AN ANALYSIS OF THE IMPACT OF HIGH SCHOOL DUAL ENROLLMENT COURSE PARTICIPATION ON POST-SECONDARY ACADEMIC SUCCESS, PERSISTENCE AND DEGREE COMPLETION

by

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PH.D. THESIS

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To the students of Geneseo High School,
who struggle, strive and achieve

To my mother,
who valued public education for her children,
but was denied a high school education

To my father,
whose advice to get a teaching certificate
started me on this career path

To my beautiful and brilliant daughter, Emily,
who will earn the first M.D./Ph.D. in our family

and most especially,

To my husband, Ron,
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Without his patience and self-sacrifice,
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"The effects of grades and tests diminish in time,
but the stuff of learning does not go away."

Clifford Adelman, "Answers in the Toolbox", 1999

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ABSTRACT

The study explored several possible impacts of high school dual enrollment course participation on post-secondary persistence and degree completion. The potentiality of participation in dual enrollment programs has not been evaluated using a national database of student records. Programs have grown in number and enrollment without a basis for evaluating the probability of improving students' success in post-secondary education. This research sought to identify dual enrollment participants' likelihood of acquiring college credits, of continuously enrolling through the second year in college, of graduating with bachelor's degrees in less than 4.56 years, and of earning post-secondary credentials.

An original causal model was developed to guide the selection of variables used in twenty-one logistic regression equations. Utilizing NELS: 88/2000 restricted data, PETS (Post-secondary Educational Transcript Study: 2000) and PETS supplementary variables, the research addressed the total and direct effects of dual enrollment participation on a specific set of outcomes. The analytical sample included students who were members of the senior class of 1992 for whom transcripts from high school and college had been collected. Tinto's theory of individual departure from institutions of higher education and Merton's theory of anticipatory socialization were tested as a means to understand the influences of dual enrollment participation on students entering post-secondary education.

Resultant inferential statistics showed that demographic and high school characteristics of dual enrollment participants, as identified in the causal model, were of little consequence to degree attainment or the types of colleges students attended

immediately after high school. Students who gained college credits through dual enrollment were more likely to enter college immediately after high school and persist to the second year in post-secondary education. Dual enrollment participants who demonstrated academic momentum (early acquisition of credit and immediate entry to college) were also more likely to complete a bachelor's degree or advanced degrees. Dual enrollment participation provided students with experiences that may have changed their outlooks on achieving a bachelor's degree.

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CHAPTER I
INTRODUCTION TO THE PROBLEM

Origin of Interest in Dual Enrollment Programs

As Assistant Superintendent for Instruction in the Geneseo Community Unit School District (Geneseo, Illinois), I spearheaded an initiative to expand opportunities for our district's high school students to enroll in at least one college credit-bearing course before graduation. I experienced and facilitated the programs required to successfully integrate dual enrollment courses into the fabric of our high school. Furthermore, I conducted training for high school teachers to develop and implement course curricula and instruction for credit bearing courses in all major content areas and the fine arts. The balance of vocational and academic college level courses offers Geneseo High School students varied choices tailored to their career or post-secondary aspirations.

Before embarking on this transformation of Geneseo High School, the district collected data from student surveys and test scores. The data indicated that our students intended to enter post-secondary education at much higher rates than the number of students actually enrolled in pre-college core courses, as recommended by American College Testing, Inc. (ACT): 4 years English, 3 years Math, 3 years Social Studies, 3 years Science (American College Testing, Inc., 2001, 2005). According to ACT and Illinois Prairie State Achievement Test Results – April/May PSAE 2005, 42% of high school juniors across the State of Illinois intended to complete the recommended college core curricula. In Geneseo, however, between 28% and 33% of high school juniors reported their intention to complete the recommended core courses over the past five school years. In contrast, an average of 85% of Geneseo graduating seniors indicated their intentions to attend post-secondary institutions. Large numbers of college-bound high school students failing to complete recommended pre-college coursework at Geneseo High School warranted changes in both the high school course offerings and the information given to parents concerning college readiness.

Although the school district personnel voiced concern for the college persistence and degree attainment rates of our students, the guidance department lacked hard data from recent graduating classes. Data collected from the High School Survey of Student Engagement (HSSSE) survey (conducted in the spring of 2005) and from ACT and PLAN test surveys indicated that more than half of Geneseo High School students requested enhanced assistance with post-secondary plans. Starting in the spring of 2006, annual surveys of high school graduates began collecting information concerning post-secondary and work plans following graduation, as well as follow up surveys of these same students for up to five years from graduation. The district expects that the data will enhance its knowledge of student graduation rates from post-secondary institutions, as well as quantify those students who successfully entered the workforce.

More opportunities to engage in college level coursework on the high school site proved appealing to students in Geneseo. As a result, student enrollments in dual enrollment classes increased our student body's involvement in credit-bearing transition program (CBTP) classes from 12% of the students in grades 10-12 during the 2004-05 school year to 32% in 2005-06. Nearly 30% of the 711 students enrolled in 10th through 12th grade at Geneseo High School in 2006-07 participated in either dual enrollment or Advanced Placement classes. Articulated courses, classes for which students may gain credit if they enroll at Black Hawk College following high school graduation, were offered in the business, agricultural, industrial technology, family and consumer sciences, and science departments. Therefore, the potential existed to reach a larger percentage of the population with the possibility of earning college credit through successful completion of high school courses. But, the consequences of providing CBTP's to enhance students' chances at persistence and degree attainment at the post-secondary institution of their choice, remains generally unknown. This research study seeks to identify the possible impact that participation in CBTP programs have upon students' persistence and degree completion in college.

Introduction to the Research Problem

The National Governors' Conference, held on February 27, 2005, brought national attention to the question of how to successfully prepare high school students for post-secondary education and for eventual gainful employment. Topical discussions included: current rigor in high school courses; increasing graduation requirements; and the burgeoning number of college students enrolled in remedial level courses (Olson & Rickard, 2005). Although these issues primarily affect students as they enter college, student departure from college has also immerged as a concern for policy makers, university officials, parents, students, and instructors in both secondary and post-secondary settings.

Vincent Tinto's theory of individual departure from institutions of higher education has provided researchers with an explanatory model of students' departure from college. In regards to student decisions to persist or depart, Tinto's revised 1993 theoretical model placed less importance upon attributes preceding post-secondary level entrance, and more emphasis on academic and social experiences during the college years. Conversely, research conducted by the US Department of Education, utilizing secondary data sets, has consistently suggested that high school curriculum exhibits strong and positive impacts toward college persistence and degree attainment (Adelman, 1999a, 2004, 2006). These differing viewpoints have produced two schools of thought regarding college persistence –those who believe that the knowledge and skills students acquire before college strongly correlate with degree completion, and those who believe that events after matriculation matter most. Whereas Tinto's theory did not wholly dismiss the importance of pre-college attributes, differences in opinions collided at the cusp of the college experience. This study, therefore, will investigate the impact of credit bearing transition programs, particularly dual enrollment (DE) course participation, upon college persistence and degree attainment. Because dual enrollment students remain officially enrolled in high school, the academic outcomes of participation may extend our understanding of both short and long term impacts of transitional experiences.

The rates of post-secondary completion for the general population, as well as for students who intended to complete college degrees, are well documented. US Census reports found that, in 2005, 28% of all adults aged 25 and older had earned at least a bachelor's degree (Bergman, 2007, p. 1). The National Educational Longitudinal Study (NELS: 88/2000) collected data on a nationally representative set of 8^{th} grade students in 1988 and followed these students through 8 years beyond high school graduation. Adelman (2006) found that 34% of the participants in the NELS: 88/2000 had earned either a bachelor's or an associate in arts degree (p. 106). Furthermore, the NELS data revealed that 45% of students whose records showed college attendance received a bachelor's degree by the age of 26 or 27 (Adelman, Daniel & Berkovits, 2003, p. 3). An analysis of the Beginning Post-secondary Students Longitudinal Studies (BPS: 96/01) revealed that 53% of students who entered a four-year institution in 1995-96 completed a degree within five years of matriculation (Horn & Kojaku 2001, p. 47). Comparable data regarding students entering two-year public institutions showed only 25% completing either an associate in arts degree or a certificate program (Horn & Kojaku, 2001, p. 53). The prevailing message points to an increase in bachelor's degree recipients for students who attended a four year college at some point in their post-secondary careers, and especially for those students whose college of first attendance was a four-year institution. Nevertheless, completion rates compare unfavorably to the number of people who anticipate successful outcomes in post-secondary education.

