after two attempts. These students are advised to enroll at community colleges or other accredited institutions of higher education to complete remediation requirements before applying for re-admission. Only after remediation requirements have been successfully completed at the other institutions were students who were academically dismissed allowed to apply for re-admission. In this case, they were no longer considered new freshmen/students. It is therefore quite possible for students to be re-admitted to State College three or more semesters after they originally started.

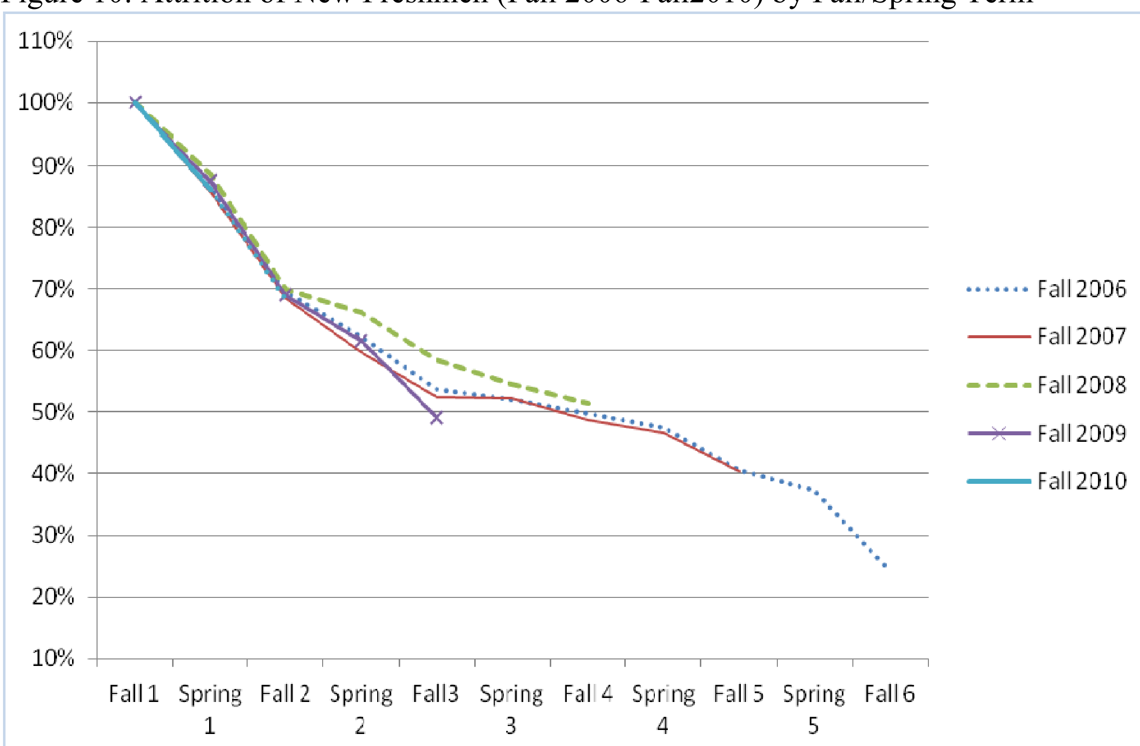
Academic dismissal may also occur when a student fails to maintain the required cumulative GPA of 1.6 after 13 credit hours attempted, CGPA of 1.75 after a minimum of 24 credit hours attempted, CGPA of 1.85 after a minimum of 48 credit hours attempted, or CGPA of 2.0 after a minimum of 72 credit hours attempted. A probationary period and an appeal process are available to the student, but failure to successfully appeal a suspension results in academic dismissal. Because of the time frame required to go through the academic dismissal due to GPA requirements, this study assumed that academic dismissal after the first year was due to failure to pass the required remedial courses after two attempts.

Students at State College could also be dismissed for non-academic reasons. Non-academic dismissals are conducted through the Dean of Student's Office, and the reasons for the dismissal are usually due to student behavior and ethics violations. Both the academic and non-academic dismissals are coded the same way in the College's integrated student database. The information retrieved from the system therefore does not distinguish the reason for dismissal, nor does it provide information on the date/time of dismissal. For this study, it was assumed that dismissals in the first year of college were due to academic reasons.

Eighty-one percent of those who did not return were required to take remediation in at least one subject. The profile of students who dropped out after one year was academically stronger than the EOF group in every measure (See Table 3). The average high school GPA was slightly higher (2.77 vs. 2.74), and lower than that of the general student population (2.77 vs. 2.84) and non-remediation students (3.02). These students had much higher Math and Verb SAT scores as compared to those of EOF students (443 vs. 382.8 and 443 vs. 363.4, respectively).

The mean ACCUPLACER math and read scores for Dropouts were higher than those who were required to take remediation (63.4 vs. 59.6 and 72 vs. 68.4), but their average high school GPA was slightly lower (2.77 vs. 2.81). The average SAT Math and SAT Verbal scores were likewise higher than the remediation students (443 vs. 435.2 and 443.1 vs. 422.3, respectively). The average college cumulative grade point average of students who did not return was 1.66.

Figure 10: Attrition of New Freshmen (Fall 2006-Fall2010) by Fall/Spring Term



A regression analysis of drop-out rates was also conducted. As with the earlier logistic regression, the results indicate that the overall models were statistically significant with p values at $p<.001$ for inferential statistical tests. The Likelihood Ratio, Score Test and Wald test were three inferential statistical tests used to evaluate the overall model fit (Peng, et al., 2002).

Table 11 presents logistic regression statistics for assignment to remediation for students who dropped out after their first year in college. For these students, SAT Math and SAT Verbal scores were statistically significant predictors of assignment to remediation, in both Model 1 and Model 3. When demographic traits were isolated from pre-college academic traits (Model2), race/ethnic origin became statistically significant predictor (Asian $p=.0041$, Black $p<.0001$and Hispanic $p<.0001$). Socioeconomic status was also statistically significant ($p<.0001$) in Model 2. Demographic traits were not statistically significant when all student characteristics (Model 3) were examined.

Table 11: Logistic Regression Statistics for Assignment to Remediation: DROP-OUT (N=1202)

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	1.031	0.861-1.234	0.7395				1.020	0.848-1.226	0.8338
SAT Math	0.992	0.989-0.995	<.0001**				0.992	0.988-0.995	<.0001**
SAT Verbal	0.986	0.982-0.989	<.0001**				0.986	0.983-0.990	<.0001**
Asian				2.936	1.408-6.12	0.0041*	2.884	0.882-9.430	0.0797
Black				2.530	1.63-3.926	<.0001**	0.788	0.414-1.503	0.4703
Hispanic				2.762	1.865-4.09	<.0001**	1.173	0.680-2.022	0.5663
Unknown				1.804	1.073-3.03	0.0261*	1.003	0.471-2.137	0.9941
First Generation In College				1.589	1.149-2.19	0.0051*	0.885	0.567-1.381	0.5905
%Need Met				2.694	1.841-3.94	<.0001**	1.164	0.669-2.024	0.5915
Gender (Female)				1.346	0.984-1.84	0.0629	1.350	0.862-2.116	0.1903
<u>Overall Model Evaluation</u>									
Likelihood Ratio (p)			<.0001**			<.0001**			<.0001**
Score Test (p)			<.0001**			<.0001**			<.0001**
Wald (p)			<.0001**			<.0001**			<.0001**

Note: *p<.05, **p<.001

Students with Zero Cumulative Grade Point Average

Two hundred fifty-six students with zero cumulative grade point averages comprised 6.65 percent of the total sample. Fifty percent of students with zero cumulative GPA were males (Table 3), with a mean high school grade point average of 2.7 (SD=0.47). Although their SAT Math scores were lower than those of the general student population ($\bar{X}$=435.66, SD=72.15 vs. $\bar{X}$=445.40, SD=76), their SAT Verbal scores were comparable ($\bar{X}$=431.48, SD=71.5 vs. $\bar{X}$=433.5, SD=74.6). Their SAT Math scores were lower than non-remediation students ($\bar{X}$= 435.66 vs. $\bar{X}$=516.51, SD=77.1) and their SAT Verbal scores were lower as well ($\bar{X}$=431.48, SD=71.5 vs. $\bar{X}$ =515.7, SD=78.5). The SAT scores for students with zero CGPA were still higher than those of students in the EOF and SSSP. Their mean ACCUPLACER Arithmetic and Reading scores were higher than that of EOF students ($\bar{X}$=61.38, SD=28.36 vs. $\bar{X}$=48.05, SD=23.7 and $\bar{X}$ =72.96, SD=20.83 vs. $\bar{X}$=58.1, SD=16.6, respectively). Overall, these students had a better academic profile than the EOF and SSSP students, and almost the same profile as those who dropped out. However, 245 (96 %) dropped out, with 24 (9%) dismissed. Only 11 students returned for a second year of college.

There were proportionately more Black students as compared to the non-remediation students (29% vs. 17.4%) and the general student population (29% vs. 21%) but less Black students as compared to the EOF population (29% vs. 31%). There were also proportionately less Hispanic students in this group as compared to the general student population (38% vs. 40%) but slightly more as compared to the non-remediation students (37.5% vs. 38.2%).

As there were only a small percentage of students with zero cumulative grade point average, there was a concern over the effect of these small numbers on the regression models for cumulative GPA. Hence, separate models for cumulative grade point average were used to differentiate students with varying cumulative grade point averages. Cumulative grade point averages of zero were also treated as missing values in the regression analysis for dependent variables.

The Underprepared College Student and Their First Year of College

The under-prepared college student is defined in this study as one who was determined to be in need of remediation in math, English or both. The variables used to assess performance during the first year of college included cumulative college grade point average, credits earned in the first year, and persistence to second year of college. Ordinary Least Squares (OLS) regression analyses were conducted on the independent variables of pre-college academic and testing characteristics and demographic student characteristics. The results of the analyses are presented in Tables 12 to 20. They represent the apparent total effects of these characteristics on the first year academic performance of underprepared college students.

Table 12 indicate that for all students, high school grade point average ($p<.0001$) and SAT Math scores ($p<0001$) were statistically significant predictors of college grade point average. ACCUPLACER Math scores were not found to be significant predictors of CGPA in any of the models for any of the groups of students except for those who earned less than 2.0 CGPA. However, Table 13 shows that ACCUPLACER reading scores were found to be statistically significant when the sample consisted only EOF students (p=.0173). ACCUPLACER reading scores were weakly and negatively associated with CGPA for EOF students in general (B=-.0078).

Students who were in remediation but did not receive special support from EOF or SSSP were most at risk of having poor academic outcomes. They earned the lowest number of credits in the first year ($\bar{X}$=18.98, SD=10.25 vs. $\bar{X}$=19.29, SD=9.98), and did not persist into the second year of college as compared to students in EOF, SSSP or the general student population. EOF students who started college with the lowest high school grade point averages, lowest SAT and ACCUPLACER scores and highest percentage from poor families were able to quickly catch up to their more skilled peers. They earned slightly more credits in their first year when compared to every other cohort except for the SSSP group. They also persisted at higher rates than all the other groups except for SSSP, including the students who were not required to take remediation courses.

Table 12: OLS Regression Modeling Cumulative Grade Point Average: ALLSTUDENTS

Variable	Model 1 Parameter Estimates	Model 1 SE	Model 1 P	Model 2 Parameter Estimates	Model 2 SE	Model 2 P	Model 3 Parameter Estimates	Model 3 SE	Model 3 P
Intercept	1.0265	0.0135	<0.0001**	2.3147	0.0432	<.0001**	0.8935	0.1483	<.0001**
HS GPA	0.0612	0.0155	<0.0001**				0.0515	0.0149	0.0006*
SAT Math	0.0019	0.0004	<0.0001**				0.0016	0.0003	<.0001*
SAT Verbal	0.0004	0.0004	0.2242				0.0001	0.0003	0.6677
Arithmetic ACCUPLACER	0.0013	0.0009	0.1348				0.0015	0.0009	0.0925
Read ACCUPLACER	0.0006	0.0014	0.6862				0.0027	0.0014	0.0468*
Asian				0.1783	0.0713	0.0124*	0.2606	0.0740	0.0004*
Black				-0.6686	0.0488	<.0001**	-0.4700	0.0536	<.0001**
Hispanic				-0.2561	0.0402	0.0001*	-0.1622	0.2409	0.0001*
First Generation in College				-0.1582	0.0351	0.0001*	-0.1312	0.0368	0.0004*
%Need Met				0.2877	0.0446	0.0001*	0.3963	0.0476	<.0001**
Gender				0.1785	0.0344	0.0001*	0.2624	0.0370	<.0001**
R square			0.0416			0.0714			0.1080

Note: *p<.05, **p<.001

Cumulative College Grade Point Average (CGPA)

Black or Hispanic, first-generation in college and poor students had the weakest academic performance in their first year and were greatly represented in the group with zero cumulative grade point average and students who dropped out after one year. Table 12 presents the results of OLS regression of cumulative grade point average to high school GPA, Math and Verbal SAT scores and Arithmetic and Read scores from the ACCUPLACER, as well as against demographic variables including gender, ethnic origin, socioeconomic status and first generation in college for all students. SAT Math scores (B=.0019, p=.0001) and high school grade point average (B=.0612, p=.0001) were statistically significant predictors of cumulative grade point average for students when only pre-college academic and test score variables were examined (Model1). These characteristics were statistically significant when demographic characteristics were taken into consideration (Model 3), but only SAT Math scores were significant at the 99.9% level. Demographic characteristics were statistically significant predictors of college success as measured by cumulative grade point average in both Model 2 and Model 3. In both models, race/ethnic origin of Black and Hispanic, first generation in college status, gender and socioeconomic status were all statistically significant. Being Black, Hispanic, first generation in college, male or poor were predictors of poor academic outcomes measured by cumulative college grade point average. While the variables pre-college academic and test score characteristics were statistically significant for predicting cumulative grade point average, the R square value of Model 1 was .0416, indicating that these variables accounted for only a very small variance of the outcome of cumulative grade point average. The R square value of .0714 for Model 2 suggests that statistically significant demographic characteristics can account for a slightly larger variance in the outcome. The findings suggest that when taken together in Model 3, both demographic and academic variables account for approximately 10 percent of variance in CGPA.

Table 13 presents the regression findings for EOF students. Unlike the non-remediation students and the general student population, EOF students' high school GPA was not a statistically significant predictor of CGPA in Model 1. SAT Math (B=.0034, $p<.0001$) score was found to be statistically significant in Model 1. For EOF students, first generation in college status ($p<.0001$), race/ethnic origin of Asian ($p=.019$), and socioeconomic status ($p=.0082$) were found statistically significant predictors of CGPA in Model 2. When both pre-college academic and student demographic characteristics were examined, however, the model was not a good fit with a p value=.2699.

Table 14 presents the regression findings for EOF students in remediation. The p values for all three models suggested poor model fit for the analysis of EOF students in remediation, and no variables were found to be statistically significant predictors of CGPA for this sub-sample.

Table 15 presents the OLS regression findings for SSSP students. While model fit was good ($p=.0256$ to $p<.0001$) for all three models, only the race/ethnic origin of Black (B=-.62218, $p=.017$) was found to be statistically significant predictor of CGPA. However, this variable could only account for 12 percent of variance in the CGPA (R square = 0.1156). Unlike the non-remediation student group, SSSP student HS GPA was not a statistically significant variable in predicting CGPA.

As shown in Table 16, only Model 2 was a good fit with p<.0001. In this model, race/ethnic origin of Black (B=-.61275, p=.0191) was statistically significant predictor of CGPA among SSSP students in remediation and accounted for 11 percent of the variance in the outcome, suggesting that support services of SSSP program may compensate or mitigate the effect of pre-college academic and demographic variables on CGPA.

Table 17 presents regression findings on students in need of remediation who did not receive special support. Model 1 was a good fit with p=.0002. In this model, high school grade point averages and SAT Math scores were statistically significant predictors of CGPA at p<.0001 and Read ACCUPLACER scores were significant at p=.02.. If only pre-college academic and test score characteristics were examined, predicted CGPA increased by .64 points for every point increase HS GPA. The R square value suggests that these variables could account for 12 percent of variance in CGPA. Model 2 was also a good fit with the data with p<.0001. In this model, Black or Hispanic, and socioeconomic status were the strongest predictors of CGPA, followed by first generation in college, gender and Asian. The R square value for Model 2, however, was only .06 suggesting that these variables could only account for 6 percent of variance in CGPA. Model 3 was not a good fit with the data with p=.06.

Table 18 presents the OLS regression findings for students who earned less than 2.0 CGPA Model 1 and Model 2 were a good fit with p values of p=.0022 and p<.0001 respectively. SAT Math score (B=.00093, p=.0449), ACCUPLACER arithmetic score (B=-.0025, p=.0358), first generation status (B=-.10019, p=.0137) and socioeconomic status (B=.45619, p<.0001) were statistically significant predictors of CGPA. Socioeconomic status held the strongest statistical significance, and ACCUPLACER arithmetic score was negatively and weakly statistically significant. The R square values for these models were also relatively weak, accounting for only 6% of variance in CGPA.

Table 19 presents regression findings for students who earned greater than 2.0 CGPA. All three models had p values of <.0001 and almost all the variables were statistically significant except SAT Verbal scores. The R square value for model 3 was also higher at .1104, suggesting that 11% of any variance in CGPA could be accounted for by the statistically significant variables.

Table 20 presents regression findings to students in remediation who dropped out. High school GPA, SAT Math scores and demographic variables were statistically significant predictors of CGPA. In particular, race/ethnic origin of Hispanic (B=-.22057, p<.0001) Asian (B=.62756, p<.0001) and high school GPA (B=.55483, p<.0001) were strongly statistically significant. However, the R square values for these models were small, suggesting that only 6% to 8% of any variance in CGPA could be accounted for by the statistically significant variables. Model 3 which takes into account both demographic and pre-college academic and test characteristics had a higher R square value (R square=.1288) suggesting that the strongly statistically significant variable of high school GPA (B=.4450, p<.0001), as well as the weaker but still significant variables of SAT Math, ethnic origin of Asian, socioeconomic status and gender could account for 13% of variance in CGPA.

Table 21 presents regression findings for all non-remediation students. This is the student group against which EOF, SSSP and Remediation-No-Support students are best compared. Model 1 and Model 2 were found to be a good fit to the data with p values of 0.0031 and <.0001 respectively. In Model 1, high school GPA and Math SAT scores were found to be statistically significant at 99.9 level and Reading ACCUPLACER score to be just barely significant at p=.04. The R square value for Model 1 suggests that 12 percent of variance in CGPA could be accounted for by the variables. In Model 2, Black, Hispanic, SES and gender were statistically significant at 99.9 level and First generation in college and Asian were significant at 99,5 level. The R square value for Model 2, however, was low, suggesting that only 6% of variance in CGPA could be accounted for by the variables.

Table 13: OLS Regression Modeling Cumulative Grade Point Average: ALL EOF STUDENTS (N=416)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	1.0618	0.3655	.0039*	0.5247	0.2961	<.0001**	-0.5878	0.5320	0.2699
HS GPA	-0.0074	0.0314	0.8148				0.0041	0.0296	0.8891
SAT Math	0.0034	0.0009	<.0001**				0.0031	0.0008	.0002*
SAT Verbal	0.0009	0.0009	0.3081				0.0007	0.0009	0.4115
Arithmetic ACCUPLACER	0.0008	0.0021	0.7203				-0.0012	0.0020	0.5677
Read ACCUPLACER	-0.0078	0.0033	0.0173*				-0.0035	0.0032	0.2634
Asian				0.1461	0.1475	0.0199*	0.2712	0.1686	0.1086
Black				-0.7036	0.1031	0.0769	-0.5733	0.1351	<.0001
Hispanic				-0.2581	0.0973	0.3223	-0.1646	0.1184	0.1653
First Generation in College				-0.0582	0.0746	<.0001**	-0.0775	0.0901	0.3904
%Need Met				2.0067	0.2901	0.0082*	1.8909	0.3668	<.0001
Gender				0.1657	0.0710	0.4359	0.1373	0.0896	0.1262
R-square			0.0646			0.1596			0.1837

Note: *p<.05, **p<.001

Table 14: OLS Regression Modeling Cumulative Grade Point Average: EOF STUDENTS in Remediation (N=641)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	-0.34667	0.58398	0.5534	0.44094	0.31958	0.1681	-0.81609	0.83442	0.3292
HS GPA	0.50105	0.13638	0.0003				0.48259	0.13324	0.0004
SAT Math	0.00369	0.00105	0.0005				0.00354	0.00103	0.0008
SAT Verbal	0.00021	0.00119	0.8597				0.00007	0.00116	0.9488
Arithmetic ACCUPLACER	0.00008	0.00285	0.9763				-0.00080	0.00281	0.7738
Read ACCUPLACER	-0.00476	0.00438	0.2782				-0.00193	0.00430	0.6542
Asian				0.14524	0.14892	0.3298	0.32637	0.24550	0.1852
Black				-0.71515	0.10426	<.0001	-0.48241	0.18723	0.0107
Hispanic				-0.26118	0.09850	0.0082	-0.18820	0.16651	0.2597
First Generation in College				-0.04734	0.07534	0.5300	-0.09990	0.12517	0.4257
%Need Met				2.07946	0.31442	<.0001	0.62977	0.57106	0.2714
Gender				0.18309	0.07168	0.0109	0.22656	0.12585	0.0733
R- square			0.1385			0.1568			0.2146

Note: *p<.05, **p<.001

Table 15: OLS Regression Modeling Cumulative Grade Point Average: ALL SSSP STUDENTS (N=119)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	1.86645	0.67325	.0066*	2.50476	0.32568	<.0001**	1.68848	0.74469	0.0256*
HS GPA	0.06927	0.06366	0.2791				0.10003	0.06302	0.1157
SAT Math	0.00292	0.00173	0.0945				0.00159	0.0018	0.3791
SAT Verbal	-0.00232	0.00166	0.1655				-0.00109	0.00166	0.5122
Arithmetic ACCUPLACER	-0.00604	0.00442	0.1748				-0.00376	0.0047	0.4022
Read ACCUPLACER	0.00977	0.00655	0.1387				0.00903	0.00655	0.1712
Asian				0.39573	0.36588	0.2818	0.47146	0.37092	0.2067
Black				-0.62218	0.2569	0.017*	-0.50175	0.26449	0.0608
Hispanic				-0.20306	0.22417	0.3670	-0.2256	0.22915	0.3273
First Generation in College				0.01722	0.17362	0.9212	-0.12196	0.18331	0.5074
%Need Met				0.22373	0.25471	0.3816	0.28105	0.26145	0.2850
Gender				0.22789	0.16397	0.1674	0.22276	0.17249	0.1996
R- square			0.061			0.1156			0.1704

Note: *p<.05, **p<.001

Table 16: OLS Regression Modeling Cumulative Grade Point Average: ALL SSSP STUDENTS IN REMEDIATION (N=113)

Variable	Model 1			Model 2			Model 3		
	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	0.60553	0.82792	0.4667	2.59193	0.33529	<.0001**	1.00147	0.91231	0.2659
HS GPA	0.71696	0.16923	<.0001				0.70465	0.18599	0.0003
SAT Math	0.00282	0.00177	0.1153				0.00177	0.00196	0.3697
SAT Verbal	-0.00477	0.00190	0.0141				-0.00384	0.00200	0.0558
Arithmetic ACCUPLACER	-0.01175	0.00476	0.10157				-0.00950	0.00501	0.0621
Read ACCUPLACER	0.02027	0.00673	0.0035				0.01748	0.00703	0.0151
Asian				0.40675	0.36658	0.2697	-0.00320	0.46713	0.9945
Black				-0.61275	0.25738	0.0191**	-0.45436	0.30063	0.1350
Hispanic				-0.24933	0.22620	0.2729	-0.18856	0.25942	0.4696
First Generation in College				-0.01485	0.17570	0.9328	-0.16821	0.20800	0.4213
%Need Met				0.14712	0.26524	0.5803	-0.00539	0.28157	0.9848
Gender				0.22514	0.16956	0.1871	0.16923	0.18697	0.3684
R-square			0.2877			0.1148			0.3302

Note: $*p<.05$, $**p<.001$

Table 17: OLS Regression Modeling Cumulative Grade Point Average: No Support Students in Remediation (N=2522)

	Model 1			**Model 2**			**Model 3**		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	-0.85961	0.23104	0.0002*	2.22424	0.05222	<.0001**	-0.44977	0.23755	0.0585
HS GPA	0.63806	0.04668	<.0001**				0.57103	0.04714	<.0001
SAT Math	0.00185	0.00045	<.0001**				0.00148	0.00045	0.0009
SAT Verbal	0.00062	0.00046	0.1785				0.00019	0.00049	0.6760
Arithmetic ACCUPLACER	-0.00086	0.00110	0.4308				-0.00029	0.00109	0.7869
Read ACCUPLACER	0.00395	0.00174	0.0233*				0.00521	0.00171	0.0024
Asian				0.20669	0.08725	0.0179*	0.09585	0.09255	0.3005
Black				-0.59118	0.05961	<.0001**	-0.39797	0.06517	<.0001
Hispanic				-0.21674	0.04872	<.0001**	-0.19730	0.05221	0.0002
First Generation in College				-0.14874	0.04273	.0005*	-0.16144	0.04558	0.0004
%Need Met				0.29661	0.05248	<.0001**	0.23533	0.05742	<.0001
Gender				0.16022	0.04219	.0001*	0.13215	0.04682	0.0048
R-square			0.1216			0.0616			0.1545

Note: *p<.05, **p<.001

Table 18: OLS Regression Modeling Cumulative Grade Point Average: Cum GPA<2.0 Students in Remediation (N=762)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	0.76024	0.24690	0.0022*	0.83203	0.05504	<.0001**	0.34812	0.25743	0.1767
HS GPA	0.02105	0.05516	0.7029				0.00298	0.05499	0.9568
SAT Math	0.00093	0.00046	0.0449*				0.00113	0.00046	0.0143
SAT Verbal	0.00004	0.00048	0.9928				0.00030	0.00047	0.5270
Arithmetic ACCUPLACER	-0.00247	0.00117	0.0358*				-0.00245	0.00116	0.0346
Read ACCUPLACER	-0.00003	0.00186	0.9858				-0.00016	0.00182	0.9311
Asian				-0.02594	0.05504	<.0001**	-0.06295	0.13246	0.6348
Black				-0.07860	0.05408	0.1464	0.03842	0.06707	0.5669
Hispanic				-0.00210	0.05052	0.9669	0.01864	0.06028	0.7573
First Generation in College				-0.10019	0.04059	0.0137*	-0.09065	0.04935	0.0666
%Need Met				0.45619	0.05282	<.0001**	0.41801	0.06454	<.0001
Gender				-0.01638	0.03973	0.6801	-0.01225	0.05097	0.8102
R squared			0.0077			0.0628			0.0654

Note: *p<.05, **p<.001

Table 19: OLS Regression Modeling Cumulative Grade Point Average: Cum GPA>0 Students in Remediation (N=3020)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	1.23948	0.11928	<.0001**	2.64776	0.03882	<.0001**	1.33475	0.13280	<.0001**
HS GPA	0.06290	0.01359	<.0001**				0.05633	0.01325	<.0001*
SAT Math	0.00147	0.00031	<.0001**				0.00115	0.00031	.0002*
SAT Verbal	0.00036	0.00031	0.2536				0.00008	0.00031	0.7983
Arithmetic ACCUPLACER	0.00203	0.00079	0.0101*				0.00225	0.00078	.0037*
Read ACCUPLACER	0.00172	0.00123	0.1603				0.00331	0.00121	.0061*
Asian				0.14105	0.06219	.0234*	0.22230	0.06520	.0007*
Black				-0.58341	0.04309	<.0001**	-0.45287	0.04794	<.0001**
Hispanic				-0.23243	0.03558	<.0001**	-0.14449	0.03760	.0001*
First Generation in College				-0.10521	0.03116	.0007*	-0.08846	0.03297	.0073*
%Need Met				-0.02910	0.04035	0.4709	0.11935	0.04342	.0060*
Gender				0.17001	0.03047	<.0001*	0.24391	0.03306	<.0001**
R-Square			0.0549			0.0698			0.1104

Note: *p<.05, **p<.001

Table 20: OLS Regression Modeling Cumulative Grade Point Average: Drop Outs in Remediation (N=976)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	-1.45371	0.43298	0.0008*	1.52309	0.09951	<.0001**	-1.19636	0.45964	0.0095*
HS GPA	0.55483	0.09757	<.0001**				0.44520	0.09839	<.0001**
SAT Math	0.00197	0.00088	0.0251*				0.00174	0.00088	0.0488*
SAT Verbal	0.00167	0.00092	0.0699				0.00120	0.00092	0.1938
Arithmetic ACCUPLACER	0.00052	0.00221	0.8140				0.00139	0.00221	0.5279
Read ACCUPLACER	-0.00091	0.00346	0.7926				0.00106	0.00342	0.7554
Asian				0.62756	0.16930	<.0001**	0.45242	0.20138	0.0250*
Black				-0.45955	0.10458	0.0002*	-0.24622	0.13017	0.0590
Hispanic				-0.22057	0.09539	<.0001**	-0.19336	0.11118	0.0825
First Generation in College				-0.14730	0.07858	0.0611	-0.17923	0.09341	0.0555
%Need Met				0.33666	0.09772	0.0006*	0.38729	0.11710	0.0010*
Gender				0.17905	0.07750	0.0211*	0.23152	0.09718	0.0175*
R square			0.0859			0.0634			0.1288

Note: *p.05, **p<.001

Table 21: OLS Regression Modeling Cumulative Grade Point Average: Non-Remediation Students (N=573)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	-0.591	0.1996	0.0031*	2.20143	0.04775	<.0001**	-0.29798	0.20856	0.1532
HS GPA	0.6377		<.0001**				0.56843	0.04328	<.0001
SAT Math	1.0187		<.0001**				0.00154	0.00039	0.0001
SAT Verbal	0.00024		0.5572				-0.00006	0.00041	0.8802
Arithmetic ACCUPLACER	-0.00129		0.1986				-0.00008	0.00099	0.4182
Read ACCUPLACER	0.00323		0.0415*				0.00461	0.00156	0.0031
Asian				0.20009	0.07408	0.0069	0.13216	0.08458	0.1183
Black				-0.61022	0.05025	<.0001**	-0.41125	0.05981	<.0001
Hispanic				-0.21056	0.04261	<.0001**	-0.18269	0.04844	0.0002
First Generation in College				-0.12939	0.03655	0.0004*	-0.14118	0.04185	0.0008
%Need Met				0.31621	0.0751	<.0001**	0.26021	0.05431	<.0001
Gender				0.1739	0.03598	<.0001**	0.15043	0.04285	0.0005
R-square			0.1178			0.0697			0.1547

Note: *p<.05, **p<.001

Credits Earned in First Year

As with cumulative grade point averages, poor, Black and Hispanic first generation in college students were found to earn fewer credits in the first year of college compared to their peers (5 credits less for Black students and 2 credits less for Hispanics), assuming all other variables were held constant. Likewise, male students earned two credits less than female students.

Students earning less than 32 credits per year automatically graduate in more than 4 years because of the 128 credit requirement for degree completion at State College. New students earned an average of 19 credits in their first year, reducing their chances of graduating in four years. Only students in the SSSP group earned an average of more than 24 credits in the first year of college, but this is not enough to assure graduation within four years unless they take heavier course-loads in future semesters. Another option is to carry more than half-time loads during the summer. However, this option is not available to all students because most of them rely on state and federal financial aid to pay for tuition and fees, and the state and federal aid programs do not provide sufficient funding for summer terms.

As with cumulative grade point average, strong predictors of credits earned in first year were demographic variables. The regression models used to analyze credits earned in first year were significant with F-test statistically significant at $p<.0001$. However, the R-squared values were relatively low, indicating that the variances in the credits earned in the first year could only be weakly associated with these independent variables.

Table 22 presents the regression findings for all students. Only Model 2 (analysis of only demographic characteristics) was statistically significant ($p<.0001$); all demographic variables except race/ethnic origin of Asian were statistically significant with p values <.0001. The R square value however, suggests that only 10 percent of variance in credits earned in the first year can be accounted for by these variables.

Table 23 presents regression findings on non-students. Model 1 was not a good fit to the data with p value of 0.0855, but Model 2 and Model 3 were both a good fit to the data with p values of <.0001 and .0425 respectively. In Model 2, race/ethnicity of Black ($B=-6.97$, $p<.0001$) and socioeconomic status ($B=11.24$, $p<.0001$) were both statistically significant at 99.9% level. The R square value for Model 2 suggests that 19.4 percent of variance in credits earned in the first year could be accounted for by these variables. In Model 3, two additional variables were found to be statistically significant: high school GPA ($B=4.66$, $p<.0001$) and first generation in college ($B=2.3$, $p=0.41$).

Table 24 presents regression findings on EOF students. Only Model 3 was a good fit, and socioeconomic status was the only strongly statistically significant predictor ($B=21.02$, $p<.0001$High school GPA ($B=3.49$, $p=.0065$) and SAT Math scores ($B=.03559$, $p=.0004$) were also statistically significant, and along with socioeconomic status these variables could account for 22.6 percent of the variance in the credits earned in the first year. Table 24 shows the findings for EOF students in remediation. The same results were obtained and the variance in credits earned in the first year accounted for by these variables was 21 percent.

Table 25 shows the results for OLS regression for all SSSP students. As with EOF students, only Model 2 had statistically significant p value of <.0001. Unlike EOF students, the only variable found to be statistically and negatively significant as a predictor of credits earned in first year was race/ethnic origin of Black (B=-5.307, p=.0409). This variable could only account for 12 percent variance in credits earned in the first year. In Table 26, when the group analyzed was limited to SSP students in remediation, none of the variables were statistically significant. As with cumulative grade point average, this finding implies that SSSP services help mitigate the effect of pre-college and demographic characteristics on credits earned in the first year.

When the credits earned by students who received no special support were examined, both pre-college academic traits and demographic characteristics were statistically significant, but not when combined in one model (Table 28). Approximately 9 percent of the variance in credits earned in the first year could be attributed to these variables in both Model 1 and Model 2. When the analysis was limited on students who received no special support but were in need of remediation (Table 29), all the variables except ACCUPLACER scores and race/ethnic origin of Asian were statistically significant. When all the variables were examined in the same model, all the statistically significant variables had p values of <.0001 and could account for 15 percent variation in the credits earned in the first year.

The regression findings on credits earned by students who had CGPA lower than 2.0 are presented in Table 30. All three models were a good fit, and ACCUPLACER arithmetic scores were consistently negatively statistically significant as was first generation in college and socioeconomic status. The R square ranged from 1 percent for Model 1 to 10 percent for Model 3 implying that only a small percentage of variance in credits earned could be attributed to these variables.

When the analysis was limited to students who dropped out (Table 31), statistically significant variables could account between 7 to 17 percent of the variance in credits earned. When examined in combination, some of the pre-college academic variables and demographic variables were predictive of credits earned. High school GPA, SAT Math score, first generation in college status, socioeconomic status and gender were statistically significant variables.

Table 22: OLS Regression Modeling Credits Earned in First Year: ALL STUDENTS (N=3593)

Variable	Model 1 Parameter Estimates	SE	P	Model 2 Parameter Estimates	SE	P	Model 3 Parameter Estimates	SE	P
Intercept	-2.5571	1.60040	0.1102	16.61143	0.39162	<.0001**	-0.99853	1.66771	0.5494
HS GPA	4.6617	0.37694	<.0001				3.73461	0.37676	<.0001
SAT Math	0.0171	0.00359	<.0001				0.01494	0.00351	<.0001
SAT Verbal	0.0063	0.00355	0.0772				0.00366	0.00345	0.2893
Arithmetic ACCUPLACER	-0.0149	0.00912	0.1033				-0.00928	0.00893	0.2987
Read ACCUPLACER	0.0004	0.01397	0.9764				0.01189	0.01360	0.3820
Asian				1.17190	0.64591	0.06970	0.66501	0.75143	0.3762
Black				-5.31993	0.43662	<.0001**	-3.32892	0.53180	<.0001
Hispanic				-1.93899	0.36440	<.0001**	-1.76405	0.42366	<.0001
First Generation in College				-1.69718	0.31777	<.0001**	-1.82931	0.36795	<.0001
%Need Met				6.59804	0.40410	<.0001**	4.88669	0.48194	<.0001
Gender				1.33137	0.31144	<.0001**	1.41563	0.37958	.0002
R-square			0.0903			0.1008			0.1469

Note: *p<.05, **p<.001

Table 23: OLS Regression Modeling Credits Earned in First Year: ALL NON-REMEDIATION STUDENTS (N=573)

Variable	Model 1			Model 2			Model 3		
	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	15.76	9.13584	0.0855	13.68659	0.91676	<.0001**	18.18774	8.92792	0.0425*
HS GPA	5.78979	1.07556	<.0001				4.65718	1.13691	<.0001**
SAT Math	-0.01678	0.01151	0.1458				-0.01789	0.01116	0.1099
SAT Verbal	0.01946	0.00988	0.0499				0.01256	0.00978	0.2003
Arithmetic ACCUPLACER	0.00886	0.04934	0.8576				0.02466	0.04821	0.6093
Read ACCUPLACER	-0.13936	0.10133	0.17				-0.13328	0.09773	0.1737
Asian				-0.93976	1.98643	0.6363	-0.6394	2.47241	0.7961
Black				-6.97385	1.38256	<.0001**	-3.87646	1.82463	0.0345*
Hispanic				-1.86221	1.02489	0.0689	-2.16304	1.25536	0.0859
First Generation in College				-0.85577	0.94965	0.3679	-2.30436	1.12489	0.0414*
%Need Met				11.23977	1.08676	<.0001**	7.80807	1.58638	<.0001**
Gender				0.63756	0.91511	0.4683	-0.53661	1.24014	0.6655
R-square			0.1039			0.1944			0.1874

Note: *p<.05, **p<.001

Table 24: OLS Regression Modeling Credits Earned in First Year: ALL EOF STUDENTS (N=654)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	-1.64594	5.6959	0.7729	-3.48368	2.68812	0.1955	-23.1107	7.5506	0.0025*
HS GPA	3.75962	1.3293	0.0051				3.49623	1.2718	0.0065*
SAT Math	0.03738	0.0102	0.0003				0.03559	0.0099	0.0004*
SAT Verbal	-0.00542	0.0116	0.6409				-0.00259	0.0111	0.8148
Arithmetic ACCUPLACER	0.00008	0.0277	0.9978				-0.00571	0.02663	0.8305
Read ACCUPLACER	-0.01150	0.0422	0.7857				0.02398	0.04086	0.5579
Asian				1.1609	1.3392	0.3863	3.10286	2.34261	0.1868
Black				-5.3201	0.9361	<.0001	-2.22623	1.78988	0.2150
Hispanic				-1.6565	0.8836	0.0613	-0.26531	1.59137	0.8678
First Generation in College				-1.2671	0.6777	0.062	-1.5001	1.19609	0.2112
%Need Met				26.8697	2.6340	<.0001	21.0289	4.69585	<.0001**
Gender				0.65410	0.6445	0.3106	1.68926	1.20269	0.1616
R-square			0.1154			0.1954			0.2259

Note: *p<.05, **p<.001

Table 25: OLS Regression Modeling Credits Earned in First Year: ALL EOF STUDENTS IN REMEDIATION (N=641)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	-3.6338	5.83852	0.5344	-5.50688	3.46812	0.1129	-24.1177	8.45729	0.0048*
HS GPA	3.9999	1.38215	0.0042				3.77867	1.34397	0.0054*
SAT Math	0.0368	0.01037	0.0005				0.03517	0.01020	0.0007*
SAT Verbal	-0.0032	0.01203	0.7929				-0.00144	0.01167	0.9018
Arithmetic ACCUPLACER	0.0012	0.02904	0.9672				-0.00769	0.02849	0.7876
Read ACCUPLACER	0.0043	0.04571	0.9257				0.01824	0.04478	0.6843
Asian				1.85506	1.56767	0.2372	3.13680	2.45002	0.2020
Black				-4.82544	1.07959	<.0001	-2.29042	1.92655	0.2360
Hispanic				-0.57603	1.02457	0.5742	0.28524	1.70934	0.8676
First Generation in College				-1.15185	0.77947	0.1401	-0.97205	1.26758	0.4441
%Need Met				27.9396	3.40173	<.001	20.6519	5.92603	.0006*
Gender				1.12946	0.74989	0.1326	2.06214	1.28281	0.1096
R-square			0.1239			0.1744			0.2115

Note: *p<.05, **p<.001

Table 26: OLS Regression Modeling Credits Earned in First Year: ALL SSSP STUDENTS (N=119)

Variable	Model 1 Parameter Estimates	SE	P	Model 2 Parameter Estimates	SE	P	Model 3 Parameter Estimates	SE	P
Intercept	3.15572	7.98266	0.6936	20.25009	3.25276	<.0001**	4.82545	8.87492	0.5882
HS GPA	5.56517	1.66141	0.0012				5.07448	1.81442	0.0067
SAT Math	0.01916	0.01771	0.2824				0.01011	0.01948	0.6054
SAT Verbal	-0.01780	0.01896	0.3504				-0.0068	0.02001	0.7353
Arithmetic ACCUPLACER	-0.13647	0.04771	0.0054				-0.1109	0.05046	0.0309
Read ACCUPLACER	0.16438	0.06782	0.0176				0.1401	0.07061	0.0510
Asian				3.60522	3.65425	0.3260	-0.6104	4.70027	0.8970
Black				-5.30693	2.56582	.0409*	-5.0945	3.02505	0.0963
Hispanic				-1.77275	2.23890	0.4302	-3.1586	2.61425	0.2308
First Generation in College				0.70320	1.73398	0.6859	-0.7783	2.08297	0.7097
%Need Met				3.92797	2.54389	0.1254	2.0684	2.76121	0.4561
Gender				2.93582	1.63769	0.0757	1.86851	1.85301	0.3165
R-square			0.2308			0.1191			0.2801

Note: *p<.05, **p<.001

Table 27: OLS Regression Modeling Credits Earned in First Year: ALL SSSP STUDENTS IN REMEDIATION (N=113)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	-11.6101	11.8859	0.3333	21.6638	3.77307	<.0001**	-5.90389	12.5605	0.6406
HS GPA	6.71685	2.08319	0.0023				6.37759	2.20375	0.0058
SAT Math	0.01748	0.02310	0.4527				0.01294	0.02705	0.6348
SAT Verbal	0.01357	0.02173	0.5350				0.01468	0.02306	0.5275
Arithmetic ACCUPLACER	-0.12969	0.05952	0.0340				-0.11453	0.06608	0.0899
Read ACCUPLACER	0.13345	0.07472	0.0800				0.11473	0.08034	0.1602
Asian				2.96166	5.08573	0.5622	-8.49461	9.17148	0.3593
Black				-5.03051	3.49983	0.1542	-6.57023	3.97757	0.1055
Hispanic				-2.73625	3.06856	0.3755	-5.21293	3.54148	0.1480
First Generation in College				1.23705	2.16160	0.5689	0.83235	2.55275	0.7459
%Need Met				-0.00226	3.04884	0.9994	-0.57163	3.13851	0.8563
Gender				3.93193	2.19065	0.0769	2.86296	2.57222	0.2716
R-square			0.2895			0.0858			0.3543

Note: *p<.05, **p<.001

Table 28: OLS Regression Modeling Credits Earned in First Year: ALL STUDENTS WITH NO SPECIAL SUPPORT (N=3077)

	Model 1			Model 2			Model 3		
Variable	Parameter Estimates	SE	P	Parameter Estimates	SE	P	Parameter Estimates	SE	P
Intercept	-4.26926	1.78463	0.0086*	16.8596	0.42148	<.0001**	-1.49548	1.83273	0.4146
HS GPA	4.61993	0.40139	<.0001**				3.69607	0.40317	<.0001**
SAT Math	0.01707	0.00392	<.0001**				0.01412	0.00384	.0002*
SAT Verbal	0.00987	0.00383	0.0099*				0.00581	0.00373	0.1191
Arithmetic ACCUPLACER	-0.00952	0.00984	0.3332				-0.00308	0.00965	0.7496
Read ACCUPLACER	-0.00016	0.01506	0.9914				0.00930	0.01468	0.5264
Asian				1.21473	0.74328	0.10230	0.51991	0.80854	0.5203
Black				-5.36035	0.50742	<.0001**	-3.39197	0.57077	<.0001**
Hispanic				-2.13711	0.40862	<.0001**	-1.98554	0.44974	<.0001**
First Generation in College				-1.85245	0.36297	<.0001**	-2.03387	0.39398	<.0001**
%Need Met				6.34055	0.43992	<.0001**	4.58067	0.50446	<.0001**
Gender				1.29360	0.35640	0.0003*	1.29751	0.40787	.0015*
R-square			0.0973			0.0982			0.1518