At no time in our country's history have so many students shown an interest in experiencing higher education. US Department of Education researcher Clifford Adelman (1999b) utilized the NELS: 88/1994 data to determine that 75% of high school seniors in the class of 1992 had continued their education within two years of graduation, and to further project that 80% or 2.56 million students from the 2007-08 high school graduating class will enter post-secondary institutions (p. 23). Discrepancies between students embarking upon a post-secondary experience versus those who earned college degrees have affirmed that a vast majority of students fail to persist (Adelman, Daniel & Berkovits, 2003).

Seeking to further investigate students' interests in gaining college credit, the National Center for Education Statistics (NCES) published two census reports in 2005 in an effort to identify rates of participation by high school students in credit-based transition programs (CBTP). The NCES documents reported 1.2 million students enrolled in dual credit courses and 1.8 million Advanced Placement (AP) student registrations during 2002-2003 (Waits, Setzer & Lewis, 2005, p. 4). For AP programs, these data represented a 750% increase in student enrollments over the past 20 years (College Board, 2005, p. 3). The effects of student participation in dual enrollment programs, as related to students' chances at persisting toward college graduation, remained largely unknown (Hughes, Karp, Fermin & Bailey, 2005). Therefore, studying the impact of dual enrollment courses upon matriculated college students' persistence and degree attainment is warranted.

Dual Enrollment: A Primer

According to Puyear, Thor, and Mills (2001), a variety of course configurations exist under the umbrella of dual enrollment. The typical DE program originates from a community college or university and enables high school students to concurrently enroll in college level courses. Students successfully completing course requirements earn college credits issued by the sponsoring post-secondary institution. College instructors teach dual credit courses earning only college credit. College courses taught by high school teachers, who are hired as adjunct professors by the sponsoring college, are usually identified as concurrent enrollment classes (CE) and customarily award both high school and college credit to students upon course completion. Concurrent enrollment courses, for purposes of this dissertation, will be considered a subset of dual enrollment. Student transcripts, as a rule, do not indicate the employment status of the instructor.

Dual enrollment classes may be taught in person at the high school or via distance learning/interactive television from the college campus. In other situations, courses might be conducted at the college or university campus, with high school students participating along side traditional college students or joining cohorts of other high school students.

No matter the course delivery system, dual enrollment courses feature a common syllabus, curriculum, textbook, grading scale, tests, course description, and identifiable course number, so that in every possible way dual enrollment classes replicate classes offered to traditional college students.

High school students enroll in dual enrollment classes at post-secondary institutions after meeting entrance regulations, usually a qualifying score on a college placement exam. Some colleges require students to meet a minimum age standard in order to take part in credit bearing classes. In order for students to earn both college and high school credit, teachers of concurrent enrollment courses must hold a current secondary school teaching certificate.

Dual enrollment programs currently flourish across the nation, by way of formalized relationships between high schools, community colleges and universities (Waits, Setzer & Lewis, 2005; Kleiner & Lewis, 2005). NACEP, the National Association for Concurrent Enrollment Partnerships, serves as the accreditation agent for concurrent enrollment programs. Standards for accreditation reinforce the credibility of courses and transferability of credits earned through successful completion of classes taught by high school staff and sponsored by community colleges and universities.

Dual and concurrent enrollment courses, as opposed to Advanced Placement (AP) courses, target students headed either for two-year or four-year institutions of higher education. Although the aforementioned 2005 National Governors' Conference promoted AP courses as a means to increase the rigor of the high school curriculum, dual enrollment courses may produce a wider range of benefits for students. First and foremost, dual credit course completion generates college transcripts and credit. Dual enrollment course credit, granted by the sponsoring post-secondary institution, transferred to either two or four-year institutions by way of articulation agreements governed by the higher education boards of individual states or agreements negotiated between institutions, such as the IAI (Illinois Articulation Initiative). Credit granted through AP classes, on the other hand, varies from institution to institution and from department to department. Credits earned through AP classes depend on the final score on the national Advanced Placement exam in any particular subject area. Therefore, Advanced Placement courses do not technically fall under the umbrella of dual enrollment classes, but rather constitute another type of credit-based transition program.

Dual enrollment classes typically include courses in the general education sequence. Students use dual enrollment credits to jump-start their way to an associate in arts degree at the local community college or to enter university at a level above the rest of the incoming freshmen. Students enroll in dual enrolment, beginning in the summer before their junior year of high school, could realistically earn enough credits to enter a four-year institution having completed all general education requirements. For students whose time to degree remained unchanged by their participation in college level credit classes before matriculation, learning was nevertheless enhanced by active involvement in these more rigorous courses (Johnstone & del Genio, 2001, p. 28).

Statement of the Problem

The potentiality of participation in dual enrollment programs, as related to persistence and degree attainment in post-secondary education, has not been evaluated utilizing a representative national database of student records. Therefore, dual enrollment programs have proliferated without comprehensive research to support their effectiveness as a means to improve persistence and degree attainment at the post-secondary level.

Purpose of the Study

Although a singular solution to college student attrition may never ever be ascertained, educational and sociological research continues to pursue possible explanations for the causes of departure from college (Clark, 1960; Tinto, 1975). Likewise, identifying the qualities of students who struggle and ultimately persevere through the educational system to college graduation remains the subject of research, such as that compiled over thirty years by Pascarella and Terenzini (2005). Therefore, defining efficacy of dual enrollment, in terms of college persistence, academic achievement, and degree attainment, merits scholarly investigation. The discrepancy between the number of students who initiate a college education and those earning degrees, further motivates this research into the possible impact of credit based transition programs, such as dual enrollment, upon college persistence and degree attainment.

Discrepancies between the numbers of students embarking upon a post-secondary experience versus those who actually earn a college degree show that a vast majority of students do not persevere to completion of the task (Adelman, Daniel & Berkovits, 2003). For those students enrolled in credit bearing transition programs, specifically dual enrollment classes, it is presently unknown if participation affects students' chances at persisting to college graduation (Hughes, Karp, Fermin, & Bailey, 2005). The purpose of this study was to investigate the relationship between high school students' participation in dual enrollment courses and subsequent college persistence and degree attainment.

Rationale for the Study

Prior research studying the effects of dual enrollment programs upon student attrition or persistence has been conducted using data obtained from individual college or statewide programs. This study evaluated the impacts of dual enrollment programs upon student persistence and degree attainment through analysis of data from a nationally obtained cohort group. Although the NELS: 88/2000 data have been utilized for any number of research projects (Adelman, 1999a, 2004, 2006), to date no research has been conducted using these data to separate dual enrollment from the aggregate of credit bearing transition programs. With increasing interest and participation by high school students, a study concerning the effects of dual enrollment programs on a national scale seems in order. Adelman (2004) cited three individual studies in which "encouraged research that would split out the dual-enrollment portion of acceleration credits… and whether dual-enrollment prepares students for post-secondary coursework" (p. 55). Due to the fact that student participation in dual enrollment programs has reached a level nearly equal to that of Advanced Placement, a national study of the effects of dual enrollment upon student outcomes in post-secondary education is now warranted (Waits, Setzer & Lewis, 2005; Kleiner & Lewis, 2005).

Research Questions

Research questions guiding this study are as listed below:

1) Do students who have participated in dual enrollment programs have higher rates of second year college persistence than those who were not dual enrollment participants?

2) Do students who have participated in dual enrollment programs have shorter time to degree periods than those who are not dual enrollment participants?

3) Do students who have participated in dual enrollment programs experience higher levels of college degree attainment than those who are not dual enrollment participants?

4) Do students who have participated in dual enrollment programs experience positive affects upon college persistence and degree attainment after accounting for specific demographic attributes, when compared to those who are not dual enrollment participants after accounting for these same attributes?

Limitations of the Study

Although the NELS: 88/2000 data identified students who received credits for college courses taken in high school through dual enrollment programs separately from students who earned Advanced Placement (AP) or credit by examination (CLEP) credits, the data do not identify students by their participation in any one particular type of dual enrollment programs. Dual enrollment programs vary greatly in format. High school students enrolled in traditional college classes taught by community college or university employed instructors at the post-secondary site. Another configuration arranged for traditional college courses taught by college instructors at the high school campus to both high school and college students. Additionally, dual enrollment programs utilize distance-learning technologies for high schools geographically removed from the sponsoring post-secondary institution. Regardless of the particular configuration, DE courses generate college credit for participating students- the primary condition of the independent variable for this study.