Note: *p<.05, **p<.001

Table 29: OLS Regression Modeling Credits Earned in First Year: ALL STUDENTS IN REMEDIATION WITH NO SUPPORT (N=2523)

Variable	Model 1 Parameter Estimates	SE	P	Model 2 Parameter Estimates	SE	P	Model 3 Parameter Estimates	SE	P
Intercept	-7.60182	2.4099	.0016*	18.0889	0.5246	<.0001**	-4.99487	2.4406	.0409*
HS GPA	4.28062	0.4836	<.0001**				3.31602	0.4835	<.0001**
SAT Math	0.02381	0.0047	<.0001**				0.02174	0.0046	<.0001**
SAT Verbal	0.01073	0.0049	.0279*				0.00731	0.0047	0.1225
Arithmetic ACCUPLACER	-0.00971	0.0115	0.3973				0.00159	0.0113	0.888
Read ACCUPLACER	0.00656	0.0182	0.719				0.01775	0.0177	0.3173
Asian				0.7389	0.8872	0.4050	-0.41190	0.9652	0.6696
Black				-5.1439	0.6052	<.0001**	-3.25613	0.6763	<.0001**
Hispanic				-2.4695	0.4943	<.0001**	-2.18977	0.5429	<.0001**
First Generation in College				-2.2283	0.4334	<.0001**	-2.16996	0.4752	<.0001**
%Need Met				4.5978	0.5301	<.0001**	3.70360	0.5938	<.0001**
Gender				1.8313	0.4287	<.0001**	2.26647	0.4912	<.0001**
R-square			0.0957			0.0808			0.1502

Note: *p<.05, **p<.001

Table 30: OLS Regression Modeling Credits Earned in First Year: ALL STUDENTS WITH CUM GPA <=2.0 (N=762)

Variable	Model 1 Parameter Estimates	Model 1 SE	Model 1 P	Model 2 Parameter Estimates	Model 2 SE	Model 2 P	Model 3 Parameter Estimates	Model 3 SE	Model 3 P
Intercept	13.0185	2.69493	<.0001**	7.85251	0.59386	<.0001**	6.5285	2.7933	0.0197*
HS GPA	-0.68566	0.63575	0.2811				-1.0714	0.6224	0.0863
SAT Math	0.00785	0.00544	0.1495				0.0117	0.0053	.0268*
SAT Verbal	-0.00024	0.00557	0.9657				0.0051	0.0054	0.3472
Arithmetic ACCUPLACER	-0.03003	0.01397	.0318*				-0.0303	0.0135	0.025
Read ACCUPLACER	-0.01835	0.02164	0.3967				-0.0184	0.0208	0.3783
Asian				0.1963	1.28740	0.8788	-0.5753	1.5779	0.7155
Black				-0.7026	0.60932	0.2491	0.76498	0.7750	0.3239
Hispanic				-0.5334	0.56635	0.3464	-0.1612	0.6902	0.8154
First Generation in College				-1.5039	0.46184	.0012*	-1.5805	0.5687	.0056*
%Need Met				6.5489	0.59483	<.0001**	6.5479	0.7469	<.0001**
Gender				-0.4796	0.45314	0.2901	0.0081	0.5916	0.9891
R-square			0.01			0.088			0.1043

Note: *p<.05, **p<.001

Table 31: OLS Regression Modeling Credits Earned in First Year: DROP-OUT (N=976)

Variable	Model 1 Parameter Estimates	Model 1 SE	Model 1 P	Model 2 Parameter Estimates	Model 2 SE	Model 2 P	Model 3 Parameter Estimates	Model 3 SE	Model 3 P
Intercept	-9.01675	3.13058	.0041*	8.29418	0.60868	<.0001**	-9.94121	3.22614	.0021*
HS GPA	3.73792	0.74063	<.0001**				2.5420	0.72684	.0005*
SAT Math	0.02213	0.00677	.0011*				0.02152	0.00656	.0011*
SAT Verbal	0.01358	0.00682	.0470*				0.01285	0.00663	0.053
Arithmetic ACCUPLACER	-0.01596	0.01742	0.3596				-0.00498	0.01683	0.767
Read ACCUPLACER	-0.05493	0.02635	.0374*				-0.04322	0.02515	0.086
Asian				3.44550	1.17143	.0033*	2.80326	1.51967	0.066
Black				-3.50262	0.71076	<.0001**	-1.32434	0.97532	0.175
Hispanic				-1.89998	0.64061	.0031*	-1.61185	0.82858	0.052
First Generation in College				-1.85600	0.54387	.0007*	-2.29654	0.69869	.0011*
%Need Met				7.55096	0.65858	<.0001**	6.75168	0.88084	<.0001**
Gender				1.10768	0.53146	.0374*	2.13111	0.73336	.0038*
R-square			0.0707			0.1306			0.1718

Note: *p<.05, **p<.001

Persistence to Second Year of College

Students who did not require remediation had the lowest persistence into second year even when compared to students who were required to take remedial courses (65% vs. 70%). Non-remediation students also had the second highest mean cumulative grade point average at 2.46. In contrast, SSSP students had the highest percentage of students persisting into the second year (86%). Higher percentages of EOF and SSP students (76%) persisted into the second year suggesting that strong support network provided for these students. EOF and SSSP students have structured programs for tutoring and mandatory advisement from dedicated faculty and staff and greater opportunities for academic and social engagement through these programs. As with cumulative grade point average and credits earned in the first year, persistence to second year was best predicted by student demographic characteristics. Logistic regression analysis of the independent variables as predictors of persistence to second year was conducted. The reference category for race/ethnic origin was White, the reference category for gender was males and the reference category for first generation in college was non-first generation in college. Percentage need met, high school GPA, and SAT scores were all interval variables.

Table 32 presents logistic regression findings for persistence to the second year for all students. High school GPA ($p<.0001$) and ACCUPLACER Math scores ($p=.0100$) were statistically significant predictors of persistent to the second year for all students. This was true for both Model 1 and Model 3, although the p value diminished as more variables were included. Demographic variables as race/ethnic origin of Black ($p<.0001$), first generation in college status (p=.0280) and socioeconomic status (p<.0001) were statistically significant in Model 2 and were also statistically significant when all student characteristics included.

Table 33 presents regression findings for non-remediation students. In Model 1, high school GPA (OR=.451, p=.0019) and Read ACCUPLACER scores (OR=1.053, p=.0261) were found to be statistically significant. In this model, the odds of persistence to second year were 0.45 times higher for every unit increase in high school GPA. In Model 2, socioeconomic status was statistically significant as a predictor of persistence to second year. The odds of persisting to the second year was 83 percent higher for students with high SES, and the odds of Black students persisting to the second year were 116% lower than the odds for white students. When both pre-college academic and test characteristics were combined with demographic traits, only high school GPA, Read ACCUPLACER scores and socioeconomic status were statistically significant. The odds of persistence to second year 80 percent lower for low SES students. Model 3 also suggests that there was a 53 percent increase in odds of persistence to second year for every unit increase in high school GPA.

Table 34 and Table 35 present regression findings limited to EOF students. Only two variables were statistically significant predictors of persistence to second year. Socioeconomic status (p<.0001) and race/ethnic origin of Black (p=.0211) were significant in Model 2, and only socioeconomic status (p=.0035) was significant in Model 3. The odds of an EOF student persisting to the second year decreases .006 times for every unit decrease in socioeconomic status (B=-5.1837), when all other variables were held constant. Similar results were found (Table 34) when the sample analyzed was limited to EOF students in need of remediation.

Logistic regression on persistence to second year for SSSP students using all three models was also conducted. The model fit was bad for both models 2 and 3 for this student group because the maximum likelihood estimate may not have existed due to the small sample size. Although the SAS program guidelines suggested running the Proc Logistic Exact process, they also warned that the Exact Logistic Models were memory intensive and could exceed the memory capacity of the computer (UCLA, 2012). When this analysis was attempted, the memory resources of the dedicated computer could not accommodate the memory requirements and the SAS program was stopped. This was attributed to the large number of variables involved in the Proc Logistic Exact analysis. While the descriptive statistics show that students who receive SSSP support persist to the second year, the logistic regression analysis conducted could not determine which variables were significant predictors of this outcome.

For students who received no special support (see Table 36 and Table 37), high school GPA, race/ethnicity of Black or Hispanic, first generation in college status, and socioeconomic status were all statistically significant predictors of persistence to second year. Only socioeconomic status was significant at 99.9% level. For students who received no support but were in need of remediation, only high school GPA, being Black, and socioeconomic status were statistically significant predictors and only socioeconomic status was statistically significant in Model 3. For students who received no support, the likelihood of persisting to the second year increased .734 times with every unit increase in high school GPA, when all other variables were held constant. The likelihood of persistence to second year also decreased .5 times with every unit decrease in socioeconomic status (B=-.6998).

Regression analysis findings on students excluding those who had a CGPA of zero are presented in Table 38. High school GPA, ACCUPLACER math score, race/ethnic origin of Black, and socioeconomic status were statistically significant predictors of persistence to second year.

Table 32: Logistic Regression Statistics for Persistence to Second Year: ALL STUDENTS (N=2047)

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	1.561	1.306-1.867	<.0001**				1.438	1.191-1.737	0.0002*
SAT Math	1.001	0.999-1.003	0.19430				1.001	0.999-1.002	0.4221
SAT Verbal	1.000	0.998-1.001	0.65020				0.999	0.998-1.001	0.4889
Score Math ACCUPLACER	0.994	0.880-0.999	0.0100*				0.994	0.990-0.999	0.012*
Score Read ACCUPLACER	1.004	0.997-1.010	0.27870				1.005	0.998-1.012	0.1678
Asian				0.989	0.719-1.362	0.9472	0.921	0.618-1.373	0.6853
Black				0.523	0.421-0.649	<.0001**	0.578	0.438-0.762	0.0001*
Hispanic				0.887	0.733-1.073	0.2175	0.816	0.645-1.033	0.0910
Unknown				0.872	0.667-1.138	0.3130	0.810	0.579-1.133	0.2182
First Generation In College				0.847	0.731-0.982	0.0280*	0.781	0.650-0.939	0.0084*
%Need Met				3.252	2.714-3.898	<.0001**	2.517	2.000-3.168	<.0001**
Gender (Female)				1.084	0.939-1.251	0.270	0.946	0.784-1.141	0.5588
Overall Model Evaluation									
Likelihood Ratio (p)			<.0001**			<.0001**			<.0001**
Score Test (p)			<.0001**			<.0001**			<.0001**
Wald (p)			<.0001**			<.0001**			<.0001**

Note: *p<.05, **p<.001

Table 33: Logistic Regression Statistics for Persistence to Second Year: ALL NON-REMEDIATION STUDENTS (N=573)

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	2.219	1.342-3.670	0.0019*				2.105	1.179-3.760	0.0119*
SAT Math	0.997	0.992-1.002	0.2721				0.997	0.991-1.002	1.2173
SAT Verbal	1.004	0.999-1.009	0.0830				1.004	0.999-1.009	0.1450
Score Math ACCUPLACER	0.995	0.973-1.018	0.6741				0.995	0.971-1.019	0.6765
Score Read ACCUPLACER	0.950	0.908-0.994	0.0261*				0.946	0.902-0.993	0.0234*
Asian				1.357	0.576-3.197	0.4870	0.726	0.207-2.546	0.6171
Black				0.464	0.261-0.824	0.0088*	0.552	0.226-1.351	0.1936
Hispanic				1.189	0.760-1.859	0.4483	0.971	0.496-1.898	0.9304
Unknown				0.880	0.476-1.627	0.6831	0.870	0.329-2.298	0.7789
First Generation In College				0.940	0.636-1.390	0.7579	0.652	0.371-1.145	0.1365
%Need Met				6.072	3.875-9.515	<.0001**	4.895	2.319-10.333	<.0001**
Gender (Female)				0.927	0.636-1.350	0.691	0.617	0.329-1.157	0.1323
<u>Overall Model Evaluation</u>									
Likelihood Ratio (p)			0.0067*			<.0001**			0.0003*
Score Test (p)			0.0069*			<.0001**			0.0003*
Wald (p)			0.01*			<.0001**			0.0016*

Note: *p<.05, **p<.001

Table 34 : Logistic Regression Statistics for Persistence to Second Year: ALL EOF STUDENTS (N=654)

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	1.979	0.901-4.347	0.0892				2.099	0.904-4.876	0.0846
SAT Math	1.005	0.999-1.010	0.0862				1.005	0.999-1.010	0.1259
SAT Verbal	0.996	0.989-1.002	0.1942				0.996	0.989-1.003	0.2718
Score Math ACCUPLACER	0.993	0.978-1.009	0.3933				0.990	0.974-1.007	0.2462
Score Read ACCUPLACER	0.999	0.976-1.023	0.9588				1.004	0.980-1.029	0.7494
Asian				0.683	0.245-1.900	0.4651	1.625	0.290-9.921	0.5811
Black				0.394	0.178-0.869	.0211*	0.599	0.174-2.068	0.4180
Hispanic				0.697	0.318-1.531	0.3690	1.075	0.333-3.470	0.9044
Unknown				1.150	0.370-3.572	0.8086	0.634	0.113-3.546	0.6035
First Generation In College				0.832	0.542-1.277	0.4002	0.788	0.373-1.666	0.5324
%Need Met				441.63	49.5->999.9	<.0001**	178.34	5.51->99.99	0.0035*
Gender (Female)				1.176	0.792-1.747	0.421	1.017	0.487-2.121	0.9645
Overall Model Evaluation									
Likelihood Ratio (p)			0.187			<.0001**			0.037*
Score Test (p)			0.201			<.0001**			0.027*
Wald (p)			0.220			<.0001**			0.222

Note: *p<.05, **p<.001

Table 35: Logistic Regression Statistics for Persistence to Second Year: ALL EOF STUDENTS IN REMEDIATION (N=641)

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	1.915	.869-4.218	0.1485				2.095	0.902-4.867	0.1394
SAT Math	1.005	.999-1.010	0.0942				1.005	0.999-1.010	0.1385
SAT Verbal	0.996	.989-1.002	0.2639				0.996	0.989-1.003	0.3080
Score Math ACCUPLACER	0.994	.979-1.010	0.2821				0.990	0.974-1.007	0.1591
Score Read ACCUPLACER	1.002	.979-1.027	0.7734				1.004	0.980-1.029	0.7525
Asian				0.600	0.207-1.741	0.7737	1.622	0.290-9.090	0.6482
Black				0.346	0.150-0.803	0.0197*	0.601	0.174-2.072	0.3653
Hispanic				0.631	0.274-1.451	0.5611	1.076	0.333-3.471	0.7760
Unknown				1.234	0.360-4.232	0.8860	0.635	0.113-3.552	0.5677
First Generation In College				0.885	0.571-1.370	0.5940	0.789	0.373-1.668	0.5540
%Need Met				>99.9	102.26->99.9	<.0001**	169.35	4.894->99.9	.0129*
Gender (Female)				1.175	0.783-1.765	0.081	1.018	0.488-2.122	0.5999
<u>Overall Model Evaluation</u>									
Likelihood Ratio (p)			0.3194			<.0001**			0.125
Score Test (p)			0.3257			<.0001**			0.105
Wald (p)			0.3504			<.0001**			0.305

Note: *$p<.05$, **$p<.001$

Table 36: Logistic Regression Statistics for Persistence to Second Year: ALL STUDENTS WITH NO SUPPORT (N=573)

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	1.511	1.254-1.822	<.0001**				1.395	1.145-1.7	.0010*
SAT Math	1.001	0.999-1.003	0.2713				1.000	0.999-1.002	0.6153
SAT Verbal	1.000	0.999-1.002	0.7096				1.000	0.998-1.002	0.8802
Score Math ACCUPLACER	0.996	0.991-1.000	0.0638				0.996	0.991-1.001	0.0821
Score Read ACCUPLACER	1.004	0.997-1.011	0.2494				1.005	0.998-1.012	0.1773
Asian				1.015	0.716-1.437	0.9343	0.898	0.591-1.367	0.6168
Black				0.525	0.415-0.664	<.0001**	0.578	0.432-0.773	.0002*
Hispanic				0.869	0.711-1.062	0.1711	0.782	0.613-0.997	.0475*
Unknown				0.845	0.640-1.117	0.238	0.828	0.587-1.168	0.2820
First Generation In College				0.837	0.713-0.983	.0299*	0.775	0.640-0.940	.0095*
%Need Met				2.887	2.385-3.494	<.0001**	2.347	1.850-2.979	<.0001**
Gender (Female)				1.053	0.900-1.232	0.517	0.949	0.779-1.157	0.6075
Overall Model Evaluation									
Likelihood Ratio (p)			<.0001**			<.0001**			<.0001**
Score Test (p)			<.0001**			<.0001**			<.0001**
Wald (p)			0.0001*			<.0001**			<.0001**

Note: *p<.05, **p<.001

Table 37: Logistic Regression Statistics for Persistence to Second Year: ALL STUDENTS WITH NO SUPPORT IN REMEDIATION (N=2523)

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	1.441	1.175-1.766	.0012*				1.336	1.079-1.655	.0112*
SAT Math	1.002	1-1.004	0.0593				1.001	0.999-1.003	0.122
SAT Verbal	1.000	0.998-1.002	0.3853				0.999	0.997-1.001	0.233
Score Math ACCUPLACER	0.995	0.990-1.00	0.0603				0.995	0.990-1.000	0.096
Score Read ACCUPLACER	1.004	0.997-1.012	0.2204				1.006	0.998-1.013	0.161
Asian				0.892	0.606-1.313	0.2686	0.914	0.584-1.428	0.298
Black				0.494	0.379-0.644	<.0001**	0.584	0.428-0.798	.0113*
Hispanic				0.765	0.607-0.964	.0306*	0.765	0.588-0.996	0.121
Unknown				0.776	0.565-1.067	0.335	0.817	0.563-1.184	0.794
First Generation In College				0.788	0.660-0.941	.0288*	0.801	0.652-0.984	0.069
%Need Met				2.347	1.896-2.904	<.0001**	2.155	1.675-2.773	<.0001**
Gender (Female)				1.058	0.889-1.259	0.464	0.985	0.799-1.215	0.954
Overall Model Evaluation									
Likelihood Ratio (p)			0.0063			<.0001**			<.0001**
Score Test (p)			0.0068			<.0001**			<.0001**
Wald (p)			0.0073			<.0001**			<.0001**

Note: *p<.05, **p<.001

Table 38: Logistic Regression Statistics for Persistence to Second Year: ALL STUDENTS WITH CGPA>0 (N=2647)

Variables	Model 1			Model 2			Model 3		
	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value	Odds Ratio	95% Confidence Intervals	P value
High School GPA	1.492	1.230-1.810	<.0001**				1.449	1.185-1.773	.0003*
SAT Math	1.001	0.999-1.002	0.4704				1.000	0.998-1.002	0.877
SAT Verbal	1.000	0.998-1.001	0.6146				0.999	0.997-1.001	0.494
Score Math ACCUPLACER	0.995	0.990-0.999	0.0263				0.995	0.990-0.999	0.0265*
Score Read ACCUPLACER	1.005	0.998-1.013	0.1329				1.006	0.999-1.013	0.112
Asian				0.937	0.673-1.306	0.7024	0.849	0.560-1.286	0.439
Black				0.585	0.464-0.736	<.0001**	0.592	0.440-0.796	.0005*
Hispanic				0.945	0.771-1.158	0.5834	0.843	0.654-1.085	0.185
Unknown				0.902	0.678-1.199	0.476	0.856	0594-1.233	0.404
First Generation In College				0.901	0.769-1.056	0.197	0.827	0.679-1.007	0.059
%Need Met				2.437	2.005-2.962	<.0001**	1.805	1.403-2.323	<.0001**
Gender (Female)				1.062	0.911-1.238	0.443	0.896	0.733-1.096	0.286
Overall Model Evaluation									
Likelihood Ratio (p)			0.0007*			<.0001**			<.0001**
Score Test (p)			0.0007*			<.0001**			<.0001**
Wald (p)			0.0008*			<.0001**			<.0001**

Note: *p<.05, **p<.001

Regression Discontinuity Model

A regression discontinuity design analysis was also used to further examine the effect of remediation on college outcomes. The key assumptions underlying the regression discontinuity approach include the continuous distribution of test scores across a cut-point for both pre-test and post test, and the unobservable determinants of enrollment being similar for students who score just above or just below the cut-point to be able to assume random assignment to treatment.

Table 39 presents the results of the OLS regression analysis of remediation and cumulative grade point average and credits earned using three RD models in three different situations. RD model 1 looked at remediation with EOF support, RD model 2 looked at remediation with SSSP support, and RD model 3 looked at remediation with No Support. The three situations involved math remediation, English remediation, and the combination of math and English remediation. Remediation was not a statistically significant predictor of CGPA or credits earned in the first year in most of these models and situations. Only math remediation for SSSP students was a predictor of CGPA. However, the R square value for math remediation for SSSP students was so low (R square = .093) accounting for a small variance in the outcome of CGPA.

A group means and differences analysis of cumulative grade point average by bandwidth was conducted to determine if students just below and above the cut-point were statistically different. Table 41 presents the group means and differences for the four bandwidths. Because the sample size was limited, bandwidth was selected by taking the frequency distribution of ACCUPLACER scores in arithmetic and reading, and setting the group upper and lower limits through cumulative percentage. Three bandwidths that ranged from wide to narrow, each with a similar number of students resulted from this process. The widest bandwidth included all students above and below the cut-point for arithmetic and reading. The medium bandwidth included all students who scored +/-33 points of the cut point of 68, and the narrow bandwidth comprised of students who scored +/- 15 points of the cut-point of 68 for arithmetic. For reading, the medium bandwidth included all students who scored +/- 20 points from the cut-point of 92, and the narrow bandwidth consisted of all students who scored +/- 10 points from the cut-point of 92. A fourth bandwidth designated as "very narrow" with only +/-5 points from the cut point for both arithmetic and reading scores in ACCUPLACER was also created. The analysis demonstrates how the means for observable factors (CGPA) were larger and statistically significant for students across the wide bandwidth. However, when students within the very narrow bandwidth around the cut point were compared, the differences vanish.

Figure 11 below shows the sample sizes for each of the bandwidths used in Table 41. More students scored on the lower end of the scale than on the upper end, even when comparing bandwidths of equal range on opposite ends of the cut point. An attempt to conduct an analysis using an even tighter bandwidth (+/- 3 or 3 points) was made but regression analysis failed because of too many missing observations for density plots to be created and the class variables did not have the two levels required for generating group means and differences.