Concurrent enrollment courses describe yet another genre of dual enrollment for high school students to pursue. Through concurrent enrollment courses (CE), students earned both high school and college credit for an individual course. Generally, to create a concurrent enrollment course, the instructor must possess both high school certification and qualification as an adjunct of the community college or university sponsoring the dual credit program. Again, NELS: 88/2000 data do not differentiate credit earned through college courses taught by high school teachers from those courses taught by college professors (Adelman, 2006, p. 99).

When classes offered at a local community college award students both high school and college credit, they may also fall under the auspices of early college high school configurations. Early college high school, educational institutions housed on site of a community college, guide predominantly students at-risk of academic failure straight through school from the ninth to the fourteenth grade in the same campus (Wechsler, 2001). Students participate in regular high school classes for the first two years exclusively with other high school students. However, in the second half of high school, hybrid situations allow students to remain primarily with their peers while enrolling in college credit courses offered by the community college. The last two years of early college high school (grades 13 and 14) mirror the experience of the first two years of a community college education. Students enroll in classes with community college students and complete a course of classes designed to earn the associate in arts degree at the end of the experience. Again, the NELS: 88/2000 data do not distinguish students' enrollment in early college high schools from students who enroll in any other type of credit bearing transition program (Adelman, 2006).

Due to the fact that thousands of community colleges, universities and local school districts participate in dual enrollment programs, a variety of program models exist (Kleiner & Lewis, 2005). The widely differing configurations may result in diverse experiences for high school students venturing into the post-secondary system. The data collected in this study will investigate direct and indirect effects of participation in dual enrollment programs upon students' persistence and degree attainment, independent of the widely different options available to students enrolling in dual enrollment programs.

Advanced Placement (AP) courses, monitored and sponsored by the College Board, require the participating high school students to take an exam that is used to determine whether post-secondary credits will be awarded. High school students participating in AP courses may enroll concurrently in courses offered through DE or CE programs, thereby simultaneously participating in multiple credit based transition programs. The NELS: 88/2000 data allow researchers to separate college credits earned through dual enrollment classes from credits awarded to participants of Advanced Placement classes (Adelman, 2004). In his study, "Principal Indicators of Student Academic Histories in Post-secondary Education 1972-2000," Adelman (2004,) encouraged the type of statistical analysis required of this current research in order to accomplish the following:

> split out the dual enrollment portion of acceleration credits and determine whether the student was receiving both high school and college credit simultaneously or accumulating college credits outside the high school curriculum (Johnstone & del Genio, 2001 & Boswell, 2001) and whether dual enrollment prepares students for post-secondary coursework (Windham & Perkins, 2001) (p. 55).

Because students potentially participate in multiple CBPT's before high school graduation, one of the limitations of this study is disentangling the direct or indirect effects of AP from dual enrollment course participation. The NELS: 88/2000 data may suggest CBPT effects on college persistence and degree attainment of both dual enrollment and AP courses. However, if students participate in both types of programs simultaneously or consecutively before high school graduation, comparisons of the effects of each type of credit based transition program may not be discernable. Rather, the research may suggest (only for cases where students participate in both types of programs) that engaging in credit bearing transition programs creates either some type of effect or no effect upon college persistence and degree attainment.

Significance of the Study

This study may provide information to policy makers, lawmakers, college and school district level administrators, students, and families concerning the possible consequences of dual enrollment course participation upon college persistence and degree attainment. In light of recurrent nation-wide inquiries relating to student preparation in post-secondary education, and longstanding concerns surrounding departure from college, a study of dual enrollment participation outcomes seems especially important. Prior investigations of dual enrollment programs have utilized local community college, university or statewide programmatic data. The NELS: 88/2000 transcript data provided a representative sample of students from across the United States, including students who participated in CBTP's, irrespective of any particular implementation formats of dual enrollment programs.

The focus of this dissertation was to analyze and interpret data exploring the role dual enrollment programs play in preparing high school students for persistence and degree attainment in post-secondary education. Institutions of higher education receive state funding for every high school student enrolled in courses. Therefore, community college and university budgets may be impacted by improved understandings of the efficacy of dual enrollment programs. Local school districts, especially those with established relationships with community colleges or with universities that offer dual enrollment courses on their high school campuses (or otherwise make arrangements for students to travel to a post-secondary site) have a stake in the results of this study. Ultimately, high school students and their families constitute both the consumers and potential beneficiaries of dual enrollment programs. Consequently, the implications of this study's results may have far reaching effects upon the appeal of and the ultimate participation rates in dual and concurrent enrollment programs across the United States.

Definition of Terms

Several vocabulary terms in this study require standardized definitions. Although already mentioned and in some cases defined when introduced, the following listing serves as an additional reference.

Accelerated classes: Classes providing opportunities to earn college credits while still remaining a high school student. Examples: Advanced Placement, dual enrollment, International Baccalaureate, tech prep. Also known as credit-based transition programs (CBTP).

Academic Integration: Interaction between students and their college environments

Advanced Placement: High School courses endorsed by the College Board which may result in college credit awarded by individual post-secondary institutions upon achievement of a particular score on the National Subject Area Test for each course.

Anticipatory Socialization: "The process or set of experiences through which individuals come to anticipate correctly the values, norms, and behaviors they will encounter in a new social setting" (Pascarella, Terenzini & Wolfe, 1986, p. 156).

Attrition: Decreasing enrollment numbers of students from one academic term to the next due to reasons other than degree completion.

College: Any post-secondary, degree or certificate conferring educational institution -two year or four year, academic or vocationally oriented.

College Environment: The sum total of academic and social experiences impacting students enrolled in post-secondary education.

Concurrent Enrollment (CE): College courses offered through a post-secondary institution and taught at the high school site by a high school certified instructor. Concurrent enrollment is the only type of dual credit or dual enrollment course that allows students to earn both high school and college credits upon successful completion of courses.

Credit Based Transition Programs (CBTP): Courses offered at the high school level that may result in college credit awarded upon successful completion of the course or a qualifying test. Advanced Placement, International Baccalaureate, and all types of dual enrollment courses are examples of CBTP's; also known as accelerated courses.

Degree Attainment: Earning of a college degree – Bachelor of Arts, Bachelor of Science from a four-year institution, or associate in arts degrees from a two-year institution- following successful completion of a course of study.

Dual Credit (DC): Used interchangeably with concurrent enrollment and dual enrollment, dual credit refers to college courses earning high school and/or college credit by high school students (Kleiner & Lewis, 2005, and Waits, Setzer, & Lewis, 2005).

Dual Enrollment (DE): The most commonly used or generic definition describes "high school students who earn college credits for courses taken through a post-secondary institution" (Kleiner & Lewis, 2005, p. 1).

Dual Enrollment Program: Cooperative ventures between post-secondary and local educational agencies (public or private schools) which allow high school students to enroll in college courses offered by the post-secondary institution before graduation from high school.

Early College High Schools: High schools whose physical plant is located on the campus of a community college. For the first or second year of school, students attend high school classes exclusively. After that point, students attend courses offered by the post-secondary institution for college credit as well as high school courses leading to graduation. Students may remain in the school through completion of an associate in arts degree, which may be the equivalent of grade 13 or 14 depending on the number of college classes taken before high school graduation.

Exclusive Participation: CBTP enrollment limited to dual and/or concurrent enrollment courses.

First Generation: Familial situations where "neither parent had attended a post-secondary institution" prior to a child's matriculation to a college or university (Adelman, 2006, p. 179).

Freshman Year: Scholarly agreement on the operational definition the freshman year in terms of dual enrollment is of particular concern to accurate data interpretation in this study, as models of student persistence show that academic success in the first year of college greatly impacts persistence into the second year (Pascarella & Terenzini, 2005). A college freshman is a student who has been accepted for entrance into a post-secondary educational institution and has earned no more than 30 hours of credit toward completion of a degree program. The freshman year is the first academic college experience for students.

Grade Point Average (GPA): The average determined by taking the total grade points earned during an academic term and dividing by the total number of semester hours attempted for college credit during that same term, as reported on a 4.0 scale.

Non-dual enrollment participating college students: Post-secondary matriculated students who did not earn college credits through dual or concurrent enrollment classes prior to high school graduation.