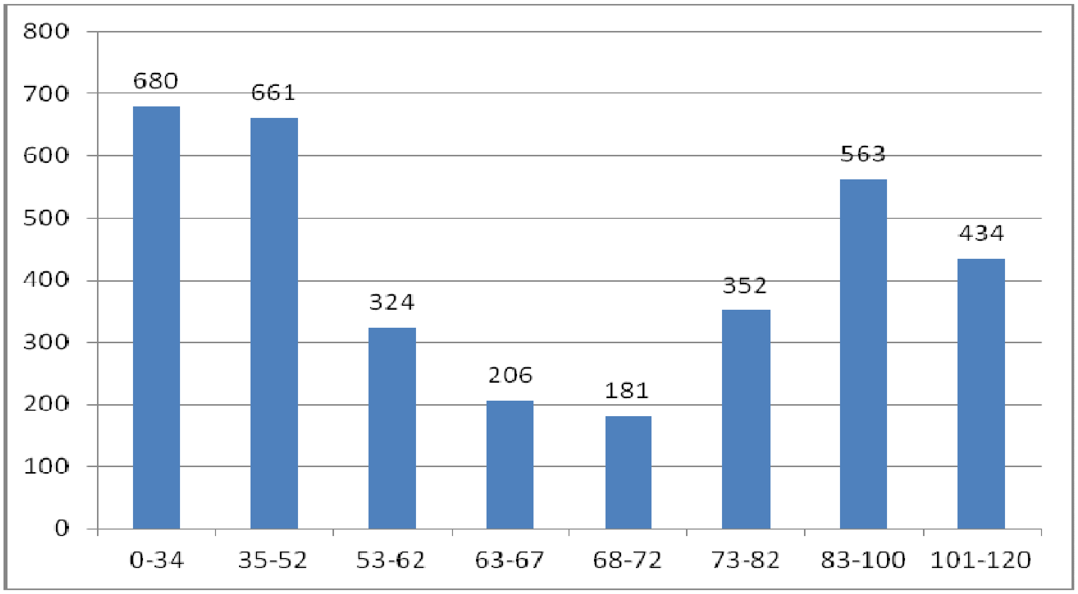


Figure 11: Sample size distribution by bandwidth, for ACCUPLACER arithmetic scores

Figure 12 below shows a graph of the mean CGPA by bandwidth. The discontinuity at the cut-point of 0.05 is visually obvious but was not found to be statistically significant.

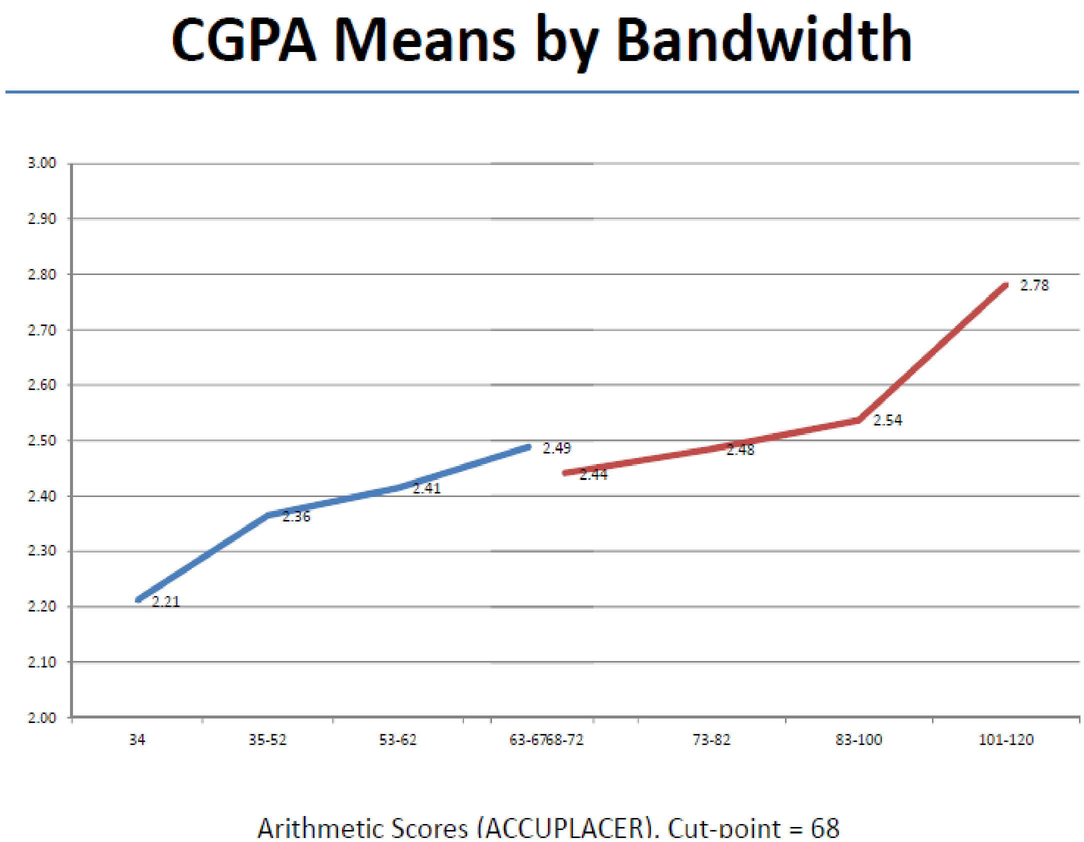


Figure 12: Bandwidth means of CGPA

Table 42 presents the group means and differences in CGPA by the same bandwidth for students separated into the five cohort years without controls. As with group means and differences in the aggregated database combining all five cohort years into one, the data demonstrate CGPA mean differences to be larger and statistically significant in the wider bandwidths. The mean differences in CGPA for students within the very narrow bandwidth just above and below the cutoff were smaller and not statistically significant. The one exception was in cohort year 2006 wherein the mean difference for the narrowest bandwidth was weakly statistically significant at p=0.04 and mean difference of 0.42.

Table 43 presents the group means and differences in credits earned in the first year for the five separate cohort years without controls. The same bandwidths as in previous analyses were used. The data show that as with cumulative grade point averages, the statistically significant group mean differences were found for students in the wider bandwidths for all five cohort years. The differences in group means for students in the narrower bandwidths were not statistically significant. Table 43 present data on the separate cohort years without controls because sample sizes for the EOF, SSSP and No Support groups within each year were too small for the analyses. Specifically, there were insufficient non-missing observations within the bandwidths to create density plots, and class variables did not have the two levels required for generating group means and differences.

Table 39: OLS REGRESSION COEFFICIENTS (N=3276)

SUBGROUP	CUMULATIVE GRADE POINT AVERAGE			CREDITS EARNED FIRST YEAR		
SUPPORT PROGRAM	Parameter Estimates	SE	P	Parameter Estimates	SE	P
REMEDIATION IN MATH						
EOF	-0.0579	0.1664	0.7282	1.9063	1.6563	0.2503
SSSP	0.7704	0.3160	0.0171*	3.5065	3.4846	0.3174
NO SUPPORT	0.1271	0.0771	0.0993	0.1943	0.7988	0.8079
REMEDIATION IN ENGLISH						
EOF	-0.0925	0.5160	0.0735	1.8378	4.6048	0.6900
SSSP	-0.2309	0.3592	0.5222	-2.7175	3.8947	0.4874
NO SUPPORT	-0.0948	0.0674	0.1597	0.4517	0.6986	0.5181
REMEDIATION IN MATH AND ENGLISH						
EOF	-0.9657	0.5086	0.0582	2.2823	4.4661	0.6096
	-0.0584	0.1661	0.7252	1.8716	1.6582	0.2596
SSSP	-0.2084	0.3501	0.5535	-2.8473	3.9162	0.4694
	0.7423	0.3204	0.0232*	2.9268	3.5086	0.4068
NO SUPPORT	-0.0735	0.0671	0.2740	0.5595	0.6945	0.4205
	0.1093	0.0773	0.1573	0.1162	0.8034	0.8850

Table 40: GROUP MEANS AND GROUP DIFFERENCES: SAT Math and SAT Verbal Scores

	WIDE			MEDIUM			NARROW			VERY NARROW		
	BAND AROUND CUTOFF (ALL RANGE)			BAND AROUND CUTOFF (+/-33)			BAND CUTOFF (+/-15)			BAND CUTOFF (+/- 5)		
VARIABLE	ALL ABOVE	ALL BELOW	DIFF	(35 to 67)	(68 TO 101)	DIFF	(53 to 67)	(68 to 83)	DIFF	(62 to 67)	(68 to 73)	DIFF
MATH												
EOF	367.80	428.10	60.37**	386.30	477.70	91.43**	392.20	412.60	20.36	386.10	407.60	21.51
SSSP	404.50	478.30	73.74**	421.20	535.00	113.8**	445.30	451.00	5.74	456.00	435.00	21.00
NO SUPPORT	407.88	487.80	79.99**	420.60	541.30	120.7**	427.80	449.90	22.07**	431.60	442.30	10.73
ALL	417.80	492.60	74.82**	426.90	543.40	116.5**	432.20	454.00	21.76**	437.10	447.50	10.46
	BAND AROUND CUTOFF (ALL RANGE)			BAND AROUND CUTOFF (+/-20)			BAND AROUND CUTOFF (+/-10)			BAND CUTOFF (+/-5)		
VARIABLE	ALL ABOVE	ALL BELOW	DIFF	(72 to 92)	(93 to 112)	DIFF	(82 to92)	(93 to 102)	DIFF	(87 to 92)	(93 to 97)	DIFF
ENGLISH												
EOF	363.00	396.00	32.96				419.20	416.70	2.50	416.40	416.70	0.30
SSSP	417.20	500.00	82.82**				474.30	500.00	25.71	488.60	480.00	8.57
NO SUPPORT	428.00	518.90	90.90**	452.40	622.30	169.9**	466.50	497.20	30.736**	480.70	489.20	8.48
ALL	417.50	5217.40	99.90**	449.40	622.30	172.9**	464.50	496.60	32.05**	477.20	488.00	10.85*

Note: *p<.05, **p<.001

Table 41: GROUP MEANS AND GROUP DIFFERENCES: Cumulative Grade Point Average (N=3593)

	WIDE			MEDIUM			NARROW			VERY NARROW		
	BAND AROUND CUTOFF (ALL RANGE)			BAND AROUND CUTOFF (+/-33)			BAND CUTOFF (+/-15)			BAND CUTOFF (+/-5)		
VARIABLE	ALL ABOVE	ALL BELOW	DIFF	(35 to 67)	(68 TO 101)	DIFF	(53 to 67)	(68 to 83)	DIFF	(63 to 67)	(68 to 72)	DIFF
MATH												
EOF	2.23	2.52	0.28**	2.34	2.50	0.16	2.22	2.50	0.28*	2.28	2.70	0.42
SSSP	2.70	2.63	0.07	2.81	2.90	0.10	2.81	2.48	0.34	3.05	2.28	0.76
NO SUPPORT	2.41	2.59	0.18**	2.41	2.78	0.38**	2.50	2.46	0.03	2.55	2.40	0.15
ALL	2.38	2.58	0.20**	2.41	2.78	0.37**	2.46	2.47	0.01	2.49	2.44	0.05
	BAND AROUND CUTOFF (ALL RANGE)			BAND AROUND CUTOFF (+/-20)			BAND AROUND CUTOFF (+/-10)			BAND CUTOFF (+/-5)		
VARIABLE	ALL ABOVE	ALL BELOW	DIFF	(72 to 92)	(93 to 112)	DIFF	(82 to 92)	(93 to 102)	DIFF	(87 to 92)	(93 to 97)	DIFF
ENGLISH												
EOF	2.29	2.67	0.37	NA	NA	NA	2.31	2.39	0.09	1.97	2.72	0.07
SSSP	2.64	3.07	0.44	NA	NA	NA	2.61	3.07	0.47	2.82	3.04	0.22
NO SUPPORT	2.44	2.73	0.29**	2.49	2.78	0.97	2.51	2.65	0.14*	2.57	2.61	0.04
ALL	2.42	2.73	0.31**	2.47	2.78	0.31	2.50	2.66	0.16*	2.53	2.62	0.09
	BAND AROUND CUTOFF(ALL RANGE)			BAND AROUND CUTOFF (+/-14)			BAND AROUND CUTOFF (+/-5)			BAND CUTOFF (+/-3)		
VARIABLE	ALL ABOVE	ALL BELOW	DIFF	(35 to 48)	(49 to 61)	DIFF	(43 to 48)	(49 to 53)	DIFF	(46 to 48)	(49 to 51)	DIFF
ENG AND MATH												
EOF	2.18	2.67	0.08	2.34	2.27	0.07	2.3	2.35	0.05	2.18	2.69	0.51
SSSP	2.47	2.81	0.33	2.73	2.77	0.04	2.28	2.69	0.41	NA	NA	NA
NO SUPPORT	2.24	2.39	0.15*	2.32	2.35	0.04	2.37	2.28	0.09	2.29	2.3	0.01
ALL	2.36	2.53	0.17**	2.4	2.4	0	2.42	2.34	0.08	2.37	2.45	0.08

Note: for English and Math, cut point = 48, *P<.05, **p<.001

Table 42: GROUP MEANS AND GROUP DIFFERENCES: CGPA BY COHORT YEAR

	WIDE			MEDIUM			NARROW			VERY NARROW		
	BAND AROUND CUTOFF (ALL RANGE)			BAND AROUND CUTOFF (+/-33)			BAND CUTOFF (+/-15)			BAND CUTOFF (+/- 5)		
VARIABLE	ALL BELOW	ALL ABOVE	DIFF	(35 to 67)	(68 TO 101)	DIFF	(53 to 67)	(68 to 83)	DIFF	(63 to 67)	(68 to 72)	DIFF
MATH												
2006	2.43	2.51	0.08	2.49	2.42	0.07	2.37	2.55	0.18	2.64	2.22	0.42*
2007	2.36	2.87	0.51**	2.38	2.87	0.48**	2.28	2.73	0.46*	2.32	2.69	0.37
2008	2.33	2.67	0.34**	2.41	2.56	0.14	2.49	2.48	0.01	2.45	2.6	0.15
2009	2.28	2.55	0.27*	2.29	2.48	0.19*	2.31	2.35	0.03	2.39	2.15	0.24
2010	2.52	2.64	0.12	2.52	2.55	0.03	2.51	2.52	0.01	2.48	2.55	0.07
	BAND AROUND CUTOFF (ALL RANGE)			BAND AROUND CUTOFF (+/-20)			BAND AROUND CUTOFF (+/-10)			BAND CUTOFF (+/-5)		
VARIABLE	ALL ABOVE	ALL BELOW	DIFF	(72 to 92)	(93 to 112)	DIFF	(82 to92)	(93 to 102)	DIFF	(87 to 92)	(93 to 97)	DIFF
ENGLISH												
2006	2.45	2.51	0.06	2.44	2.51	0.08	2.43	2.46	0.03	2.43	2.55	0.13
2007	2.36	2.87	0.51**	2.39	2.87	0.48**	2.28	2.74	0.46*	2.32	2.69	0.37
2008	2.44	2.73	0.29*	2.58	2.67	0.09	2.57	2.62	0.04	2.52	2.73	0.21
2009	2.35	2.65	0.30*	2.41	2.67	0.26*	2.48	2.65	0.17	2.36	2.6	0.24
2010	2.51	2.91	0.40**	2.55	2.3	0.34*	2.69	2.82	0.14	2.66	2.81	0.15
	BAND AROUND CUTOFF (ALL RANGE)			BAND AROUND CUTOFF (+/-14)			BAND AROUND CUTOFF (+/-5)			BAND CUTOFF (+/-3)		
VARIABLE	ALL ABOVE	ALL BELOW	DIFF	(35 to 48)	(49 to 61)	DIFF	(43 to 48)	(49 to 53)	DIFF	(46 to 48)	(49 to 51)	DIFF
ENG AND MATH												
2006	2.51	2.26	0.25*	2.48	2.44	0.04	2.24	2.26	0.16	2.23	2.42	0.18
2007	2.31	2.33	0.02	2.32	2.35	0.03	2.15	2.38	0.23	2.29	1.87	0.45
2008	2.25	2.21	0.24*	2.35	2.37	0.17	2.45	2.57	0.11	2.02	2.7	0.68
2009	2.25	2.12	0.15	2.19	2.21	0.12	2.2	2.28	0.08	2.40	2.67	0.27
2010	2.40	2.37	0.04	2.55	2.42	0.13	2.49	2.30	0.19	2.58	2.38	0.20

Note: for English and Math, cut point = 48, *P<.05, **p<.001

Note: N for 2006=765, N for 2007=737, N for 2008=636, N for 2009=712, N for 2010=743

Table 43: GROUP MEANS AND GROUP DIFFERENCES: CREDITS EARNED IN FIRST YEAR BY COHORT YEAR

	WIDE			MEDIUM			NARROW			VERY NARROW		
	BAND AROUND CUTOFF (ALL RANGE)			BAND AROUND CUTOFF (+/-33)			BAND CUTOFF (+/-15)			BAND CUTOFF (+/- 5)		
VARIABLE	ALL BELOW	ALL ABOVE	DIFF	(35 to 67)	(68 TO 101)	DIFF	(53 to 67)	(68 to 83)	DIFF	(63 to 67)	(68 to 72)	DIFF
MATH												
2006	18.14	21.16	3.01**	19.11	20.25	1.15	19.71	19.88	0.09	18.56	20.61	2.05
2007	17.28	19.99	2.71*	18.23	20.15	1.92*	19.31	20.06	0.75	18.96	20.62	1.66
2008	17.67	21.71	4.03**	19.04	21.47	2.43*	19.56	20.71	1.14	20.16	20.78	0.62
2009	17.76	21.63	3.88	19.68	21.16	1.49	19.54	20.02	0.48	17.5	19.52	2.02
2010	18.6	21.52	2.91**	20.34	20.83	0.49	19.95	21.22	1.28	19.69	19.99	0.3
	BAND AROUND CUTOFF (ALL RANGE)			BAND AROUND CUTOFF (+/-20)			BAND AROUND CUTOFF (+/-10)			BAND CUTOFF (+/-5)		
VARIABLE	ALL ABOVE	ALL BELOW	DIFF	(72 to 92)	(93 to 112)	DIFF	(82 to92)	(93 to 102)	DIFF	(87 to 92)	(93 to 97)	DIFF
ENGLISH												
2006	19.14	20.15	1.01	19.68	20.27	0.59	19.34	20.51	1.17	18.93	21.84	2.91
2007	18.17	20.64	2.46*	19.15	20.74	1.59	18.39	20.42	2.04	18.68	20.62	1.94
2008	19.31	20.33	1.02	19.7	20.34	0.63	19.41	20.16	0.76	18.87	19.47	0.61
2009	19.04	21.28	2.24*	20.38	21.25	0.88	20.98	21.74	0.77	10.14	21.52	1.38
2010	19.38	22.16	2.77*	21.48	22.17	0.69	22.66	22.57	0.09	22.23	23.22	0.99
	BAND AROUND CUTOFF (ALL RANGE)			BAND AROUND CUTOFF (+/-14)			BAND AROUND CUTOFF (+/-5)			BAND CUTOFF (+/-3)		
VARIABLE	ALL ABOVE	ALL BELOW	DIFF	(35 to 48)	(49 to 61)	DIFF	(43 to 48)	(49 to 53)	DIFF	(46 to 48)	(49 to 51)	DIFF
ENG AND MATH												
2006	19.52	18.28	1.24	18.89	18.85	0.04	17.61	19.38	1.78	19.86	18.13	1.73
2007	18.71	16.86	1.85*	17.22	18.97	1.74	14.96	17.29	2.33	17.75	13.9	3.85
2008	19.7	17.32	2.38*	18.78	18.96	0.16	19.92	19.59	0.34	12.29	19.57	7.3
2009	20.14	18.07	2.07	19.48	19.85	0.36	22.69	20.96	1.73	24.62	22.09	2.53
2010	20.03	18.89	1.15	20.3	20.57	0.26	20.67	20.46	0.21	22.8	19.54	3.26

Note: for English and Math, cut point = 48, *P<.05, **p<.001

Note: N for 2006=765, N for 2007=737, N for 2008=636, N for 2009=712, N for 2010=743

The results of the logistic regression analysis of remediation and persistence to second year of college are presented in Table 44. As with cumulative grade point average and credits earned in the first year, remediation was not statistically significant in predicting persistence to the second year in college even when the models were found to be a good fit to the data.

Consistent with statistical evidence, the scatter plots in Figure 13 and Figure 14 demonstrate no significant discontinuity at the cut-point. The results from this analysis show that remediation alone, as it is currently delivered, is not effective at improving academic outcomes for under-prepared college students.

Table 44: REGRESSION COEFFICIENTS FOR PERSISTENCE TO SECOND YEAR WITH REMEDIATION AS THE ONLY VARIABLE (N=2647)

	ODDS RATIO	CONFIDENCE LIMITS	P
REMEDIATION IN MATH			
EOF	0.7500	0.546-1.030	0.0754
SSSP	0.7720	0.562-1.106	0.1110
NO SUPPORT	0.7490	0.545-1.029	0.0748
ALL	0.7680	0.559-1.053	0.1016
REMEDIATION IN ENGLISH			
EOF	0.8850	0.669-1.710	0.3927
SSSP	0.9260	0.700-1.226	0.5928
NO SUPPORT	0.8880	0.671-1.175	0.4059
ALL	0.9090	0.687-1.203	0.5050
REMEDIATION IN MATH AND ENGLISH			
EOF	0.8620	0.650-1.144	0.3043
	0.7520	0.547-1.035	0.0803
SSSP	0.9090	0.686-1.206	0.5092
	0.7690	0.559-1.059	0.1074
NO SUPPORT	0.8650	0.652-1.147	0.3141
	0.7530	0.547-1.037	0.0825
ALL	0.8930	0.674-1.183	0.4306
	0.7640	0.555-1.050	0.0968

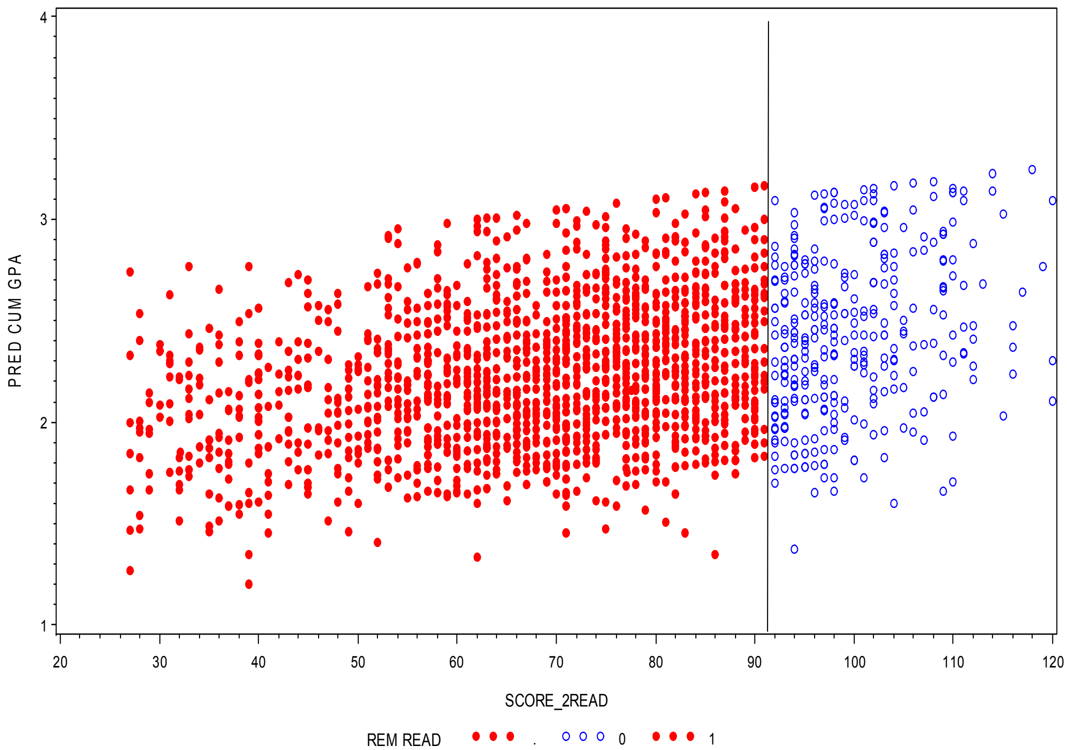


Figure 13: Discontinuity at cut point for Read scores from ACCUPLACER

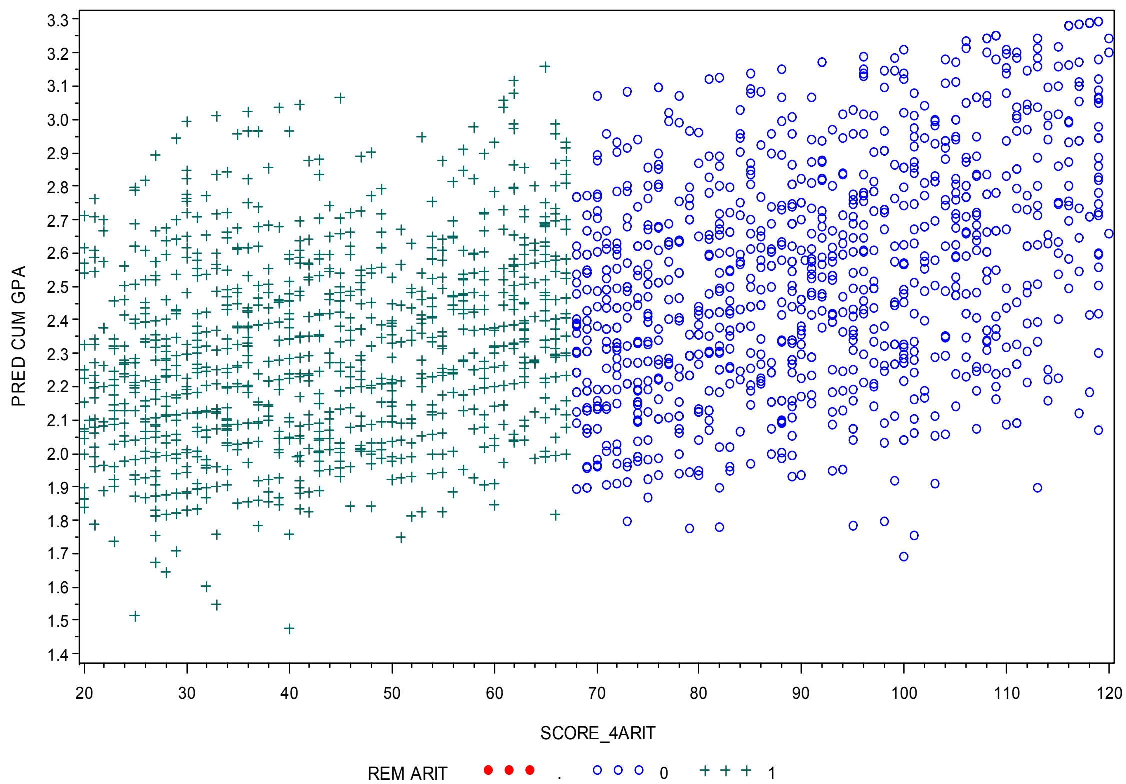


Figure 14: Discontinuity at cut point for Arithmetic (ARIT) scores from ACCUPLACER

Chapter V: DISCUSSION AND CONCLUSIONS

This chapter summarizes the answers to each of the research questions based on the findings from the secondary analyses. A cogent explanation for the rationale for these answers is provided.

Question 1: How do underprepared college students of varying skill perform during their first year of college?

This study found student high school GPA and SAT test scores to be statistically significant predictors of assignment to remediation, whether they are examined on their own (Model 1) or in combination with student demographic characteristics (Model 3). When student demographics alone were examined (Model 2) in relationship with assignment to remediation, the findings revealed that race/ethnicity, socioeconomic status and gender was negatively associated with and statistically significant predictor of assignment to remediation. First generation in college was also found to be statistically significant in this model, but not as strong as the other demographic variables. Being Black, Hispanic, male and/or poor was the strongest predictors of assignment to remediation. Except for gender, all these variables were strong predictors of drop-out. However, when students' demographic characteristics were examined in combination with pre-college academic characteristics (Model 3), only SAT scores remained as statistically significant predictors of assignment to remediation.

Examination of student characteristics as predictors of academic performance in the first year of college showed that as with assignment to remediation, high school GPA and test scores were strong predictors of academic performance. Student demographic characteristics were also strong and significant predictors of academic performance when examined on their own. Demographic variables of being Black, Hispanic, poor, male or first generation in college were associated with poor academic performance in the first year of college for underprepared students. However, when demographic variables were combined with high school GPA and SAT scores, these demographic variables were not statistically significant. SAT Math scores were consistently strong statistically significant predictors at the 99.9 level for both CGPA and credits earned in the first year of college for all students.

Given these findings, it is no surprise to observe the achievement gap between Black and Hispanic students on the one hand, and White students on the other. This achievement gap continues into the academic performance of students in their first year of college. Black students in particular, earned the lowest cumulative grade point averages as compared to students from other racial or ethnic backgrounds. They also earned less credits by the end of the first year of college.

Black and Hispanic students who received support services provided through the EOF and SSSP performed better academically when compared to students from other racial/ethnic backgrounds. EOF students who started college with the weakest pre-college academic characteristics were able to catch up to their non-EOF peers in terms of CGPA. EOF students also earned more credits in the first year than their peers who received no special support, and slightly more credits than their peers who did not need remediation at all.

The same was true for first generation in college status. While this characteristic was negatively associated with CGPA in the general student population, students in the SSSP program, of whom 90 percent were first generation in college, earned the highest cumulative college grade point average. This was also true when these students were compared against non-remediation students.

The findings revealed that high school GPA and SAT test scores were statistically significant predictors of academic performance in the first year for the general student population. ACCUPLACER scores in Reading and Arithmetic, however, were not statistically significant predictors of academic performance in college. The findings of this study are in line with recent research in student placement testing, remediation and college readiness. Placement tests were not strong predictors of how well students perform in college (Belfield & Crosta, 2012; Scott-Clayton, 2012), remediation had little effect on persistence and degree completion (Calcagno & Long, 2009; Martorell & McFarlin Jr., 2010; Martorell, et al., 2011), and the effects of remediation varied by gender, ethnicity and socioeconomic status (Calcagno & Long, 2009). With the recent findings on the efficacy of placement tests as predictors of success in college, the better use for these tests could be for diagnosis purposes with the intent of providing the needed support and remediation without the punitive deficit orientation of the current remediation process.

Other findings from recent research on remediation were mixed. Some studies found remediation to have no positive effect on long term progress towards degree completion or academic success (Calcagno & Long, 2009; Martorell & McFarlin Jr., 2010), while others found remediation to have a positive effect on academic achievement (Bettinger and Long, 2009; Calgano and Long, 2008; Lesik, 2006). The conflicting results from previous studies emphasize the need for further study and refinement of techniques to better assess the effects of remediation. They also emphasize the need to take a closer look at the college experience of the students being studied. The finding that remediation has a stronger effect on students who score far from the cut-point (less skilled students) could be attributed to other interventions and support programs that these students receive and students at the margins of the cut-points or passing scores do not. Support programs and interventions like EOF or SSSP are usually provided for students who are most at risk, have less academic skills, and are in most need of these services. Students who are at the margin (just below the cut-point) do not usually receive additional support as they are perceived to be better prepared and more likely to succeed on their own. The students' college experience should therefore be examined more closely when studying the effect of remediation on academic outcomes.

Question 2: Does remediation improve student outcomes? Are remediation and student support programs more effective than remediation on its own?

The findings from this study support the conclusion that remediation alone, as it is currently delivered, has no observable effect on the measures used in this study to evaluate the college outcomes of under-prepared students. Remediation as an intervention and variable influencing academic outcomes was found to be statistically significant in some models for data analysis. However, the effect of remediation was so small suggesting very little observable impact on academic outcomes. Even in the two special cases wherein the variable was found to be statistically significant at $p<.05$, the effect of remediation was so weak to create sufficient impact on the variances in academic outcomes. The scatter plot of scores and measures demonstrated no discontinuity at the cut-point. The study findings can be explained by Coe's (2002) observations on the effect size for educational interventions on student achievement as "small" in most research. Coe attributed his observation in part to the variability in populations being examined, and the challenges in implementing interventions to influence student achievement and assessment of these interventions.

The findings on remediation as a strong predictor of drop-out are consistent with the "discouragement effect" noted by Rosenbaum and Deil-Amen. Students who are placed into remediation are effectively "cooled-out," whether through the stigma of being in remediation, or the simple discouragement brought about by delaying their entry into college level work or the extra costs in time and resources created by remediation (Clark, 1960; Deil-Amen & Rosenbaum, 2002). For students who are socioeconomically disadvantaged, these additional costs needed to complete remediation requirements could effectively dissuade them from pursuing a college degree. In addition, the status of being first generation in college could also contribute to this discouragement effect. Students without the human or cultural capital to understand and navigate the college because their parents may not have the experience and resources that can motivate and support them in understanding the benefits of delayed gratification and earning a college degree are at a disadvantage. The perception of the worthiness of college to offset the effort and costs is compromised by unexpected or unappreciated delays in earning a college degree.

The findings suggest that support services provided for under-prepared college students are more effective at improving college outcomes (including persistence) affirming Tinto's(1987,1997) integration model of retention. Students who receive academic and social support within and outside the classrooms are more likely to persist in college. This was especially true for the SSSP and EOF students. EOF students in particular, started college with the lowest high school grade point averages, SAT scores and ACCUPLACER test results but by the end of their first year, these students persisted at higher rates than their peers who were not required to take remedial courses. EOF students go through a planned and structured summer bridge program before they start college. The design of this program is based on the premise that students need not only the skills necessary to take college level courses, they also need the social skills and networks on which they will inevitably rely during their college years. The summer bridge program allows them to create relationships with peers, mentors and faculty. The result is observable differences in persistence and academic success, especially when their initial skill level is taken into consideration. These findings support intrusive advisement (Escobedo, 2007) and use of learning communities ((Engstrom & Tinto, 2008). The finding of socioeconomic status as a predictor of persistence is congruent with the student involvement model of retention (Astin, 1975) and the financial nexus model of student retention (Paulsen & St. John, 1997) . Both these models contend that student persistence is influenced by financial need and students' perceptions of financial factors vis-à-vis their evaluation of their college experience. EOF promotes student persistence through its learning community and provision of additional supplemental grants to augment resources from state and federal agencies.

The SSSP program is another working example that supports the student engagement model for student retention. Unlike the EOF program, students in SSSP enter the college with higher skill levels and academic credentials. Like the SSSP students, they are highly diverse with large percentage of students with Black or Hispanic race/ethnic origins. A very high (90%) percentage of them are also first generation college students. Data suggest that the mentoring, intrusive advisement, and social networks created and provided by the SSSP program successfully compensates for any lack of cultural and human capital that otherwise comes with having parents who graduate from college. While the SSSP program does not have a financial aid or grant component to its services, the need may not be as great since these students come from families with slightly better socioeconomic status.

The findings also support a nested factors model of student retention and success. This conceptual framework takes into consideration the complex and dynamic interplay of individual and environmental factors on students' academic and social integration and interactions in college. This model integrates the various factors already identified in various theories of retention and provides a framework through which both positive and negative outcomes can be assessed and understood. The discouragement effect is one such demonstration of interactions between observable and unobservable traits and factors on students that result in a negative outcome. The cost of remediation that includes tuition and fees as well as opportunity costs of not working (or delay of entry into the workforce) contribute as a negative factor to the college experience. The stigma of being in a remedial course and the delay into entry into college level work are compounded with these perceived costs incurred and result in student drop-out.

The academic and social support provided students in both EOF and SSSP demonstrate interactions that result in positive academic outcomes in spite of student skill deficiencies and aptitudes, financial challenges and limitations in human capital. Both programs provide opportunities for peer group membership and meaningful interactions by providing learning communities within which curricular and extra-curricular components are delivered. These include the tutoring and mentoring components of these structured programs. These opportunities also support the non-cognitive learning and development of students to allow them to persist, persevere and succeed in college. EOF also addresses the financial aspect of retention by providing fiscal resources that help students focus on their academic goals instead of the valuation of their college experience and goals vis-à-vis the cost they incur for attending school.

The nested factors model can also help explain the limited observable effects of remediation alone (as delivered at State College) on the academic outcomes of underprepared college students. The delivery of remedial coursework in the classroom without the support and reinforcement of meaningful interactions outside the classroom demonstrate a one dimensional or limited college experience. When students are limited to classroom remedial coursework, they are not provided an opportunity to experience college learning even as they sit in a college classroom. Remediation alone does not provide students with opportunities for meaningful interactions with faculty and peers made possible through tutoring, counseling/mentoring, intrusive advisement, and participation in academic and social experiences of college. Lecture series, mandatory orientation, freshman seminars, symposia, research projects and college traditions that include convocations and other student club rituals are all examples of academic and social experiences in college.

Question 3: Does the treatment effect vary across students from different ethnic and racial backgrounds, generational and socioeconomic status?

This study found evidence of the effects of student support on academic outcomes. There was, however, very little evidence of improvement on college academic achievement through remediation alone. The variation in the effect of support services across different ethnic/racial groups and first generation in college students was difficult to isolate because of the way these variables were correlated and associated. Examination of the student profile helps provide insights on academic performance. The poorer students have to rely more heavily on state and federal aid to pay for tuition and fees. They also have to work at least part-time in order to support themselves or to contribute to family resources. The added costs of taking courses that do not count towards their college degree compounded by the resource costs of time and lost opportunity for earnings do not make remediation a beneficial event for these students from a short-term financial perspective. Financial obligations and challenges become a competing priority to academic achievement and performance. Yet, they cannot afford to give up on the long-term benefits of a college degree

First generation in college status may have two opposite effects. The positive effect, as demonstrated by SSSP students manifest in the pride, aspiration and value placed on achievement of earning a college degree that can bring like-minded students together to form informal networks that provide support for each other. The negative effect may be a possible reason that contributes to why students who do not have support services and networks drop-out. These students, for example, may not have known of options for tutoring, re-computation of grades, withdrawal from courses without penalties, and other resources available to help them persevere and do better in college. This practical knowledge on how to navigate through college is something that parents who have been to college can share with their children. Another possible effect involves the lack of understanding or appreciation for a college degree. When families do not understand or believe that a college degree can provide multiple benefits (some of which are discussed earlier in this dissertation), it becomes more difficult for students to get the emotional, psychological and financial support needed to persevere.

The special support programs provide services that help address needs in several aspects of college attendance. Tutoring services are provided for students in need of academic skill remediation. Intrusive advisement helps students navigate through college, and build stronger relationships with faculty and peers on campus. Opportunities for social engagement and building support networks are nurtured by these programs. The summer bridge programs offered through EOF or SSSP for example, provide a "sneak peak" at what to expect in the fall semester and reassure students of available supports when the academic year starts.

Study Limitations and Recommendations for Future Research

This study was limited by the lack of more longitudinal data, and the size of the student sample examined. While over 3,800 students might seem like a large number with which to start, after sorting the student data into cohorts and "treatment" groups, a more limited number was available for analyses. Data from all five years were combined into a single database for statistical analyses. Because of these limitations, one of the questions not answered by this study has to do with the long-term academic outcomes of students through the subsequent years (2^{nd} through to degree completion) in college. A follow-up study would be able to evaluate these outcomes and provide greater insight on the effects of remediation and student support programs on under-prepared college students. Future research should focus on a follow-up on each cohort year for 4 to 6 year graduation rates and survival analysis. This longitudinal study should focus not only on the retention and graduation rates of students, but also look at their transition to the workforce.

The data available for analysis also made it difficult to examine unobserved variables, including financial reasons, and their relationship to student attrition. Data that includes student responses to "exit interviews" or "exit surveys" could help inform the study on the effect of unobserved variables on drop-out and poor academic outcomes.

This study looked at students as they attended one institution. The phenomenon of "swirling" or transferring from one institution to another should not be ignored. The finding that students who did not require remediation also had low rates for persistence into the second year, in spite of earning higher grade point averages, point to the need for tracking students as they transfer to other institutions, or upon their return after a hiatus of several years. Research should track students as they transfer from one college to the next so that assumptions about drop-outs and stop-outs can be validated. Because completion of a college degree is believed to be a step towards upward mobility and gainful employment, tracking students as they transfer into the work-force is an important area to explore.

A limitation to this study is its generalizability to other institutions. The student population at State College is unusually diverse and very high need. As the only four-year public college designated as a minority serving institution in a densely populated and urban area in the state, the generalizability of the student sample may be true only for a few similar institutions in the country. The unique constitution of the student body in this college along with the small sample size used for analysis may explain the difference in the results of this study from studies by Attewell, et.al. (2006), Lesik (2006) and

Calgano and Long (2008, 2009). The generalizability of the findings on the efficacy of remediation are also limited to the narrow band-width of students who scored just above and just below the cut-points. The regression discontinuity analysis was, by virtue of design, confined to students with scores close to the margin (cut-point) of remediation. The conclusions about remediation drawn from this analysis are therefore made only for similar students. A more thorough exploration of the point at which remediation makes a difference for under-prepared college students is recommended. A study exploring the effect of moving the cut-point up or down the scale could be useful in setting policy for remediation. This is especially true for institutions with options of setting their own cut-points or selecting their own tests. The data available for this study did not make this analysis of sliding cut-points possible because the passing scores at State College have been consistent over the time of the study (Fall 2006 to Fall 2010). These scores were determined by the College Advisement Center in collaboration with faculty from both the English and Math departments.

This study focused on the effect of pre-college academic and test variables, as well as demographic traits on the academic outcomes of underprepared college students. Future research should also focus on the effects of non-cognitive variables on these outcomes. These variables include but are not limited to positive self-concept, realistic self-appraisal, perseverance/tenacity or “stick-to-itiveness”, strong support systems and contextual intelligence.

Development or use of other measures to determine academic outcomes should also be explored. Because the students’ choice of major or the subjects in which they enroll affect cumulative grade point averages, the true progress in the subject of deficiency/remediation may not be apparent. Grades in the specific subject area of initial deficiency (college level math or English), while possibly subjective could provide greater insight on the efficacy of the remediation received. Collection of more detailed information especially for students who drop out or earn CGPA of zero can yield better explanation of observed differences in results.

College readiness is a continuum and should be measured per se, instead of being measured in a binary fashion. The remediation courses into which students get placed are themselves not binary, but differ in levels and number. Further exploration of the tools, protocols and processes of assessing college readiness is recommended. While the use of high school grade point average and high school transcripts has been suggested as an alternative to or in combination with the placement exams and cut-scores (Belfield & Crosta, 2012) the author of this study endorses a balance between procedural efficiencies, consistency and proven predictors of college performance. While high school grades and transcripts provide a wealth of information on student attributes and performance, they are far from consistent across schools, districts or even states.

One of the questions not explored in this study has to do with the quality of the remediation, and the consistency of the program of remediation over time. This discussion on remediation quality requires both institutional information as well as student level data that was not available at the time. The experience, qualifications and credentials of the faculty, schedule and length of courses, resources made available to students, class size, curriculum and pedagogy involved are only some of the information that will be required. All this data could be used to inform the observable academic outcomes or results in order to better evaluate remedial programs.

Future research should focus on the financial aspect of remediation. With increasing percentage of students in need of remediation, and costs of providing remediation, fuller exploration of the cost-benefit analyses of remediation is needed. This cost-benefit analysis should look at the costs to the student as well as the institution. Costs to students are not limited to the actual costs of tuition and fees but also extend to opportunity costs of not working and the psychological costs due to stigma of being labeled "not-college ready." Institutional costs could extend from the actual costs of running the remedial programs to include the less tangible costs to academic and institutional reputation. As noted by Martorell and McFarlin (2010), evaluating the institutional costs and benefits of offering remediation is an area of great interest to educators, policy makers and institutional leaders.

Policy Implications

These findings contribute to the literature on college degree completion and the impact of remedial education courses on student academic success. The study provides empirical evidence and methods for examining the effects of remedial education and compensatory higher education programs on academic outcomes of underprepared college students. The study generated empirical evidence that can guide program and policy development relevant to support programs for underprepared students. With shrinking resources available to institutions of higher education, and the "new normal" in the political and financial environment, the need to prove effectiveness of programs and efficient use of resources is imperative. The study has illustrated a pathway for validating effectiveness of programs that can inform collaborative efforts with secondary and primary schools, data collection strategies and improving the infrastructure and delivery systems of support programs. Shifting from a monolithic structure of remediation departments or organizations to incorporating the mentoring/intrusive advisement (and possibly tutoring) specifically for English or math skill deficiency into faculty roles and interactions with students is one option. Seemingly simple as that may sound, it would require informed decisions and collaboration between members of various college communities.