Persistence: If the student enrolls and earns credits at any time in any institution during the next academic calendar year, that student has persisted (Adelman, 2006).

PETS: Post-secondary Education Transcript Study. A subset of the NELS: 88/2000 data with variables created from high school and college transcripts linked to individual respondents to the second, third and fourth follow up waves of data collection of the NELS surveys.

Retention: The act of re-enrolling for subsequent terms in a college until the student graduates from college and/or a degree or certificate is awarded.

CHAPTER II
REVIEW OF THE LITERATURE

Introduction – Current Concerns Regarding College Preparation of American High School Students

The Reauthorization of the Elementary and Secondary Education Act of 1965 in January 2002, also known as "No Child Left Behind" (NCLB), focused national attention on accountability standards and testing of public school students across America. Although concentrating its efforts on underachieving students in grades 3-8, the act's far-reaching goals aimed to instill an accountability system that could demonstrate whether children were becoming proficient readers. As a result of NCLB, several states instituted assessments for students in one high school grade level for the purpose of evaluating students' growth and competencies through the end of their K-12 education. The emerging focus for NCLB is now bringing new attention to the academic achievement of high school students. The Commission on No Child Left Behind, in a report issued on Feb. 13, 2007, recommended the creation of 12th grade assessment tests for the explicit purpose of ensuring that all high school graduates emerge from either college or work academically prepared, and also suggested states award college credit to students whose achievement on such tests showed competency at the college-level. Although not all states require passing exams as a precursor to high school graduation, at least a few have adopted the use of college entrance examinations, such as Illinois' selective use of the ACT as a part of the Prairie State Achievement Exam. The visible intervention of federal and state governments in the actions of the school demonstrate the urgent need to prepare all students for work and for further study after high school.

Higher education has enjoyed immunity from accountability standards, such as those permeating the K-12 system. A series of recently published reports, however, suggests that closer scrutiny will be placed upon post-secondary education, especially in the area of employment after graduation. The American Association of Colleges and Universities published a report in January 2007, “College Learning for the New Global Century,” that suggested an expanded set of courses and experiences designed to enhance employability of college graduates. The report encouraged students of all majors to enroll in more liberal arts foundational courses prior to graduation, rather than to pursue courses in the vocations, which, it argues, has served to devalue general education courses commonly required during the first two years of post-secondary education. Success in the first two years of college, as measured by credit acquisition and a usable content knowledge base, directly correlate with graduation rates. However, contemporaneous studies have pointed to multiple factors influencing student persistence and degree attainment. The American Association of Colleges and Universities and The Education Trust, a Washington-based non-partisan think tank, have conducted investigations of high-performing colleges – institutions generating high graduation rates (Carey, 2004). The rising cost of a college education, along with the extended time required by students to complete a program of study, has brought into question the historical position of colleges as providers of educational opportunity that posses little or no responsibility for ensuring or assisting students to complete programs of study. Statistics from the Beginning Post-Secondary study of 1995-96 revealed that fewer than 40% of students completed a degree in four years; less than 60% completed their studies in six years (Carey, 2005, p. 1). The Education Trust has developed a website, CollegeResults.org, listing graduation rates of all public and private colleges and universities. Although these publicized graduation rates are based upon entering first year students and do not take into account transfer students, the overarching message is that some schools achieve higher graduation rates than other similarly situated colleges. The consumers of education, both students and their parents, are encouraged to "shop" for a college based on the best prospects of completing a degree.

Historically, plenty of blame has been directed at the entire American educational system (PK-16), and a variety of solutions have been devised to fix what may or may not be broken. The latest attempt to revamp American education was organized by a high-powered, bipartisan commission including past presidents of teachers and labor unions, former congressmen, former US Secretaries of Education, presidents of colleges, and urban mayors. "Tough Choices or Tough Times" calls for sweeping reforms of the PK-16 system, including the idea of allowing sixteen year olds to take a qualifying test for entrance to community colleges or technical schools rather than completing high school through the 12th grade (National Center on Education and the Economy, 2007). More academically oriented students could remain in high school for two more years and take yet another entrance examination to certify entrance into the university or four-year college pipeline. The general idea, all American students engage in at least two years of post-secondary education, moves well beyond the general requirement of mandatory schooling to age 16 or 17. Even workers currently employed, but without some college education, would benefit from the commission's larger restructuring plan in the way of financial help and other incentives to enter job training through community colleges or technical schools. Clearly, obtaining a college degree is paramount to higher wage employment, with the differential in median earnings for college graduates 63% higher than high school graduates as of 2005 (College Board, 2006, p. 2). The economic reality of the differential between the high school and the college graduate is fueling aspirations for college attendance. America is witnessing “a growing tide of students for whom higher education success is more and more a matter of economic life or death, and an economy and society in greater and greater need of successful students” (Carey, 2005, p. 18). Therefore, restructuring the last two years of high school and the first entrance to college in order to affect student post-secondary success plays a large part in the reforms suggested the “Tough Choices or Tough Times” report, (National Center on Education and the Economy, 2007).

While prior research has documented the frailties and failures of both K-12 and higher education, my research investigates their intersection - the last two years of high school and the first two years of college- where many students either fail to prepare in high school or fail to thrive in college. In this chapter, I explore the historical basis of the divide between K-12 schooling and post-secondary education, and thoroughly investigate what is currently known about credit based transition programs – especially dual enrollment programs. Theoretical models of college entry and persistence to degree, along with hypotheses regarding social assimilation, are analyzed in relation to their impact on students’ academic and social integration to college. I include a review of the current research on college access, achievement and completion. Finally, the most current studies on dual enrollment programs and their student outcomes are critiqued.

Navigating the Educational Spectrum PK-16

From High School to College – the Historical Divide

The quality and breadth of the high school curriculum, according to Adelman (1999a), produce the greatest influence upon students' future college persistence and degree attainment. The importance of the pre-college curriculum upon the scope and sequence of post-secondary study was not lost upon the giants of 19th century American education. In 1876, Charles Eliot, longtime president of Harvard University, offered the following definition of a classical baccalaureate course of study:

> The course of study which terminates in the degree of Bachelor of Arts ordinarily covers from seven to ten years, of which four are spent in college and three to six at school (Orrill, 2003, p. 16).

The liberal arts college, modeled after similar institutions in England, constitutes the oldest educational organization in America. Conversely, elementary and secondary educational structures are uniquely American institutions. During the mid to late 1800's, when the universities began to offer some scientifically oriented electives and newly formed high schools taught vocational classes in addition to college preparatory courses, the liberal arts college found itself squeezed from both ends to remain viable. Colleges were forced to restructure their traditional four-year curriculum into two years of general education studies, and offer students more electives in the form of major areas of concentration in their last two years before graduation. Each tier of the educational system developed independently. Shared educational expectations and goals were largely non-existent, so the levels of the educational system developed in a disconnected manner. According to Kleiman (2001), "no [other] industrialized country in the world has as fractured an educational system as the United States" (p. 9).

In the early years of the 20th century, John Dewey and Charles Eliot debated the appropriate type of curriculum for the American high school. Dewey preferred a set of courses which would infuse vocational or life skills, while Eliot promoted the use of academic core courses to prepare students for more advanced study in the liberal arts at the post-secondary level. These curricular conflicts, played out in the Committee of Ten (1893) and Cardinal Principles (1918) reports, resulting, in the latter case, in the design of the comprehensive high school found across the country today (Wechsler, 2001). Increasing enrollment in high schools, starting in the 1940's, forced the expansion of curricular offerings to meet the need of a diverse student population. Dubbed the "shopping mall" approach, by Powell, Farrar, and Cohen (1985), the comprehensive high school offered a plethora of core and elective courses, designed for both the college bound and the work bound student. Despite their differences in philosophy, Dewey and Eliot agreed that the K-16 education should appear seamless, without fragmentation - a system marked by continuity and educational unity. This ideal has yet to be achieved. The concept of a K-16 unified system, established through collaborations between state lawmakers and higher education and K-12 boards, finds itself stymied by policies formed separately and exclusively by each of these bodies (Venezia, Callan, Finney, Kirst, & Usdan, 2005).