According to Bourdieu, resources are fungible. While there will always be the hard financing to help pay for wages, goods, and other expenditures at institutions of higher education, other resources like technology and human creativity and services are more flexible and open to new applications. Remediation is one area in particular wherein the application of technology and human creativity can be very effective. Incorporating the same technology that students rely on everyday is practical as it engages them in a medium they understand and appreciate, and fosters independence that is essential to critical thinking. Identifying and guiding students towards free web-based video libraries featuring self-paced lessons could assist them by providing opportunities to re-learn or brush-up on various subjects. Creating and delivering similar offerings to augment classroom teaching or serve as tutorials are also an innovative approach to improve remediation. Efficiency, cost effectiveness and student engagement in learning are enhanced by using the internet for web-based instruction and tutoring. The use of early alert systems monitored through tablet computers and other personal/handheld devices are another innovation that could improve the delivery of remediation. Shifting from the traditional lecture method to student-centered engagement can address the types and levels of skill deficiencies unique to each student.

Deliberate and focused policy to improve remediation and retention requires the use of milestones and risk-analytics. These tools and others have become more readily available through improvements in technology, allowing improved diagnosis and monitoring of student needs, progress and outcomes. Reducing reliance on lag indicators such as drop-out and retention rates that become evident after the fact can change the focus to risk identification and prevention. The use of milestones and risk analytics that monitor student progress early and consistently throughout the academic year provide the college with actionable information while the action can still be meaningful for those particular students.

Other policy implications involve partnerships and collaboration between K-12 and higher education. These partnerships and collaborations could extend into the creation or assessment of programs that provide early notification of skill deficiencies to students and interventions that address these deficiencies. Education leaders can use the information to more intentionally and methodically address the challenges of educating students.

This study looked at a very thin slice of a very specific group of students in higher education. The profile of students examined in this study may very well be the prevalent profile of the future of American higher education. Hence continued focus on examining remediation and improving its effectiveness can make a difference for these students.

In the debate between remediation as a "cooling-out" process (Clark, Rosenbaum and Deil-Amen) versus remediation as a necessary measure to help ensure the success of poor and minority students (Attewell and Lavin), both groups argue for the same thing but from various stages in the delivery and assessment of education. Both groups advocate for improved preparation and information, remediation, and education. The need for remediation can be lessened by better prepared high school students who are informed about the rigors of college work and the consequences of failure to earn a college degree as well as alternatives to a college degree. Effective remediation programs should help underprepared students succeed and enjoy the benefits of college education.

One innovation being explored is early placement testing. The California State University system has implemented an Early Start initiative that looks at scores on the Early Assessment Program (EAP) to determine if students need to take remedial courses in the summer before they start college (CSU, 2012). The Early Assessment Program test is taken in the 11th grade so that students who find themselves in need of improving academic skills will have the opportunity to do so in the 12th grade. Concomitant with determining college readiness as early as 11th grade is the understanding of the consequences of failing to acquire the needed academic skills – remediation. Early assessment helps students become better informed about the rigors of college work, and provides them the opportunity in high school to better prepare for college. Summer courses for students needing remediation is another step in the right direction by providing a last opportunity to catch up without using up a semester of college. A similar program for math placement tests called the North Carolina Early Mathematics Placement Testing Program (NC EMPT) provides high school students in that state with a " non-threatening, eye opening reality check of their readiness for college-level mathematics" (NCEMPT, 2011). Maryland and Ohio have similar programs for math as well.

Another approach involves the use of learning communities. This approach emphasizes the linkage between the remedial course and the courses the students need to satisfy requirements for their academic major. Proponents of this approach argue that the linkage makes the material more engaging and more motivating than simply offering basic skills courses. The linkages allow students to learn critical thinking skills as well as strengthen their support network by building stronger ties to the college community of peers and faculty.

Another approach used in Tennessee requires the more specific assessment of skill deficiencies (Short, Vandal, & Berryman, 2012). After the specific skill deficiency level is identified, the students are offered remediation through courses taught using technology that allows them to work at their own pace. This gives students the opportunity to focus on the specific skills in which they are deficient for a much longer time than is allowed within the traditional term.

CONCLUSION

Access to higher education alone is not enough. The college degree has replaced the high school diploma as the minimum requirement for social and economic mobility (Blundell, et al., 2005; Kolesnikova, 2010), and as more high school graduates attend college, a large percentage of these students will leave college before earning a degree (Adelman, 2007; Thomas Brock, 2010; Engle & Tinto, 2008; Kuh, et al., 2008; Ruppert, et al., 1998). This study started with an exploration of the achievement gap in higher education. It also explored the effects of student support programs and remediation on college outcomes.

This study shows that for a state college that is also a minority serving institution, remediation alone, as it is currently delivered, is not enough. The challenges, however, do not start with the remediation courses; they also involve the sorting process. This sorting process is done through the administration of a placement test, ACCUPLACER. Unlike the SAT or the ACT, no significant test-preparation market has developed for placements tests (ACCUPLACER or COMPASS) and most students do not prepare for these tests the way they would have for the SAT or ACT (Scott-Clayton, 2012). The consequences of failing the placement exam are more costly in terms of the time and resources required of students for remediation. The consequences do not stop with students; they extend to costs to institutions and the public in general.

The high stakes placement exams used by colleges to test and sort students entering college for the first time, are far from accurate in the placement of these students into the right courses. Recent studies have shown that the assignment of students into remediation coursework using placement test cut-offs have high error rates that range from 27 to 33 percent for English, and from 17 to 24 percent in Mathematics (Belfield & Crosta, 2012; Scott-Clayton, 2012). Students can be erroneously assigned into remediation even after preparing for the placement exam, if the institutions do not set the correct cut-scores, or the scores are incorrectly interpreted

The problem then extends into the remediation program itself. Within a remedial course, there is no distinction in a "skills deficiency" designation on the specific deficiency for a particular individual. Hence, a student is required to enroll in a 15-week instruction cycle but the reality is that the specific skill deficiency may be remediated during a two week instruction period for the specific skill needed. The current remediation instruction model at State College does not use an individualized approach to addressing the specific skill deficiency. Students must sit through a full semester's worth of remediation classes and miss the opportunity to progress to college level coursework sooner.

Because colleges do not clearly inform students of the importance of placement tests and the value of remediation, students do not fully understand or appreciate the need for this intervention. Many students perceive this first semester of remediation as an extension of high school and find early college experience discouraging. An effective alternative is to address the specific skill deficiency over a longer period, while allowing students to experience college level coursework and its concomitant expectations. Another alternative is to assess the skill deficiencies earlier, or assess the level of skill deficiencies and create remediation courses targeted specifically to the identified needs. These courses could be offered in the summer before students start college, and linked to their first college level courses for further assessment.

Both these alternatives are currently being explored in colleges across the country. The early placement testing being conducted in Ohio high schools (in partnership with Ohio state colleges and universities) was designed to provide early signals of college skill and competency deficiencies so that students can address these deficiencies in high school. Another innovation in the design and delivery of remedial coursework being explored in Tennessee involves the use of technology to enable students to focus on specific skill deficiencies and work at their own pace. Learning community models that link remedial coursework to college courses in the students' major are also being explored. Proponents of these models contend that linkages engage and motivate students, help them build critical thinking skills, and provide them opportunities for forging stronger ties with peers and mentors on campus.

This study also examined the efficacy of support programs in helping under-prepared college students. Student support programs show greater evidence of helping improve the academic outcomes of these students. The findings support what has been observed and accepted as fact on college campuses: support programs are more effective at helping underprepared college students succeed. Since support services are more effective than remediation as it is currently delivered, it is only logical to support these programs.

Linking the services provided by these programs with alternatives mentioned previously, as well as tutoring and mentoring programs for underprepared college students should be provided to under-prepared students who are mainstreamed into college level courses after an intensive remediation summer program. Mandatory tutoring and mentoring will help reinforce remediation done over the short (summer) semester, while allowing students to experience college level coursework, and meet college expectations.

At State College, of the total 309 remediation courses offered between Fall 2006 and Fall 2010, 158 were in English remediation and 151 were in math remediation. The majority of these courses were taught by adjunct faculty. The cost of running these courses for an entire term can only be estimated at $1.1 million, based solely on salary costs for adjuncts. This amount excludes the even higher auxiliary costs of supporting these courses (campus resources, technology, and facilities), overload and program costs for testing and evaluations at the end of the English remedial courses, or the costs of personnel benefits and additional services.

Based on this study, remediation alone as it is currently delivered, is not a predictor of college success as measured by cumulative grade point average, persistence into the second year, and credits earned in the first year, but strong support services that include tutoring, intrusive advisement and mentoring are shown to be more effective; it behooves the institution to expand these services. Students in greatest need of remediation were Black and Hispanic, a growing demographic entity in the country and in State College. For State College, this is especially important because it designated as a minority serving institution. The achievement gap between Black and Hispanic students on the one hand and White students on the other needs to be addressed intentionally and methodically. Failure to do so would undermine the "access" and "success" in higher education for minority students.

This study serves as a clarion call for the improvement of remediation, and not its elimination. The findings suggest that other services in the form of tutoring, intrusive advisement, and mentoring provided through the special support programs are more effective at improving academic outcomes. A blending or incorporation of these two, and the use of other innovations currently being explored around the country could help improve the delivery of remediation to underprepared college students. Access to a college degree does not erase nor cancel out the inequities and achievement gaps rooted in race and socioeconomic status that undeniably exist in K-12. Remediation that works is one hope for helping bridge this achievement gap for college students.

BIBLIOGRAPHY

Achieve. (2007). *Aligned Expectations? A closer look at college admissions and placement tests*. The American Diploma Project: http://achieve.org/.

Achieve. (2010). *Closing the Expectations Gap* The American Diploma Project: : Achieve: http://achieve.org/.

Adelman, C. (1999). Answers in the toolbox: Academic intensity, attendance patterns and bachelor's degree attainment. Available from http://www2.ed.gov/pubs/Toolbox/index.html

Adelman, C. (2007). Do We Really Have a College Access Problem? *Change, Vol. 39, no. 4*.

Adelman, C. (Ed.). (2006). *The toolbox revisited: Paths to degree completion from high school through college.* Washington, DC: U.S. Department of Education.

Allen, J., Robbins, S., Casillas, A., & Oh, I.-S. (2008). Third Year College Retention and Transfer: Effects of Academic Performance, Motivation and Social Connectedness. *Research in Higher Education, 49*, 647-664.

Anyon, J. (2005a). *Radical Possibilities*. New York: Routlege.

Anyon, J. (2005b). What counts as educational policy? Notes toward a new paradigm. *Harvard Educational Review, 75, No. 1*(Spring 2005), 65-88.

Arenson, K. (1999a). Rebutting task force, Group urges CUNY to keep remediation*. The New York Times*.

Arenson, K. (1999b). Trustees Anoint CUNY Chief with a Pledge Not to Meddle*. The New York Times*. Retrieved from Retrieved from archives: http://www.nytimes.com/1999/07/23/nyregion/trustees-anoint-cuny-chief-with-a-pledge-not-to-meddle.html?pagewanted=all&src=pm

ASHE. (2007). *Economically and Educationally Challenged Students in Higher Education*.

Astin, A. W. (1975). *Financial Aid and Student Persistence*: Higher Education Research Inst, Inc Los Angeles C. A.

Astin, A. W. (1977). *Four Critical Years*. San Francisco: Jossey-Bass Publishers.

Astin, A. W. (1991). *Assessment for Excellence: The philosophy and practice of assessment and evaluation in higher education*. New York: American Council on Education and MacMillan Publishing Company.

Astin, A. W. (1993). *What matters in college: four critical years revisited.* San Francisco: Jossey-Bass.

Astin, A. W., & Panos, R. J. (1967). *ATTRITION AMONG COLLEGE STUDENTS*: American Council on Education, Washington D. C.

Attewell, P., Heil, S., & Reisel, L. (2010). Competing Explanations of Undergraduate Noncompletion. *American Education Research Journal, Online*.

Attewell, P., & Lavin, D. (2007). *Passing the Torch*. New York: Russell Sage Foundation.

Attewell, P., Lavin, D., Domina, T., & Levey, T. (2006). New Evidence on College Remediation. *The Journal of Higher Education, 77*(5), 886-924.

Bail, F. T., Zhang, S., & Tachiyama, G. (2008). Effects of a Self-regulated Learning Course on the Academic Performance and Graduation Rate of College Students in an Academic Support Program. *Journal of College Reading and Learning, 39, no 1*(Fall 2008), 54-73.

Bailey, T. (2009). Challenge and Opportunity: Rethinking the role and function of developmental education in community college. *New Directions for Community Colleges, 145*(Spring 2009), 11-30.

Bastedo, M., & Gumport, P. (2003). Access to What?: Mission differentiation and academic stratification in U.S. public higher education. *Higher Education 46*, 341-359.

Battistin, E., & Rettore, E. (2003). Another Look at the Regression Discontinuity Design. *CENMAP Working Papep. Downloaded from http://www.google.com/url?q=http://www.cemmap.ac.uk/wps/cwp0301.pdf&sa=U&ei=k4N8TqGEK-H30gHvg6nuDw&ved=0CCEQFjAD&sig2=YnD8um3pcJbf7JwqWwjtsA&usg=AFQjCNHFXP5H1tyuiiZv1wOIAIkTMboy-A*,

Baum, S., Ma, J., & Payea, K. (2010). *Education Pays: The benefits of higher education for individuals and society*. Washington, DC: College Board.

Bean, J. P., & Bradley, R. K. (1986). Untangling the Satisfaction-Performance Relationship for College Students. *The Journal of Higher Education, 57*(4), 393-412.

Beil, C., Reisen, C. A., Zea, M. C., & Caplan, R. C. (1999). A Longitudinal Study of the Effects of Academic and Social Integration and Commitment on Retention. *NASPA Journal, 37*(1), 376-385.

Belfield, C., & Crosta, P. (2012). *Predicting Success in College: The importance of placement tests and high school transcripts*. New York, NY: Columbia University, Teachers College.

Bennett, W. (1998). A Nation Still at Risk. *Policy Review*(90), 23-29.

Bennett, W. J. (1992). *The De-Valuing of America. The Fight for Our Culture and Our Children*.

Bettinger, E. P., & Long, B. T. (2004). *Shape up or or ship out: The effects of remediation on students at four year colleges*. Cambridge, MA: National Bureau of Economic Research.

Bettinger, E. P., & Long, B. T. (2005). Remediation at the Community College: Student Participation and Outcomes. *New Directions for Community Colleges, Spring 2005*(129), 17-26.

Bettinger, E. P., & Long, B. T. (2006). Institutional Response to Reduce Inequalities in College Outcomes: Remedial and developmental courses in higher education, *Forthcoming in Economic Inequality and Higher Education: Access, Persistence and Success*. New York: Russell Sage Foundation Press.

Bettinger, E. P., & Long, B. T. (2009). Addressing the Needs of Underprepared Students in Higher Education: Does College Remediation Work? *Journal of Human Resources, 44*(3), 736-771.

Blanc, R. A., DeBuhr, L. E., & Martin, D. C. (1983). Breaking the Attrition Cycle: The Effects of Supplemental Instruction on Undergraduate Performance and Attrition. *The Journal of Higher Education, 54*(1), 80-90.

Blundell, R., Dearden, L., & Sianesi, B. (2005). Evaluating the Effect of Education on Earnings: Models, Methods and Results from the National Child Development Survey. *Journal of the Royal Statistical Society. Series A (Statistics in Society), 168*(3), 473-512.

Boatman, A., & Long, B. T. (2010). *Does Remediation Work for All Students? How the Effects of Postsecondary Remedial and Developmental Courses Vary by Level of Academic Preparation. An NCPR Working Paper*: National Center for Postsecondary Research.

Borman, K. M., & Associates. (2005). *Meaningful Urban Education Reform: Confronting The Learning Crisis In Mathematics And Science*. Albany: SUNY Press.

Bounds, S. M. (2005). *Universal Access, American Democracy and the Community College: The Legacy of the Truman Commission* Paper presented at the 2005 Oxford Round Table.

Bracy, R. (1972). *Compensatory Education Programs - Is there a place in higher education?* Paper presented at the First National Congress of Black Professionals in Higher Education.

Brock, T. (2010). Young Adults and Higher Education: Barriers and Breakthroughs to Success. *The Future of Children, Vol. 20, no. 1*(Transition to Adulthood:), 109-132.

Brock, T., & Richburg-Hayes, L. (2006). *Paying for Persistence. Early Results of a Louisiana Scholarship Program for Low-Income Parents Attending Community College*: MDRC: Manpower Demonstration Research Corp, New York N. Y.

Burlison, J. D., Murphy, C. S., & Dwyer, W. O. (2009). Evaluation of the Motivated Strategies for Learning Questionnaire for Predicting Academic Performance in College Students of Varying Scholastic Aptitude. *College Student Journal, 43*(4), 1313-1323.

Cabrera, A. F., Castañeda, M. B., Nora, A., & Hengstler, D. (1992). The Convergence between Two Theories of College Persistence. *The Journal of Higher Education, 63*(2), 143-164.

Cabrera, A. F., Nora, A., & Castaneda, M. B. (1993). College Persistence: Structural Equations Modeling Test of an Integrated Model of Student Retention. *The Journal of Higher Education, 64*(2), 123-139.

Calcagno, J. C., & Long, B. T. (2008). *The Impact of Postsecondary Remediation Using a Regression Discontinuity Approach: Addressing Endogenous Sorting and Noncompliance. An NCPR Working Paper*: National Center for Postsecondary Research.

Calcagno, J. C., & Long, B. T. (2009). *Evaluating the Impact of Remedial Education in Florida Community Colleges: A Quasi-Experimental Regression Discontinuity Design. NCPR Brief*: National Center for Postsecondary Research.

Carroll, C. D. (2007). *Characteristics of Minority-Serving Institutions and Minority Undergraduates Enrolled in These Institutions*. Washington, DC: National Center for Education Statistics, U.S. Department of Education.

Cartney, W., & Morrison, A. (1970). *Compensatory Education Programs in Higher Education: A Nationwide Survey*. New York: Columbia University.

Choy, S., Horn, L., Nunez, A.-M., & Chen, X. (2000). Transition to College: What helps at-risk students and students whose parents did not attend college. *New Directions for Institutional Research, 107*(Fall 2000), 45=63.

Clark, B. R. (1960). The"Cooling Out" Function in Higher Education. *The American Journal of Sociology, 65, No. 6*((ay, 1960)), 569-576.

College_Board. (2003). *ACCUPLACER Online Technical Manual*.

College_Board. (2010). ACCUPLACER. from http://professionals.collegeboard.com/higher-ed/placement/accuplacer

College_Board. (2012). The College Completion Agenda: Latino Edition. 2012, from http://completionagenda.collegeboard.org/latino//?affiliateId=profad&bannerId=latinoedition

Collins, R. (1971). Functional and Conflict Theories of Educational Stratification. *American Sociological Review, Vol. 36*, 1003-1019.

Conley, D. T. (2007). *Redefining College Readiness*. Eugene, OR: Educational Policy Improvement Center. Retrieved from http://inside.redwoods.edu/basicskills/documents/1.RedefiningCR_Vol3_Copy.pdf.

Conley, D. T. (2010). *Replacing Remediation with Readiness*. Paper presented at the NCPR Developmental Education Conference: What Policies and Practices Work for Students?

ConnectEd. (2012). *College and Career Readiness: What do we mean?* Berkley, CA: California Center for College and Career.

Connolly, Westlund, & Plank. (2012). Defining College Readiness: Learning from the Past and Looking toward the Future.

CSU. (2012). The California State University Early Assessment Program from http://www.csumathsuccess.org/mshome

CUNY. (1999). Trustees approve landmark remediation exit test: Chancellor calls move profound step forward. *CUNY Newswire: Retrieve online from: http://www1.cuny.edu/mu/forum/1999/09/30/trustees-approve-landmark-remediation-exit-test-chancellor-calls-move-profound-step-forward-for-cuny/*.

CUNY. (2011). Pre-College Education / Collaborative Programs. from http://www.cuny.edu/academics/k-to-12.html

DeAngelo, L., Franke, R., Hurtando, S., Pryor, J. H., & Tran, S. (2011). *Completing College: Assessing Graduation Rates at Four Year Institutions*. Los Angeles, CA: Higher Education Research Institute, University of California, Los Angeles.

Deil-Amen, R., & Rosenbaum, J. E. (2002). The Unintended Consequences of Stigma-Free Remediation. *Sociology of Education, 75*(3), 249-268.

Durkheim, E. (1951). *Suicide, a study in sociology. Translated by J.A.Spaulding and G. Simpson*. Glencoe, New Jersey: Free Press.

Dynarski, S. M. (2003). Does Aid Matter? Measuring the Effect of Student Aid on College Attendance and Completion. *The American Economic Review, 93*(1), 279-288.

Engle, J., & Tinto, V. (2008). Moving Beyond Access: College Success for Low-Income, First-Generation Students. *Pell Institute for the Study of Opportunity in Higher Education*.

Engstrom, C., & Tinto, V. (2008). Access without Support Is Not Opportunity. *Change: The Magazine of Higher Learning, 40*(1), 46-50.

Escobedo, G. (2007). A retention/persistence intervetion model: Improving success across cultures. *Journal of Developmental Education, 31*(1), 12-17, 37.

Fike, D. S., & Fike, R. (2008). Predictors of First-Year Student Retention in the Community College. *Community College Review, 36*(2), 68-88.

Fischer, M. J. (2007). Settling into Campus Life: Differences by Race/Ethnicity in College Involvement and Outcomes. *The Journal of Higher Education, 78*(2), 125-161.

Flanagan, C., & Levine, P. (2010). Civic Engagement and the Transition to Adulthood. *The Future of Children, Vol. 20, No. 1*(Transition to Adulthood), 159-180.

Florida_Department_of_Education. (2011). Florida College Entry-Level Placement Test (CPT). from Retrieved from http://www.fldoe.org/asp/fcelpt/

Geiser, S., & Santelices, M. V. (2007). *Validity of High-School Grades in Predicting Student Success Beyond the Freshman Year*. Berkely, CA: University of California-Berkely.

Glenn, D. (2010). The Quality Question. *The Chronicle of Higher Education,* pp. A1, A8.

Goldin, C., Katz, L. F., & Kuziemko, I. (2006). The Homecoming of American College Women: The Reversal of the College Gender Gap. *The Journal of Economic Perspectives, 20*(4), 133-156.

Gumport, P., & Bastedo, M. (2001). Academic Stratification and Endemic Conflict: Remedial Education Policy at CUNY. *The Review of Higher Education, 24, 4*, 333-349.

Gurley-Alloway, T. (2009). *More than money: Higher education decisions of low-income and minority students.* Unpublished Ph.D., The University of Texas at Arlington, United States -- Texas.

Hacker, A. (2010, July 16, 2010). Are Colleges Worth the Price of Admission? Some Are. *The Chronicleof Higher Education,* pp. A25 - A26.

HACU. (2009). Hispanic-Serving Institution Definitions *Hispanic Association of Colleges and Universities*, from http://www.hacu.net/hacu/HSI_Definition_EN.asp?SnID=2125217208

Hahn, J., Todd, P., & Van der Klaauw, W. (1999, 2001). Identification and estimation of treatment effect with a regression-discontinuity design. *Econometrica, 69 (1).* 201-209. Downloaded from http://www.google.com/url?q=http://www.unc.edu/~vanderkl/rd.pdf&sa=U&ei=zZB208TvmSDILY200QHQ-_j208Dw&ved=200CBQQFjAB&sig202=TjUnIGsL209niZliZeR200YicA&usg=AFQjCNFnAbof200mB201SPdpoB205BN208G201JLoNfw

Hauptman, A. M. (2007). *Strategies for Improving Student Success in Postsecondary Education: Changing Direction: Integrating Higher Education Financial Aid and Financing Policy*: WICHE - Western Interstate Commission for Higher Education

Heaton, J. (1998). Secondary Analysis of Qualitative Data. *Social Research Updates*, 2012, from http://sru.soc.surrey.ac.uk/SRU22.html

Hester Sr., T. (2011). New state task force to determine how N.J. students can best be prepared for college and careers. *newjerseynewsroom.com*,

Horn, L. (2006). *Placing College Graduation Rates in Context: how 4-year college graduation rates vary with selectivity and teh size of low-income enrollment*. Washington, DC: National Center for Education Statistics.

Hu, S., & St. John, E. P. (2001). Student Persistence in a Public Higher Education System: Understanding Racial and Ethnic Differences. *The Journal of Higher Education, 72*(3), 265-286.

Hussar, W. J., & Bailey, T. M. (2011). *Projections of Education Statistics to 2019*. Washington, DC.: U.S. Department of Education. National Center for Education Statistics. Institute for Education Sciences.

Hutchinson, S. R., & Lovell, C. D. (2004). A Review of Methodological Charactersistics of Research Published in Key Journals in Higher Education: Implications for Graduate Research Training. *Research in Higher Education, 45*(4, June 2004), 383-403.

Imbens, G. W., & Lemieux, T. (2007). Regression discontinuity designs. A guide to practice. *Journal of Econometrics, doi.10.1016/j.jeconom.2007.05.001*, Ishitani, T. T. (2006). Studying Attrition and Degree Completion Behavior among First-Generation College Students in the United States. *The Journal of Higher Education, 77*(5), 861-885.

Jacob, B. A., & Lefgren, L. (2004). Remedial Education and Student Achievement: A Regression-Discontinuity Analysis. *The Review of Economics and Statistics, 86*(1), 226-244.

Jacobs, J. A., & King, R. B. (2002). Age and College Completion: A Life-History Analysis of Women Aged 15-44. *Sociology of Education, 75*(3), 211-230.

Jamelske, E. (2009). Measuring the impact of a university first-year experience program on student GPA and retention. *Journal of Higher Education Vol 57, No. 3*.

Jensen, E. L. (1981). Student Financial Aid and Persistence in College. *The Journal of Higher Education, 52*(3), 280-294.

Johnson, I. (2008). Enrollment, Persistence and Graduation of In-State Students at a Public Research University: Does High School Matter? *Research in Higher Education, 49*(8), 776-793.

Keller, J. (2010). As Pension Costs Rise, Public Colleges Pay the Price*. The Chronicle of Higher Education,* pp. A24 - A26.

Kelly, A., Schneider, M., & Carey, K. (2010). *Rising to the Challenge: Hispanic College Graduation Rates as a National Priority*: American Enterprise Institute.

Kirst, M. W., & Venezia, A. (2006). *Improving College Readiness and Success for All Students: A joint responsibility between K-12 and postsecondary education*. Paper presented at the A National Dialogue: The Secretary of Education's Commission on the Future of Higher Education. Retrieved from http://ed.gov/about/bdscomm/list/hiedfuture/reports.html

Kolesnikova, N. (2010). Community Colleges and Economic Mobility. *Federal Reserve Bank of St. Louis Review, 29*(1), 27-53.

Kuh, G. D., Cruce, T. M., Shoup, R., Kinzie, J., & Gonyea, R. M. (2008). Unmasking the Effect of Student Engagement on First Year College Grades and Persistence. *The Journal of Higher Education, Vol. 79, No. 5*.

Kulm, T. L., & Cramer, S. (2006). The Relationship of Student Employment to Student Role, Family Relationships, Social Interactions and Persistence. *College Student Journal, 40*(4), 927-938.

Lareau, A. (2002). Invisible Inequality: Social Class and Childrearing in Black Families and White Families. *American Sociological Review, 67*(5), 747-776.

Lee, H., & Munk, T. (2008). *Using Regression Discontinuity Design for Program Evaluation*. Denver, CO: American Statistical Association.

Lee, V. E., & Ready, D. D. (2006). *Schools Within Schools: Possibilities and Pitfalls of High School Reform*. New York: Teachers College Press.

Lesik, S. A. (2006). Applying the regression-discontinuity design to infer causality with non-random assignment. *The Review of Higher Education, 30, 1*, 1-19.

Lesik, S. A. (2007). Do developmental mathematics porgrams have a causal impact on student retention? An application of discreet-time survival and regression discontinuity analysis. *Research in Higher Education, 48*(5), 583-608.

Lewis, A. E. (2007). *Race in the Schoolyard: Negotiating the color line in classrooms and communities*. New Brunswick, New Jersey: Rutgers University Press.

Light, A., & Strayer, W. (2004). Who Receives the College Wage Premium? Assessing the Labor Market Returns to Degrees and College Transfer Patterns. *The Journal of Human Resources, 39*(3), 746-773.

Marcus, J. (2000). Revamping Remedial Education. *National Crosstalk*.

Marmer, V., Feir, D., & Lemieux, T. (2011). Weak identification in fuzzy regression discontinuity design. *University of British Columbia. Department of Economics. Downloaded from http://microeconomics.ca/vadim_marmer/wfrd09.pdf*,

Martorell, P., & McFarlin Jr., I. (2010). Help or Hindrance? The effects of college remediation on academic and labor market outcomes. *Unpublished. Working paper version with appendices*,

Martorell, P., McFarlin Jr., I., & Xue, Y. (2011). Does Failing a Mandatory Placement Exam Discourage College-Going? *National Poverty Center Working Paper Series, 11-14*,

Massey, D. S., & Denton, N. A. (1993). *American Apartheid: Segregation and the Making of the Underclass*. Cambridge: Harvard University Press.

McDonough, P. (2004). *The School to College Transition*. Washington, DC: The American Council on Education.

Mealli, F., & Rampichini, C. (2002). *Impact Evaluation of University Grants*. Paper presented at the Joint Statistical Meetings. Social Statistics Section. American Statistical Association.

Merisotis, J., & Phipps, R. (1998). *College Remediation: What it is, What it Costs and What's at Stake*: Institute for Higher Education Policy.

Mogulescu, J. (2011). *Evaluating the Impact of College Remediation at Community Colleges and other Postsecondary Institutions*. New York: City University of New York and New York City Council Committe on Higher Education.

Moore, C., & Shulock, N. (2009). *Student Progress Toward Degree Completion: Lessons from the research literature*. Sacramento: California State University - Sacramento - Institute for Higher Education Leadership and Policy

MSCHE. (2007a). *Self-Study: creating a useful process and report. Middle States Commission on Higher Education*. Philadelphia: Middle States Commission on Higher Education.

MSCHE. (2007b). *Student Learning Assessment: options and resources. Middle States Commission on Higher Education*. Philadelphia: Middle States Commission on Higher Education.

MSCHE. (2009). *Characteristics of Excellence in Higher Education: requirements of affiliation and standards for accreditation*. Online Version: Middle States Commission on Higher Education.

NCEMPT. (2011). North Carolina Early Mathematics Placement Testing Program. from ncempt.org

NCES. (2003). *Remedial Education at Degree Granting Postsecondary Institutions in Fall 2000*. Washington, DC: US Department of Education.

NCES. (2007). *Status and Trends in the Education of Racial and Ethnic Minorities*. Washington, DC: National Center for Education Statistics.

NCES. (2011a). *The Condition of Education 2011*.

NCES. (2011b). *Enrollment in Postsecondary Institutions, Fall 2009: Graduation Rates, 2003 & 2006 Cohorts; and Financial Statistics, Fiscal Year 2009*: National Center for Education Statistics, Washington D. C.

Nemko, M. (2008, May 2, 2008). America's Most Overrated Product: the Bachelor's Degree. *Chronicle of Higher Education,* pp. B17 - B 18.

NJDOE. (2010). New Jersey School Report Card. Retrieved February 2010, from http://education.state.nj.us/rc/

Pascarella, E. T. (1984). College Environmental Influences on Students' Educational Aspirations. *The Journal of Higher Education, 55*(6), 751-771.

Pascarella, E. T., Duby, P. B., & Iverson, B. K. (1983). A Text and Reconceptualization of a Theoretical Model of College Withdrawal in a Commuter Institution Setting. *Sociology of Education, 56*(2), 88-100.

Pascarella, E. T., Ethington, C. A., & Smart, J. C. (1988). The Influence of College on Humanitarian/Civic Involvement Values. *The Journal of Higher Education, 59*(4), 412-437.

Pascarella, E. T., Pierson, C. T., Wolniak, G. C., & Terenzini, P. T. (2004). First-Generation College Students: Additional Evidence on College Experiences and Outcomes. *The Journal of Higher Education, 75*(3), 249-284.

Pascarella, E. T., & Terenzini, P. T. (1977). Patterns of Student-Faculty Informal Interaction beyond the Classroom and Voluntary Freshman Attrition. *The Journal of Higher Education, 48*(5), 540-552.

Pascarella, E. T., & Terenzini, P. T. (1979). Interaction Effects in Spady and Tinto's Conceptual Models of College Attrition. *Sociology of Education, 52*(4), 197-210.

Pascarella, E. T., & Terenzini, P. T. (1980). Predicting Freshman Persistence and Voluntary Dropout Decisions from a Theoretical Model. *The Journal of Higher Education, 51*(1), 60-75.

Pascarella, E. T., Terenzini, P. T., & Hibel, J. (1978). Student-Faculty Interactional Settings and Their Relationship to Predicted Academic Performance. *The Journal of Higher Education, 49*(5), 450-463.

Pascarella, E. T., Terenzini, P. T., & Wolfe, L. M. (1986). Orientation to College and Freshman Year Persistence/Withdrawal Decisions. *The Journal of Higher Education, 57*(2), 155-175.

Paulsen, M. B., & St. John, E. P. (1997). The Financial Nexus Between College Choice and Persistence. *New Directions for Institutional Research, 24*(3), 65-82.

Paulsen, M. B., & St. John, E. P. (2002a). Social Class and College Costs. *The Journal of Higher Education, 73, No. 2*, 189-236.

Paulsen, M. B., & St. John, E. P. (2002b). Social Class and College Costs: Examining the Financial Nexus between College Choice and Persistence. *Journal of Higher Education, 73*(2), 189-236.

Paulsen, M. B., St. John, E. P., & Carter, D. F. (2005). Diversity, College Costs, and Postsecondary Opportunity: An Examination of the Financial Nexus between College Choice and Persistence for African Americans and Whites. *Journal of Higher Education, 76*(5), 545.

Peng, C.-Y. J., Lee, K. L., & Ingersoll, G. M. (2002). An Introduction to Logistic Regression Analysis and Reporting. *The Journal of Educational Research, 96* (1 p3-14 Sep-Oct 2002), p3-14.

Perna, L. W. (2005). The Benefits of Higher Education: Sex, Racial/Ethnic, and Socioeconomic Group Differences. *The Review of Higher Education, 29, No 1*(Fall 2005), 23-52.

Perna, L. W., & Thomas, S. L. (2006). *A Framework for Reducing the College Success Gap and Promoting Success for All*: National Postsecondary Education Cooperative.

Person, A. E., Rosenbaum, J. E., & Deil-Amen, R. (2006). Student Planning and Information Problems in Different College Structures. *Teachers College Record, 108*(3), 374-396.

Portes, A., & Rumbaut, R. G. (2006). *Immigrant America, a portrait* (Third Edition ed.). Berkeley: University of California Press.

Ravitch, D. (2000). *Left Back: A century of battles over school reform*. New York: Simon and Schuster.

Reardon, S. F. (2011). The Widening Academic-Achievement Gap between the Rich and the Poor: New Evidence and Possible Explanations. In R. M. Murnane & G. Duncan (Eds.), *Social Inequalities and Educational Disadvantage*. Washington, DC.

Richards, A. (2010, September 3, 2010). 30 Ways to Rate a College. *The Chronicle of Higher Education*.

Richardson, J. W. (2005). "Who Shall Be Educated?" The case of restricting remediation at the City University of New York. *Education and Urban Society, 37, No. 2*, 174 - 192.

Robbins, S., Allen, J., Casillas, A., Akamigbo, A., Saltonstall, M., Campbell, R., et al. (2009). Associations of Resource and Services Utilization, Risk Level, and College Outcomes *Research in Higher Education, 50, no 4*, 101-118.

Rosenbaum, J. E. (1980). Track Misperceptions and Frustrated College Plans: An Analysis of the Effects of Tracks and Track Perceptions in the National Longitudinal Survey. *Sociology of Education, 53*(2), 74-88.

Rosenbaum, J. E. (1998). College-for-all: Do students understand what college demands? *Social Psychology of Education, 2*, 50-85.

Rosenbaum, J. E. (2001). *Beyond College for All*. New York: Russell Sage.

Rudolph, F. (1962). *The American College and University*. New York: Vantage Books.

Ruppert, S., Harris, Z., Hauptman, A., Nettles, M., Perna, L. W., Millett, C. M., et al. (1998). *Reconceptualizing Access in Postsecondary Education and Its Ramifications for Data Systems: Report of the Policy Panel on Access.*

(Washington, DC, September 9, 1997): National Center for Education Statistics (ED), Washington, DC..National Postsecondary Education Cooperative.American Council on Education, Washington, DC.

Sadovnik, A. R. (1994). *Equity and Excellence in Higher Education: The Decline of a Liberal Educational Reform* (Vol. 35). New York: Peter Lang Publishing, Inc.

Sadovnik, A. R., O'Day, J. A., Bohrenstedt, G. W., & Borman, K. M. (Eds.). (2008). *No Child Left Behind and the Reduction of the Achievement Gap*. New York: Routledge.

Sanoff, A. P. (2007). The U. S. News College Rankings: A view from the inside, *College and University Ranking Systems: global perspectives and American challenges. A monograph*. Washington, DC: Institute for Higher Education Policy.

Schmidt, B., Badillo, H., Brady, J., Mac Donald, H., Ohrenstein, M., Roberts, R., et al. (1999). *The City University of New York: An Institution Adrift*. New York: Mayor's Advisory Task Force on the City University of New York.

Schochet, P., Cook, T., Deke, J., Imbens, G., Lockwood, J. R., Porter, J., et al. (2010). Standards for Regression Discontinuity Design: Retrieved from What Works Clearinghouse. *What Works Clearinghouse*. Retrieved from http://ies.ed.gov/ncee/wwc/pdf/wwc_rd.pdf

Scott-Clayton, J. (2012). *Do High Stakes Placement Exams Predict College Success? (CCRC Working Paper No. 41)*. New York, NY: Columbia University, Teachers College, Community College Research Center.

Semel, S. F. (1994). Writing School History as a Former Participant: Problems in Writing the History of an Elite School. In G. Walford (Ed.), *Researching the Powerful in Education* (Vol. Book Chapter, pp. 204-220): University College London Press.

Semel, S. F. (1995). Writing History as a Former Participant: Reflections on the Connection Between Autobiography and History. *Hofstra Horizons, Fall,* 8-11.

Sewall, M. (2010, August 27, 2010). Northeast Colleges Prepare for the New Normal - Budget Crises. *The Chronicle of Higher Education,* pp. 50-56.

Sewell, W. H., & Shah, V. P. (1967). Socioeconomic Status, Intelligence, and the Attainment of Higher Education. *Sociology of Education, 40*(1), 1-23.

Shadish, W., Cook, T., & Campbell, D. (2002). *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. New York: Houghton Mifflin Company.

Sherman, R. H., & Tinto, V. (1975). *The Effectiveness of Secondary and Higher Education Intervention Programs: A Critical Review of Research*.

Short, P., Vandal, B., & Berryman, T. (2012). Tennessee Developmental Studies Redesign. from http://www.tnredesign.org/

Sickles, R. C., & Taubman, P. (1986). An Analysis of the Health and Retirement Status of the Elderly. *Econometrica, 54*(6), 1339-1356.

Smart, J. C., & Pascarella, E. T. (1987). Influences on the Intention to Reenter Higher Education. *The Journal of Higher Education, 58*(3), 306-322.

Spenner, K., Buchmann, C., & Landerman, L. R. (2002). *The Black-White Achievement Gap in the First College Year: Evidence froma New Longitudinal Study*. Paper presented at the XV Congress of Sociology of the International Sociological Association.

St. John, E. P., Paulsen, M. B., & Carter, D. F. (2005a). Diversity, College Costs, and Postsecondary Opportunity: An Examination of the Financial Nexus between College Choice and Persistence for African Americans and Whites. *The Journal of Higher Education, 76*(5), 545-569.

St. John, E. P., Paulsen, M. B., & Carter, D. F. (2005b). Diversity, College Costs, and Postsecondary Opportunity: An Examination of the Financial Nexus between College Choice and Persistence for African Americans and Whites. *Journal of Higher Education, 76*(5), 545.

Strauss, L. C., & Volkwein, J. F. (2004). Predictors of Student Commitment at Two-Year and Four-Year Institutions. *The Journal of Higher Education, 75*(2), 203-227.

Suhre, C. J. M., Jansen, E. P. W. A., & Harskamp, E. G. (2007). Impact of Degree Program Satisfaction on the Persistence of College Students. *Higher Education: The International Journal of Higher Education and Educational Planning, 54*(2), 207-226.

Texas A&M Basic Skills Placement. 2012. from http://www.tamu-commerce.edu/vpaa/tasp/taspcompare.htm

TheEconomist. (2006, January 19, 2006). Rebuilding the American Dream Machine. *The Economist*

Tienda, M. (2009). *Hispanicity and Educatioanl Inequality: Risks, Opportunities and the Nation's Future*: ETS.

Tierney, W. G. (1992). An Anthropological Analysis of Student Participation in College. *The Journal of Higher Education, 63*(6), 603-618.

Tinto, V. (1974). *Public Junior Colleges and the Substitution Effect in Higher Education*. Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, Ill., April 16, 1974).

Tinto, V. (1982). Limits of Theory and Practice in Student Attrition. *The Journal of Higher Education, 53*(6), 687-700.

Tinto, V. (1987). *The Principles of Effective Retention*. Paper presented at the Fall Conference of the Maryland College Personnel Association (Largo, MD, November 20, 1987).

Tinto, V. (1988). Stages of Student Departure: Reflections on the Longitudinal Character of Student Leaving. *The Journal of Higher Education, 59*(4), 438-455.

Tinto, V. (1993). *Leaving College: Rethinking the Causes and Cures of Student Attrition* (Second Edition ed.). Chicago: The University of Chicago Press.

Tinto, V. (1997). Classrooms as Communities: Exploring the Educational Character of Student Persistence. *The Journal of Higher Education, 68*(6), 599-623.

Tinto, V., & Cullen, J. (1973). *Dropout in Higher Education: A Review and Theoretical Synthesis of Recent Research*: Columbia Univ., New York, NY. Teachers College.

Tinto, V., & Sherman, R. H. (1974). *The Effectiveness of Secondary and Higher Education Intervention Programs: A Critical Review of the Research*: Columbia Univ., New York, NY. Teachers College.

Titus, M. A. (2006). Understanding the Influence of the Financial Context of Institutions on Student Persistence at Four-Year Colleges and Universities. *The Journal of Higher Education, 77*(2), 353-375.

Trochim, W. (1994). The Regression Discontinuity Design: An Introduction. *Research Methods Paper Series. Retrieved from* *www.socialresearchmethods.net/research/reshome.html*,

Trochim, W. (2006). The Regression-Discontinuity Design. *Downloaded from* *www.socialresearchmethods.net/kb/quasird.php*,

Trochim, W. M. K., & Spiegelman, C. H. (1980). The relative assignment variable approach to selection bias in pretest-posttest group designs. *In Proceedings of the American Statistical Association, Social Statistics Division*,

U.S.Census. (2000). U.S. Census Bureau. from www.census.gov

U.S.Census. (2008). Current Population Survey: Annual Social and Economic Supplement.

UCLA. (2012). Introduction to SAS: Academic Technology Services, Statistical Consulting Group. from http://www.ats.ucla.edu/stat/sas/dae/exlogit.htm

USDE. (2001). No Child Left Behind. from http://www2.ed.gov/policy/elsec/leg/esea02/index.html

USDE. (2006). Accredited Postsecondary Minority Institutions. from http://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst-list-hisp-tab.html

USDE. (2009). Developing Hispanic-Serving Institutions Program -- Title V.

USDE. (2010). TRIO Programs. from http://ed.gov/about/offices/list/ope/trio/index.html#programs

Usher, A., & Savino, M. (2007). A global survey of rankings and league tables, *College and University Ranking Systems: global perspectives and American challenges. A monograph*. Washington, DC: Institute for Higher Education Policy.

Venezia, A., Kirst, M. W., & Antonio, A. L. (2003). *Betraying the College Dream: How disconnected K-12 and postsecondary education systems undermine student aspirations*. Stanford University: http://www.stanford.edu/group/bridgeproject/.

Wells, R. (2008). The effects of social and cultural capital on student persistence. *Community College Review, 36*(1), 25-46.

Winerip, M. (2011). In college, working hard to learn high school material. *The New York Times*. Retrieved from http://www.nytimes.com/2011/10/24/education/24winerip.html

Woosley, S., Slabaugh, K., Sadler, A. E., & Mason, G. W. (2005). The Mystery of Stop-Outs: Do Commitment and Intentions Predict Reenrollment? *NASPA Journal, 42*(2), 188-201.

Woosley, S. A., & Miller, A. L. (2009). Integration and Institutional Commitment as Predictors of College Student Transition: Are Third Week Indicators Significant? *College Student Journal, 43*(4), 1260-1271.