In the text, "From High School to College," Kirst and Venezia (2004) identified the following disconnects between secondary and post-secondary education:

1) differences in the intensity and quality of high school courses

2) inequities in college preparation opportunities

3) a confusing array of state and institutional exams within and between K-16 school systems

According to Kirst and Venezia (2004), as well as Powell, Farrar and Cohen (1985), high school students select courses generally on an "a la carte" basis, guided by both local graduation requirements and individual preferences. Each state determines its own graduation requirements for high school students. The state government in New York stands alone in promoting a high school diploma that seamlessly aligns with the state university system and its college preparation exam, the New York State Regent's examination (Kleiman, 2001). One of the few states that has traditionally eschewed the idea of statewide high school graduation requirements, Iowa, is currently moving toward adopting the recommended ACT college core curriculum – 4 years English, 3 years math, 3 years science, and 3 years social science (Graham, 2006).

The American secondary and post-secondary systems of education have generally continued to follow Eliot's course of study model. However, in terms of intellectual achievement, modern high schools typically end their preparation for post-secondary study at eleventh grade. According to Venezia, Kirst and Antonio (2003) and Harvey (2001a, 2001b), eleventh grade students dedicate much of their time to college entrance examination testing. In the twelfth grade, the high school senior year, the incentives or the urgency to engage in substantive academic work wanes. Instead, many students spend the year concentrating on college applications and acceptance activities. Because colleges request seventh semester transcripts for the application process, the latter half of the senior year does not even count toward admission into college. Non-college bound students pass the time... literally. Misconceptions abound concerning entry into post-secondary education versus preparation for successful completion of a college degree. Data collected from the NELS: 88/2000 indicated that nearly 93% of students who graduated on time in 1992 expected to attend a post-secondary institution (Adelman, 2006, p. 25). Unfortunately, students mistakenly believed that gaining acceptance into college rather than completion of degree constituted the most difficult part of accessing post-secondary education (Venezia, Kirst & Antonio, 2003). Students and their parents don't seem to accept the message that preparation for college forms the basis of future success. According to Rosenbaum (2001), "Students easily see college enrollment, for which high school achievements are irrelevant, but they have difficulty seeing college completion, for which high school achievements are highly relevant" (p. 81). All serious preparation for post-secondary school ends at the eleventh grade in the high school, culminating with the administration of college entrance examinations, such as the ACT or the SAT. The transitional period to college created by these examinations basically discourages serious academic work in the senior year of high school. The senior year should be the point in a students' educational career that "launches the well-prepared student toward success in post-secondary education" (Harvey, 2001a, p. 12). Today, and for the foreseeable future, nearly all Americans will encounter the need for additional training or schooling after graduation from high school. Therefore all students must to have the opportunity to experience a rigorous curriculum not only in the ninth and tenth grades, but also in the last two years of high school. At the heart of the miscommunication and misconceptions about college access versus completion, as succinctly outlined in the "Stanford Bridge Project" (Venezia, Kirst & Antonio, 2003), lies the disconnect between high school and post-secondary education systems. Students and their parents fail to realize that a high school diploma does not grant automatic entry into credit-bearing courses. Establishing effective communication "between high schools and colleges may help improve high school students' understanding of college requirements" (Hanson, 2003, p. 83).

Concerned lawmakers and educators have begun to question the lack of rigor in the last year of high school. Therefore, the National Commission on the High School Senior Year was organized in June 2000. The Commission's initial report, "The Lost Opportunity of Senior Year: Finding a Better Way," (and its subsequent final report, "Raising our Sights: No High School Senior Left Behind") suggested a variety of remedies that address the PK-16 disconnection and lack of preparation among high school students enrolling in higher education. First and foremost, the commission recommended that K-12 and post-secondary education become one system. In order to accomplish that goal, the group devised an acronym to characterize the processes needed to align the systems. Known to the commission as the "Triple-A Program", the PK-16 education system reform strategy challenged education to improve alignment, raise achievement, and provide more (and more rigorous) alternatives for high school students. By paying more attention to the last two years of high school and the first two years of college, (thereby formally structuring an alignment of the system) education could provide students with better links for student performance and achievement expectations. The commission's report advanced the prevailing the concerns regarding students' misconceptions that acceptance to college is the goal of high school preparation as opposed to adequate preparation for college completion and entrance into credit-bearing classes. To help students gauge their readiness for college, the commission promoted the idea of making college placement exams mandatory in the 10^{th} grade – preferably administered at the high school. The last "A" in the commission's recommendation encouraged capstone classes, projects and opportunities for students to pursue college level courses before high school graduation. Specifically, the commission endorsed credit based transition programs, specifically Advanced Placement and dual enrollment, as examples of rigorous alternative courses for students in the senior year. The group also recommended that students as young as age 16 or 17 be allowed to begin post-secondary course work, through dual enrollment classes (Harvey, 2001b, p. 32). According to authors of the preliminary report, "young people should not have to wait until they have a high school diploma in hand to learn that they are unqualified for college level courses or work" (Harvey, 2001a, p. 26).

The authors of the report also argued a need for improved correspondence with all parents, especially those living in poor or minority communities. Low income and minority students, more than their advantaged peers, require extra encouragement to participate in college placement exams and to enroll in dual enrollment classes. The commission's authors omitted detailed recommendations for how best to reach members of low-income groups. Despite interests from educators, politicians, and the news media, no federal legislation has been passed to implement these recommendations.

According to Venezia, Callan, Finney, Kirst, and Usdan (2005), post-secondary admissions/placement offices operate seemingly unaware of the K-12 standards movement, or any knowledge of high school tests administered for the purposes of the NCLB inspired accountability system. Likewise, K-12 state and local level officials are neither cognizant of nor taking into consideration college entrance requirements (outside of tests like the ACT or SAT) when developing curriculum or state/local graduation requirements. These two groups continue to work independently of one another.

In an effort to further examine the intersection between secondary and post-secondary schools, Venezia et al. (2003) conducted a six-year national study, known as the Stanford University "Bridge Project," utilizing information from students in six states (California, Georgia, Illinois, Maryland, Oregon and Texas). The research investigated students' readiness for and awareness of college requirements. Conducted from 1996-2000 (and published in 2003), the study found that 88% of all surveyed students and 80% of the minority students surveyed planned to enter some type of post-secondary institution (p. 2). The data included interviews, surveys, and focus group discussions of state-level educational representatives, college administrators and staff, high school teachers, counselors and administrators, parents, 9th and 11th grade students, and community college students. High schools included in the survey predominantly fit the profile of urban or suburban. No rural or high poverty urban schools were sampled, leading the authors to theorize that the findings would have shown an even higher need for accurate advice on how to plan for and manage the transition from high school to college. The researchers suggested that parents and students should receive specific information from high schools and colleges regarding how to prepare for successful completion of a college degree. A vital part of this information would include the opportunity for all students to participate in taking college placement examinations, such as the COMPASS. The "Bridge Project" report suggested that these placement exams should be conducted in high schools so that student readiness for college level work can be assessed. The report further recommended that students enroll in college courses before graduation from high school, and that dual enrollment courses be open to all students, including those who are not the most academically talented or highest achieving. "The Bridge Project" survey results showed the greatest need for high quality and accurate college preparatory information should be directed towards the 80% of students who enroll in non-selective institutions - including state universities and community colleges (p. 14). Statistics gathered by the research showed that 45% of students chose the community college as their first college of entry (p. 14). According to Venezia et al. (2005), community colleges are the point of entry for half of America's first time undergraduates, especially for students whose families fall into the lower socioeconomic brackets (p. 22). The remainder of the students, 20% of the surveyed population, intended to enter more selective institutions where graduation rates were significantly higher and student preparation for college courses much more in alignment with college academic demands (p. 14).

The Stanford University "Bridge Project" also uncovered significant misconceptions held by students and parents about college. These included statements, such as: "My senior year doesn't matter", "Getting into college is the hardest part" and "Community colleges don't have academic standards" (p. 31). As stated previously, an overwhelming majority of high school students intend to enter post-secondary education and yet relatively few complete degrees. Finishing a degree seems much more difficult than entering college. Perhaps the perceived ease of entry into non-selective institutions has decreased the urgency of students to embrace rigorous coursework in preparation for college. Students in high school watch large numbers of their upper classmates on a yearly basis apply for, receive acceptance into, and leave high school bound for college.

However, how many of these high school graduates come back to high schools to share experiences of success and failure? The "Bridge Project" clearly uncovers the untruths students harbor and their lack of understanding of the ramifications of entering post-secondary school unprepared for college-level academics.

As reiterated by both the "Bridge Project" and the National Commission on the High School Senior Year, inadequate messages about courses required for high school graduation leave students unprepared for rigorous work in college. Furthermore, high school exit exams, whether given by the school system to determine graduation status or college entrance, do not necessarily reflect the proficiencies necessary for success on placement examinations given by the community colleges and four-year institutions (Venezia, Callan, Finney, Kirst & Usdan, 2005). The reality is that misalignment of high school exit and college entrance standards has created a situation where incoming students may place into remedial level courses upon entrance to college. Each post-secondary institution uses different placement tests and establishes different standards for entrance into credit bearing classes (Haycock & Huang, 2001). This unsynchronized system of examinations may leave students questioning the value of their high school coursework, and colleges blaming K-12 school systems for ill-prepared students. Multiple college placement tests make it difficult to know levels of competency required in the credit-bearing classes. Making matters worse, the post-secondary institutions rarely conduct research into the efficacy of their placement tests. And, academic departments sometimes develop their own placement exams in addition to relying on results from standardized tests (Venezia, Callan, Finney, Kirst & Usdan, 2005).

Students earn diplomas by fulfilling state imposed requirements. Unrelated to high school graduation requirements, students earn scores on college entrance exams (ACT/SAT), and many are admitted to institutions of higher education. Having passed the hurdles of college entrance, students might assume that colleges would automatically allow enrollment into credit bearing courses. However, high school graduation and college entrance exams assess different sets of entrance expectations, in the way of knowledge and skill competencies, from those required by subsequent departmental or college-wide placement examinations. Regardless of previous coursework, college-level placement exams determine how students begin their college academic careers. The reality of this disconnect between the K-12 and higher education systems quite often places an additional burden on students and their families, in the form of paying tuition for classes taken with no credit earned. The unexpected hurdle – graduating with one set of standards and entering post-secondary education under another set of expectations – lands many students into remedial education rather than credit bearing coursework. Statistics gathered by the US Department of Education in 2001 showed that 63% of students in two-year colleges and 40% enrolled in four-year institutions participated in some type of remedial class during their tenure (Venezia, Callan, Finney, Kirst & Usdan, 2005, p. ix). The long-term effects on college persistence and degree attainment of participation in remedial courses have produced some sobering statistics. Students who placed into remedial courses during the first year of college attained a 48.7% graduation rate, whereas their peers (those who completed only credit-bearing courses) achieved a 70% graduation rate (Adelman, 2006, p.50). The bottom line remains that rigorous academic preparation in high school readies students for post-secondary education.

Gaining credit in high school for entry-level courses, through credit-bearing transition programs like dual enrollment classes, may help students overcome the burden of repeating classes and low credit momentum caused by taking remedial classes during the first year in college. According to Rosenbaum (2001), continuing to work toward enhanced "linkages between high school and college may help improve high school students' understanding of college requirements" (p. 83).

Gaps between the secondary school and higher education, while firmly documented, lack broad-based political support to create and carry out the recommendations found in the aforementioned reports. Fundamental academic and fiduciary challenges abound for those who would create a new PK-16 seamless education system in the United States. However, educational research continues to strongly suggest that access to rigorous coursework, through dual enrollment, can very much affect college persistence and overall college success.

Defining Academic Intensity in High School

According to Adelman (1999a), PK-16 policy and school/college collaborations have very little basis in test scores, grade point averages or class ranks, but everything to do with curriculum. "A Nation at Risk" (US Department of Education, 1983) offered a definition of the "New Basics" high school courses, which were selected to better define what it means to be college qualified. The New Basics is identified by a specified number of Carnegie units in key subject areas (4 units of English, 3 units of Math, Social Science, and Science, 2 units of Foreign Language). Clifford Adelman's monographs, "Answers in the Toolbox" (1999a) and "The Toolbox Revisited" (2006), further refined degrees of college readiness by identifying academic resources acquired by high school students.

The term, academic resources, originated with Karl Alexander's research on student academic preparation for post-secondary education in the 1970's and 1980's (Adelman, 1999a, p. 3). Alexander's research demonstrated that high school course selection choices override demographic variables when considering their relationships to college attendance and completion. As a result, subsequent investigations of academic preparation were undertaken by researchers utilizing national secondary data sets, and their accompanying transcript records, in order to more accurately identify course taking habits of students who completed academic programs in higher education. Adleman (2006, p. 27) identifies the highest level of rigor by the following course sequence:

3.75 or more Carnegie units of English

3.75 or more Carnegie units of mathematics; highest mathematics of calculus, pre-calculus or trigonometry;

2.5 or more Carnegie units of science *or* more than 2.0 Carnegie units of core laboratory science (biology, chemistry, and physics);

more than 2.0 Carnegie units of foreign languages;

more than 2.0 Carnegie units of history and /or social studies;

more than 1 Advanced Placement course; and

no remedial English; no remedial math

More important than the name of the course itself, educators should become more cognizant of the skills and content taught within any course. Not all algebra I courses are taught in the same way or with the same expectations or with the same level of difficulty and sophistication. Across the country, as more and more schools offer algebra I to their 8th grade students, will the standards of rigor mirror those of the course traditionally taught as the stepping-stone to higher math classes? Will the standard geometry course omit instruction in proofs and therefore transform into a lower level course, such as plane geometry? Shireman (2004) agrees that rigorous course names do not guarantee rigorous course content. If schools merely change the names of their courses without improving the quality and intensity of the course content, students will not benefit. Moving beyond the established Carnegie unit to a criterion-referenced outcome for a core course of study has been the work of various national standards commissions within the content areas of mathematics, science, English, and the social sciences. However, without nationally mandated curricula or exit examinations, consistency in both content and outcome expectations varies with each state's standards and within each school district and classroom. At the present time, no standardized methods exist to ensure the common quality of course content or assessments needed to prepare students for post-secondary work within high school courses. No consensus exists on the degree of proficiency students should exhibit in particular content areas in order to be "college ready". Let's take math, for instance. Students can graduate from high school having completed algebra II, usually the third year in a math sequence, which starts with algebra I in the 9^{th} grade. Completing three years of mathematics would meet the standard for college readiness as outlined by both the New Basics and the ACT college core curriculum. However, it is altogether likely that other students could also graduate from high school having completed four or even five Carnegie units of mathematics. Adelman's transcript evaluations of the NELS: 88/2000 data showed a tremendous differential in the percentage of students graduating from college after completing pre-calculus (74.6%) or calculus (83.3%)in high school versus those students who completed algebra II (39.3%)

(Adelman, 2006, p. 31). Therefore, both the types and availability of higher level, more academically intensive courses create differentiated opportunities for students to achieve in post-secondary education.

The academic resources students acquire in high school create a stronger predictor of bachelor's degree attainment than test scores or grade point averages (Adelman, 2006). A product of three or four years of planning on the part of students, parents, and mentoring teachers, course enrollments affect students' long term opportunities and either strengthen or weaken their chances at completing a post-secondary program to a greater extent than performance on college entrance examinations. High school grades should be a natural outgrowth of what is learned in the classroom and should also correlate with the quality of performance required by the instructor. Recent concerns over grade inflation aside, high school grades are a long-term indicator of effort, study skills, rapport with the teacher, and course selection. But, because course grades are inherently subjective in nature, more importance must be placed upon the intensity of the content taught in the course rather than the evaluation of proficiency at the high school level. Adelman's "toolbox" metaphor implies rightly that the curricular content students bring with them to the post-secondary experience matters most.

Outcomes of Intensive High School Academic Preparation

Kati Haycock, director of Education Trust, has authored and/or co-authored a series of publications entitled, *Thinking K-16*. These documents explore a variety of topics related to the misalignment of the secondary and post-secondary systems, along with research regarding programs trying to bridge the gap between the two systems of education. The Winter 2001 edition of this series presented data on high school graduation rates, college attendance and dropouts, the academic growth of high school students in the US (against students in other countries), workplace earnings by education attainment, and the changing demographics of our nation's school children. Haycock and Huang (2001) strongly advocated for all high school graduates entering post-secondary education to complete courses commonly labeled "college prep" in high school. College preparatory courses, particularly lab science and upper level math courses including trigonometry, pre-calculus and calculus, may not be accessible to students in rural or high poverty areas of the country. However, even in school systems offering these types of courses in the high school, transcript studies showed that students did not always elect to enroll in college prep classes or were sometimes counseled away from enrollment by teachers who held low expectations for the students' post-secondary plans. Exposure to higher-level courses resulted in greater gains for previously low achieving students, while those already achieving academically continued to benefit (Haycock & Huang, 2001). The statistical results showing gains by lower achieving students in more rigorous courses mirrored data produced by Jencks (1998) and Halliman (2002), as cited by Barth (2003). In each case, students who participated in more rigorous courses, regardless of their entry skill level, increased their outcome achievement to a larger extent than other similarly situated students who participated in less rigorous coursework. In fact, students placed in the most rigorous classes made the largest gains. These students' results reiterated the old adage, "What you study you will learn." Access to rigorous courses improved high school academic achievement and consequently promoted success in college courses.