Zea, M. C., Reisen, C. A., Beil, C., & Caplan, R. D. (1997). Predicting Intention to Remain in College among Ethnic Minority and Nonminority Students. *Journal of Social Psychology, 137*(2), 149-160.

Appendix A: Summary of Recent Studies on Remediation

Study	Authors	Design	Findings	Sample Size	Cut Point	Band-width
Shape Up or Ship Out: The effects of remediation on students at four year colleges	Bettinger and Long (2004)	instrumental variables strategy based on variation in placement policies and the importance of proximity to college (OHIO)	F1: placement in remediation (intent to treat) increases likelihood of drop out or transfer to lower level college (remediation becomes resorting method) F2: students who complete remediation less likely to drop out (inc persistence) but take longer to graduate and more likely to transfer to lower-level colleges	8,600 first time full time freshmen enrolled at Ohio non selective 4 year colleges	NA/ varied, depending on the college (autonomy of IHE)	N/A
New Evidence on College Remediation	Attewell, Lavin, Domina and Levey (2006)	Counter-factual model of causal inference, using propensity scoring and caliper matching to examine NELS:88 data to determine degree completion, number of credits earned and interruption of enrollment	F1: remediation in reading in 4yr colleges lower likelihood of graduation, in 2 yr colleges show higher likelihood of graduation in 8 years F2: remediation in math in 4 yr colleges show ambiguous results, in 2yr colleges indicate lower likelihood of graduation F3: remediation increases time to degree completion and lowers likelihood of degree completion in 4 yr colleges	6,879	NA: looked at whether student took remediation, and whether completed remediation or not	N/A
The impact of postsecondary remediation using a regression discontinuity approach: addressing endogenous sorting and noncompliance	Calgano and Long (2008) (Florida)	RD (with IV) look at Florida student outcomes of those who scored just above and below cutoff, persistence to 2nd yr, future course performance (passing subsequent college level English comp, math) total credits earned, total college level credits earned	F1: students near margin of requiring math remediation slightly more likely to persist to 2nd year; F2: students near margin of requiring reading remediation less likely to pass college English F3: no similar finding for remedial math F4: remediation promotes early persistence but does not help students within bandwidth to persist and complete degree	100,000	CPT score of 72 for elementary algebra and 83 for reading Bandwidth is 0 to 20 after sensitivity analysis	0-20 points after sensitivi ty analysis
Addressing the needs of	Bettinger and	instrumental variables	F1: students who completed remediation	28,000	NA	NA

underprepared students in higher education: does college remediation work?	Long (2006 study, pub 2009)	strategy based on variation in placement policies and the importance of proximity to college (OHIO)	had better educational outcomes. F2: remediation reduces likelihood of dropping out after 5 years and increasing likelihood of completing within 4 to 6 yrs only for those close to margin of needing remediation			
Does remediation work for all students? How the effects of postsecondary remedial and developmental courses vary by level of academic preparation	Boatman and Long (2010)	RD (with IV)to look at multiple levels of remediation at multiple points on skill spectrum (TENNESSEE)	F1: Effect of assignment to remediation differs by level of preparation/skill. F2: Remediation negative effect on students on the margins - less likely to complete college degree in 6 yrs. And completed fewer courses in 3 years. F3: Remediation less negative with some positive effects on students with scores far from cut-off (less prepared): math only marginally negative and writing had some positive effects on persistence and degree attainment compared to better prepared students	2500 observations out of 200,000 due to restrictions	COMPASS score of 50 for Math and 68 for Reading. Bandwidth is 5 for Math and 7 for reading	5 for math and 7 for reading
Help or hindrance? The effects of college remediation on academic and labor market outcomes	Martorell and McFarlin (2007, pub 2010)	RD (with IV) look at longitudinal administrative data on TX students attending 2 and 4 yr colleges, at margin for placement into remediation (TEXAS)	F1: little evidence of positive effects of remediation on student's completion, number of credits attempted or future labor market earnings for students at margin/close to cutoff scores F2: small negative effect on # credits attempted, and completion of at least 1 yr of college. F3: statistically insignificant effect on degree completion and transfer to 4 yr	255,000 2yr college students and 197,000 4 yr college students, with fewer observations due to restrictions	220 then changed to 230 on the TASP (Texas Academic Skills Program) test. Bandwidth is 10 above and below c/o	10 above and below
Competing explanations of undergraduate non-completion	Attewell, Heil and Reisel (2010)	analysis using sheaf coefficient of multiple variables	remediation significantly larger effect on college completion if students attend less selective colleges, not for 2 yr school or moderately or highly selective 4 yr schools	65,130 for base sample and 32,909 for 90 day buffer from test-taking to enrollment sample	Cutoff 220, 230	
Does failing a mandatory placement exam	Martorell, McFarlin Jr.,	RD (IV) analysis of placement/requiremen	F1: requirement/placement into remediation has little or no effect on	65,130 for base sample	65,130 for base sample and	

discourage college-going?	Xue (2011)	t of remediation on college enrollment behavior for students on margins of passing scores (TEXAS)	enrollment behavior (delay or non-attendance). F2: financial and psychic costs of being assigned to remediation are not very high/not sufficiently high to offset college attendance. F3: receiving test results indicating poor academic skills are either no "news" or not enough to dissuade students from attending college	and 32,909 for 90 day buffer from test-taking to enrollment sample	32,909 for 90 day buffer from test-taking to enrollment sample	
Applying the Regression-Discontinuity Design to Infer Causality with Non-Random Assignment	Lesik, 2006	RD (IV) analysis of impact of developmental math program on student success in college level math courses	F1: participation in developmental math program significantly increases the odds of successfully completing college level mathematics course on the first attempt	1276	125 on undisclosed college placement exam	Assigned 5 points off the cut score
Do developmental mathematics programs have a causal impact on student retention? An application of discrete-time survival and regression-discontinuity analysis	Lesik, 2007	RD (IV) and discreet-time hazard model to determine causal impact of math developmental programs on when students are most at risk of dropping out of college for the first time	F1: participation in a developmental math program has a positive impact on student retention. F2: students who participated in the remedial math program were 4.3 times more likely to drop out of the university in their first 3 years, when compared to similar students who did participate in the math remedial program	1276, N=212 WITHIN BANDWIDTH	125 on undisclosed college placement exam	
Evaluating developmental education programs in higher education	Lesik, 2008	RD (IV) and discreet-time hazard model to determine causal impact of math developmental programs on when students are most at risk of dropping out of college for the first time	F1: students at margins who completed remediation found more likely to persist			

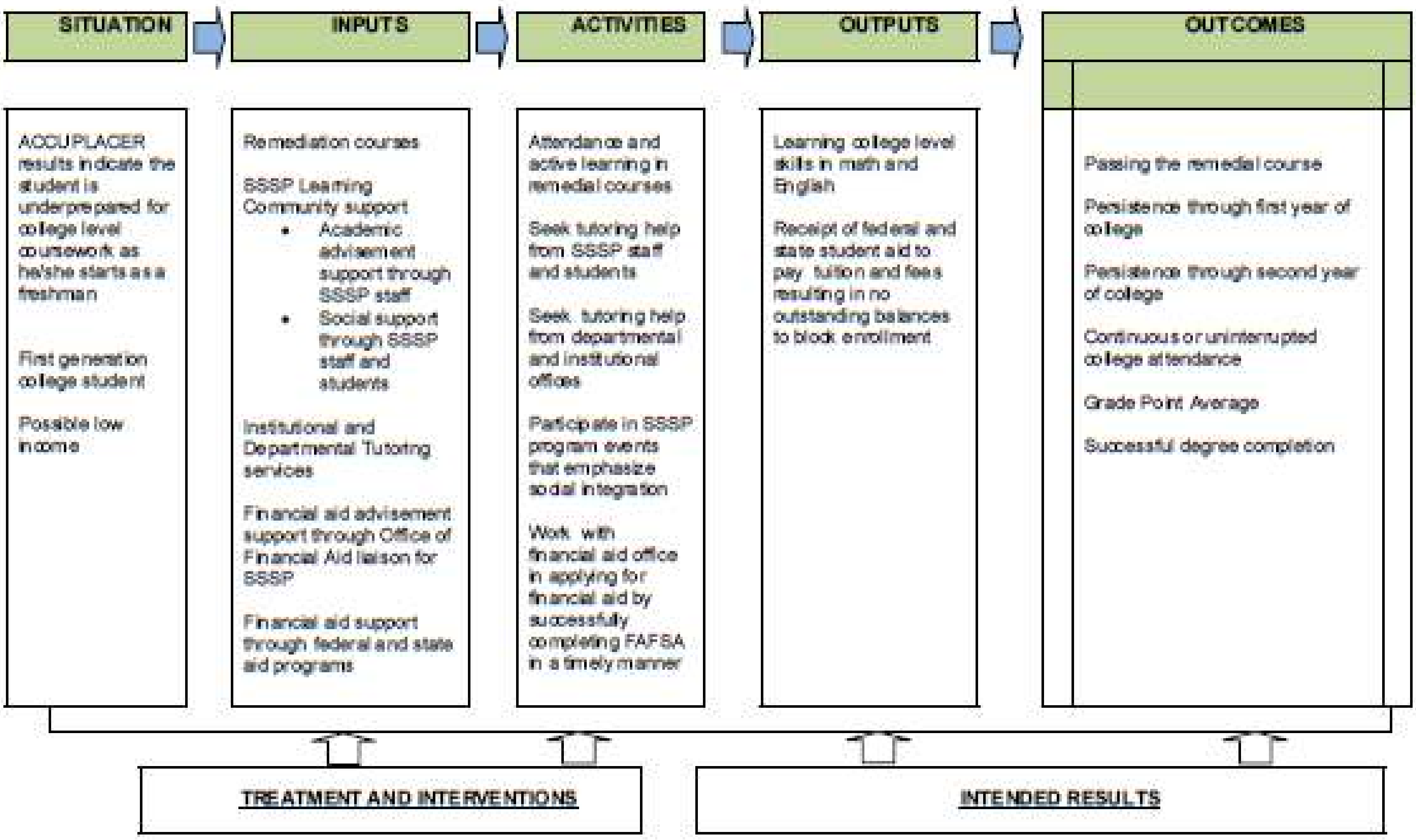
REMEDIATION LOGIC MODEL Worksheet: EOF Cohort

SITUATION	INPUTS	ACTIVITIES	OUTPUTS	OUTCOMES
ACCUPLACER results indicate the student is **underprepared** for college level coursework as he/she starts as a freshman Low income, historical poverty Possible first generation college student	Remediation courses EOF Learning Community support • Academic advisement support through EOF staff • Grant funding support through EOF Institutional and Departmental Tutoring services required Financial aid advisement support through Office of Financial Aid liaison for EOF Financial aid support through federal and state aid programs	Attendance and active learning in remedial courses Seek tutoring help from EOF staff and students Seek tutoring help from departmental and institutional offices Work with EOF counselors and staff to meet and maintain cohort membership/participation and grant eligibility Work with financial aid office in applying for financial aid by successfully completing FAFSA in a timely manner	Learning college level skills in math and English Receipt of federal and state student aid to pay tuition and fees resulting in no outstanding balances to block enrollment Receipt of additional grant funds to purchase books and supplies in a timely manner	Passing the remedial course Persistence through first year of college Persistence through second year of college Continuous or uninterrupted college attendance Grade Point Average Successful degree completion

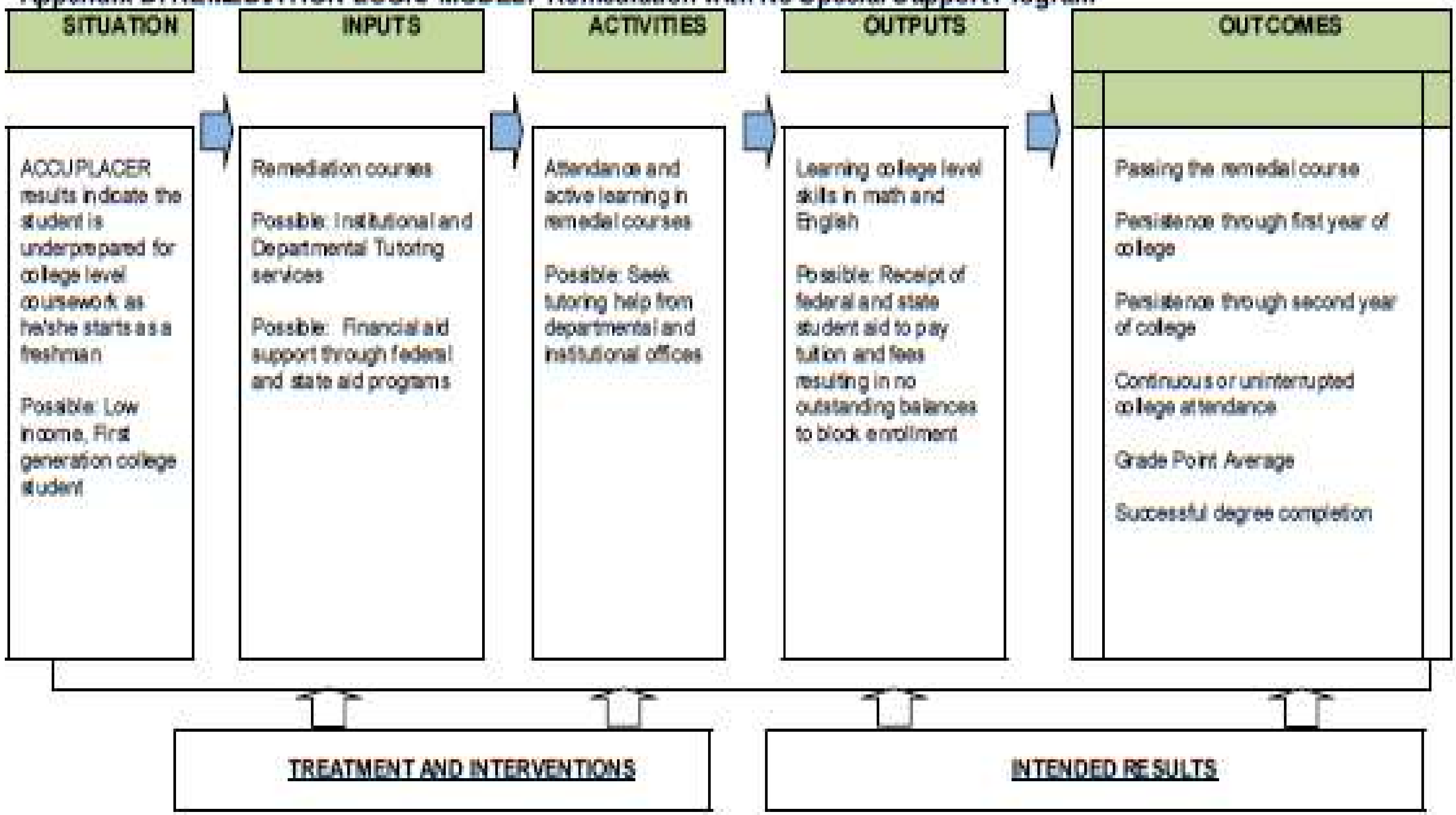
TREATMENT AND INTERVENTIONS

INTENDED RESULTS

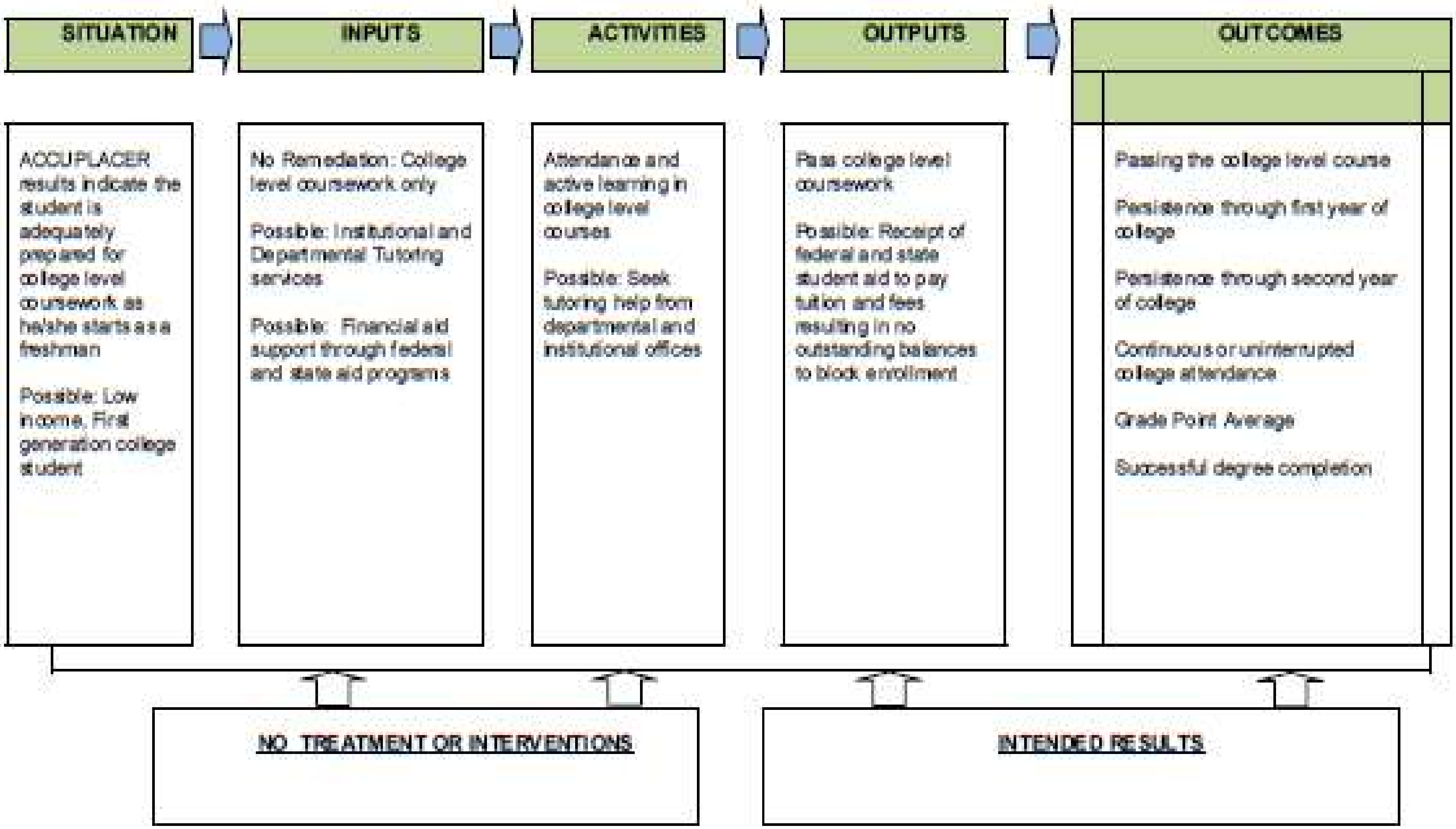
Appendix C: REMEDIATION LOGIC MODEL: SSSP Cohort



Appendix D: REMEDIATION LOGIC MODEL: Remediation with No Special Support Program



Appendix E: NON-REMEDIATION LOGIC MODEL Worksheet: Non-Remediation (Control)



APPENDIX F:

Variable Name	**Description**	**Notes/Coding**
Pre-College Variables		
• HS GPA	High School cumulative grade point average	4.0 scale, max value = 4.0
• SAT Math	Highest recorded SAT score for Math component	Minimum value = 200 Maximum value = 800
• SAT Verbal	Highest recorded SAT score for Verbal component	Minimum value = 200 Maximum value = 800
• READ	Reading score on ACCUPLACER	Minimum value = 0 Maximum value = 120 Cut Score = 92
• ARIT	Arithmetic score on ACCUPLACER	Minimum value = 0 Maximum value = 120 Cut Score = 68
Demographic Variables		
• Female	Student reported gender	0 = no 1 = yes
• Male	Student reported gender	0 = no 1 = yes
• Ethnicity	Student reported ethnicity	Black Hispanic Asian White
• FIRSTGEN	Student reported first generation status	0 = no 1 = yes
• FINAID	Student reported need for financial aid	0 = no 1 = yes
• %NeedMet	Percentage of student's tuition and fee costs met by financial aid	Minimum value = 0 Maximum value = 1
Independent Remediation Variables		
• REMEDIATION	Students in remediation but no special support	0= No 1 = Yes
• EOF	Students in remediation with	0 =No

	EOF support	1 = Yes
• SSSP	Students in remediation with SSSP support	0 = No 1 = Yes
• Control (No Remediation)	Students with no remediation requirements	
Output/Outcome Variable		
• Persistence to Second Year	Student returned for a second year of college	0=No 1 = Yes
• CGPA	Cumulative GPA as of fall 2011 or term of last attendance	4.0 scale
• Degree	BA degree awarded	1 = yes 0 = no
• DISMISSAL	Student dismissed from State College	0 = no 1 = yes
• Credits Earned in First Year)	Credits earned in the first fall and spring term at State College	Minimum value = 0 Maximum value = 32

APPENDIX G: Recoding of College Grade Point Average and Credits Earned in the First Year

The cumulative grade point averages were coded as follows:

5 = 3.5 to 4.0

4= 2.5 to 3.49

3=1.5 to 2.49

2=0.5 to 1.49

1=0 to 0.49

The %Need Met, the proxy used for socioeconomic status, was coded as follows:

76% to 100% Need Met = 4

51% to 75% Need Met =3

26 % to 50% Need Met =2

0% to 25% Need Met =1

CURRICULUM VITAE

CARMEN PANLILIO
February 16, 1965
Manila, Philippines

EDUCATION

1979 – 1983 Philippine Science High School

1983 – 1989 B.A., English Language and Literature, University of the Philippines

1995 – 1999 M. A., Human Behavior & Organizational Psychology, Kean University

2008 – 2012 Ph.D., Urban Systems, Rutgers University – The State University of New Jersey

PROFESSIONAL EXPERIENCE

February 2011 to Present, New Jersey City University, Jersey City, New Jersey, Associate Vice President for Enrollment Management

2008-2011, New Jersey City University, Jersey City, New Jersey
Assistant Vice President for Enrollment Management and Admissions

2005 to 2008, New Jersey City University, Jersey City, New Jersey
Assistant Vice President for Admissions and Financial Aid

2001 – 2005, New Jersey City University, Jersey City, New Jersey
Director, Office of Financial Aid

1998 – 2001, Thomas Edison State College, Trenton, New Jersey
Director of Financial Aid and Veterans Services

1994 – 1998, Berdan Institute/EFC Trade Inc. III, Director of Financial Aid

1989 – 1994, United Counties Trust Company, Student Loan Manager