In another edition of *Thinking K-12*, Barth (2003) presented two studies, in San Jose and Houston, where standards were raised to require student to enroll in a course sequence aligned with college readiness. Descriptive statistics indicated that, over three years of implementation, students' graduation rates in San Jose fell within two percentage points of those posted before increasing course requirements (p. 23). Houston students, while not required to engage in more rigorous course for graduation, were encouraged and recommended by teachers to take college preparatory courses before graduation. As a result of adult interventions, the percentage of students choosing the recommended curriculum increased from 22% of students in 1999 to 73% participation in 2002 (p. 23). The seventh largest school district in the nation, Houston's school data show an 87% minority and 79% low-income population (p. 23). Yet, despite the preconceived notion that students from disadvantaged families cannot or do not wish to enroll in higher-level academic courses, the students in Houston defied the odds and increased their participation in rigorous courses.

Barth's report (2003) did not go into detail about student course loads or pre-post results of college entrance examinations. However, the data showed that, when adults encouraged all students without prejudice and supported their quest to be successful, positive changes in preparation for college level work occurred. Changes in course taking habits materialized when adults communicated with students and guided them toward more advantageous choices, either as a requirement for high school graduation or as a course of study within the school system. Barth's message was clear: high school can't be the culminating educational activity for students, as nearly all occupational placements now require some post-secondary training. However, rigorous preparation for that training is also essential for students to enter and finish a program - whether an apprenticeship or a bachelor's degree.

Shireman (2004) investigated the outcomes of increasing graduation requirements in the State of Texas for the class of 2002. Modeled after the National State Scholars' Initiative, the Texas group was encouraged to complete a course of study very similar to the New Basics curriculum. The curriculum required specific courses in math, science and social science not merely years of study. According to data detailing course enrollments of Texas high school students, approximately 40% completed the State Scholars' recommended curriculum during the years 1995-2000. Beginning in 2000, the state changed policies from recommending to requiring the State Scholars' Initiative curriculum for all high school students. By the year 2002, nearly 60% of students in Texas completed the required curriculum course (p. 4). I believe that a twenty-percentage point rise in students completing the college preparatory course in only two years seems statistically suspicious, and proving any causal effect on behalf of the new curriculum is premature. Further doubts have been raised as to whether districts have simply renamed courses to meet the graduation requirements.

Indiana modified its high school graduation requirements and has seen the percentage of students completing their "Core 40" classes increase from 43% in 1997-98 to 62% in 2002-03 (Shireman, 2004, p. 5). Descriptive statistics were available from the State of Indiana, which showed that student rates of choosing the Core 40 increased regardless of race. Scores on the SAT test rose 30 points from 1993-2003, an indicator that student knowledge base was affected by the content of the curricular course.

However, no comparisons or controls were applied to the statistics used in order to determine the statistical significance of the gains for any one demographic group.

These state and local efforts to increase the rigor of courses required for high school graduation point to the same theoretical construct: that the academic strength of the curricular base acquired by students in the K-12 school system pays rich educational dividends. Adelman (1999a, 2006) conducted exhaustive transcript studies, utilizing the HS&B/SO and subsequently the NELS: 88/2000 secondary data, to illuminate the strength of the high school curriculum upon degree attainment for students who had entered a four-year institution during their post-secondary careers. Through logistic regression analysis, Adelman’s 2006 research suggested the likelihood that students’ academic resources (defined as high school curriculum, GPA, and test scores) consistently affected degree attainment through six different regression models. Parceling the curriculum from the other two contributors to the variable “Academic Resources” (GPA and test scores), Adelman (1999a, 2006) strongly indicated that the rigor of the curriculum matters most for all students in terms of moving towards degree attainment, regardless of race, sex or socioeconomic status. For most students, course enrollment, aside from graduation requirements, represents a personal choice. Theoretically, all students could elect to participate in the highest level of curricular rigor. All could benefit from opportunities to learn and take this learning along to the post-secondary experience - if the opportunity to enroll in these rigorous courses were made available to all students regardless of where they attend high school. Making rigorous courses available to all students could, therefore, positively impact rates of college degree completion.

Using the Beginning Post Secondary (BPS) 1995-96 data from the National Center for Educational Statistics, Horn and Kojaku (2001) investigated high school academic preparation as reported on questionnaires submitted to ACT and SAT. Utilizing three variant levels of course taking and limiting the analytic sample to only students entering four year institutions in 1995-96, the BPS research investigated college persistence of students at each level of course intensity. Descriptive statistics showed that by the conclusion of the third collegiate year, 78% of the students who engaged in a rigorous course of study (19% of the sampled students) remained enrolled in their institution of first entry, and if transferred to another four-year institution had no break in enrollment. For students meeting the “core” curriculum level, similar to the New Basics course sequence, 54% remained enrolled at the end of the third year (p. vi). The rigorous set of courses mirrors that utilized by Adelman (1999a, 2006), except that 3 years of foreign language and 1 Advanced Placement course or test was required to meet the BPS standard. Students who transferred from their initial four-year college to a two-year community college were more likely to have completed the “core or less” level of curriculum preparation (47%) than were students more highly qualified for college entry (19%) (p. viii).

The results of regression analysis conducted by Horn and Kojaku suggested something similar. Controlling for a variety of demographic and college level variables, Horn and Kojaku utilized high school academics and college entrance scores as the main independent variables. College GPA was used as a control variable in one model and purposefully omitted in the second model. Dependent variables included continuous enrollment and on track to a BA (no transfer to a two-year institution). Regression analysis showed that without College GPA as a variable, a rigorous high school curriculum and SAT scores contributed significantly to college persistence. Utilizing the college GPA, however, the rigorous high school curriculum remained a statistically significant factor for persistence, while SAT scores dropped out of the range of statistical significance. In this particular analytic sample, the high school curriculum correlated with the college GPA, and together affected persistence to a greater extent than SAT scores. This finding reinforced those promoted by Adelman (1999, 2006), who argued that the quality of the HS curriculum mattered more than scores on college entrance examination tests or high school grades in affecting persistence and degree attainment.

Because Horn and Kojaku found that student demographic characteristics and the economic situation of high schools affected the type of courses elected by students, they suggest that the intensity of a student's high school curricula can overcome socioeconomic status and a lack of parental experience with college and keep students on track to a bachelor's degree even if they transfer from one school to another. When intensifying their high school course selections, students were more likely to transfer from one four-year institution to another rather than regressing off of the BA track to a two-year college. Holding the demographic variables constant served to equalize the chances for students from lower socioeconomic and/or first-generation families to benefit equally from high quality college preparation and produce the resultant persistence toward degree. However, disadvantaged families were less likely to access or seek out information related to college preparation. Students whose families either lack the knowledge or who individually fail to receive encouragement from their high school teachers have little incentive to research what types of classes are necessary for college admission or long term achievement. Mentoring of individual students by high school faculty will improve their chances of producing a quality course plan, which may lead to college entrance and achievement (Schneider & Stevenson, 1999).

Data utilized for the BPS research were collected from student self-reports on college entrance examinations, such as the ACT or SAT. Although the analysis supported the contention that more rigorous course taking rewarded the students with greater persistence to a bachelor's degree, student self reports have a history of inaccuracies. Students misinterpret directions on questionnaires and either over or under report courses taken. The large number of participants in the national data sets, such as the BPS 95/96, may reduce errors. However, by using transcript data, such as that available with the NELS: 88/2000, researchers further reduce the likelihood of errors and consequently report course taking patterns with greater accuracy.

To this point, the primary focus of the effects of a rigorous curriculum has been the entire population of eligible high school students. However, the level of rigor in the high school course of study influences post-secondary success rates of first generation students in ways that differ from non-first generation students. The literature has not produced a definitive description of a first generation family, but common characteristics include parents who either have not previously attended a post-secondary or have not completed a degree prior to their children's first post-secondary matriculation. Warburton, Bugarin and Nunez (2001) reported that, in an historical context, first generation status has been negatively associated with academic achievement and persistence to degree. However, their research suggested that rigorous preparation in high school especially narrows the gap in post-secondary attainment for first generation students. Without a solid academic foundation, first generation students are thirty percent less likely to persist after three years of attendance at a four-year institution (Warburton, Bugarin & Nunez 2001, p. viii) than their second plus generation peers. However, first generation students who engaged in rigorous high school curricula were no "more likely than their peers whose parents had a bachelor's degree to leave post- secondary schooling completely (five percent versus three percent)" (Warburton, Bugarin & Nunez, 2001, p. 34). These findings demonstrate the importance of opportunities to learn and encouragement from adults in the school setting to perform the role of mentor in matters related to college preparation. Students from disadvantaged homes, if afforded the opportunity and support to find success in challenging academic courses, can position themselves toward a greater likelihood of college persistence. High school curricular choices can make a difference, especially if those courses are among those categorized as rigorous.

Although high school preparation is keenly important for minority and other traditionally disadvantaged students, the fact remains that "high achieving, low-income students are less likely to go to college than high income, low achieving students" (Hoffman, 2003, p. 1-2). Low income and minority students rely heavily upon the direction and counseling of school personnel to make choices about class selection. Yet studies show that only thirty-eight percent of teachers believe that they have a responsibility to help students prepare for post-secondary education (Harvey, 2001a, p. 28). If these high achieving, low income students have no opportunity to enroll in courses earning college credit before leaving high school, they may not realize that they have the capability to do college level work. Students who are demographically categorized as low socioeconomic status and academically accomplished at the highest levels of academic coursework in high school actually earn bachelor's degrees at higher rates than students who are categorized in the highest socioeconomic levels and the lowest academic levels (Adelman, 2006). The academic intensity of the high school curriculum completed by minority or lower SES students was the strongest of all factors identified in decreasing the achievement gap in completing the bachelor's degree (Adelman, 2006, p. xxvi). Again, what students learn in high school does count toward academic success and attainment in college.

Intensive high school academic preparation stereotypically targets gifted or exceptional students. In 2004, the National Association for Gifted Children (NAGC), in conjunction with the Belin & Blank International Center for Gifted Education and Talent Development at the University of Iowa, published a two-volume report entitled, "A Nation Deceived: How Schools Hold Back America's Brightest Students". The report described students who entered college at a younger age than their peers, while also discussing the academic, social and emotional considerations that come into play with such circumstances. The authors recalled a long history in America of recommending advanced students for early college entrance, and allowing students to learn at their own pace, i.e. entering college when ready, or moving cohorts through an accelerated program including skipping entire grade levels. Up until the early 20th century, American colleges routinely admitted students at 16 or 17 years of age on an individual basis. Today, a variety of programs systematically encourage and support students who wish to enter college before their age-mates, including early college high schools. These secondary schools, housed on community college campuses, allow students to engage in high school courses through 10th or 11th grade, and then begin college level courses in the 11th or 12th grades. Early college high schools' course of study typically culminates with earning an associate in arts degree. For students who remain in a traditional high school setting, Advanced Placement and dual enrollment courses provide part time acceleration options. Data collected for the "Nation Deceived" report suggested that students benefited from remaining with their age peers in high school while accessing the opportunity to engage in more rigorous courses and earning college credit. Early entrance options, available at college and university campuses throughout the country, provided another means for students to accelerate their learning opportunities. Flexible formats allowed through early entrance programs provided students with the opportunity to enroll formally in college. In more unusual cases, students enrolled full time and lived on campus as college freshmen. Students concurrently earned credits toward high school graduation and their first year in college. Variations on this theme allowed students to choose part time enrollment in college and part time enrollment in high school while living at home. These scenarios mirrored the course taking profile of dual enrollment students, with the main difference lying in the bonafide college enrollment status of the students. Early entrance students generally consider themselves freshmen in college, whereas dual enrollment students generally self-identify as a high school student first, college enrollee second.

Colangelo, Assouline and Gross (2004a, 2004b) reported investigations into the academic and sociological effects of early enrollment programs on students' transition and success in college. One study showed that prior experience with Advanced Placement classes correlated positively with early entrance success, especially at selective universities. According to the authors, experience with rigorous classes, such as Advanced Placement, affirmed "the importance of content knowledge and academic rigor prior to enrolling in college" (Colangelo, Assouline & Gross, 2004b, p. 103). Summary recommendations included encouraging students to take advantage of all opportunities at the high school level to broaden content knowledge, to participate in some rigorous courses, such as AP, IB, or dual enrollment, and not just to strive to achieve minimum course requirements for college admission. Unfortunately, student accessibility to college level courses in high school or to early entrance type programs remains an impediment to the acceptability and viability of these options for the majority of American high school students.

Credit Based Transition Programs

Credit based transition programs (CBTP) are most commonly associated with college level courses that allow high school students to earn college credits for successful completion. Among the most common credit based transition programs realized under CBTP are Advanced Placement (AP) courses, International Baccalaureate (IB) programs, tech prep articulated courses, and dual enrollment programs (American Association of State Colleges and Universities, 2002). Transcript records for the year 2000 at the University of Michigan confirm that 80% of incoming freshman entered with credits earned as a result of some type of credit based transition program (Andrews, 2001 p. 15). Across the nation, dual enrollment constitutes the largest growth area among credit based transition programs (Bailey & Karp, 2003), and among college courses as a whole. In 2006, Lerner and Brand (American Youth Policy Forum) and the Western Interstate Commission for Higher Education (WICHE) published reports that investigated all four types of CBTP's, along with in depth investigations of individual and state-wide programs and policies governing the spread and implementation of CBTP across the nation.

Bailey and Karp (2003) conducted a meta-analysis of credit based transition programs by reviewing related literature written since 1990 and conducting qualitative fieldwork at 15 community colleges between 2000 and 2002. Their research found that CBTP was driven by several purposes, including:

1) preparing for the academic rigors of college

2) exposing students to both the academic and non-academic aspects of college

3) assisting with transitions to college life

4) exposing first generation students to college routines, expectations, and career possibilities

5) activating students' visualization of themselves as "college material"

6) offering new high school courses in both the academic and the vocational sectors

7) reducing college costs and time to degree through earning college credits in high school

8) improving relationships between secondary and post-secondary institutions

Since its inception in 1955, the College Board's Advanced Placement program has offered high school students an opportunity to participate in rigorous academic course work evaluated along a common metric. Advanced Placement classes, although not originally aimed at the academically gifted, became a means for accelerated students to experiment with a wide variety of college courses taught by high school teachers for high school credit. Advanced Placement satisfies Bailey and Karp's criteria for credit bearing transition programs due to the fact that college credit may be awarded as a result of the AP examination. Common national subject area exams, given each May across the country, are evaluated by college professors and result in students earning a scaled score between 1 and 5. According to the rules and regulations established by individual colleges or by state policy, students may be awarded an amount of college credit for the competency level of their subject area examinations. The National Center for Educational Statistics' census of AP enrollment in 2002 totaled 1.8 million course registrations with an estimated 1.2 million individual students participating (Waits, Setzer & Lewis, 2005, p.4). According to statistics provided by the College Board (2005), enrollment in AP classes has increased 750% in the past 20 years (p.3).

International Baccalaureate (IB) programs were found by the NCES survey to involve smaller numbers of students. An estimated 165,000 students participated in IB programs in 2002-03 (Waits, Setzer & Lewis, 2005, p.4). International Baccalaureate, like AP, offers students the opportunity to participate in rigorous courses within the high school setting and taught by high school teachers. The program serves high school students in grades 11 and 12 through a systematic set of liberal arts oriented course offerings. Students usually enroll in a required series of courses, rather than selecting some IB and some non-IB classes for a semester's work. The IB course of study culminates with high stakes examinations, which determine if students have earned an IB diploma. Colleges may grant credit for passing grades in IB classes. The beauty of these courses comes in their portability, especially for students enrolled in American or European schools abroad who wish to enroll in American colleges and universities.

Tech Prep courses have a history of federally funded support through the Carl D. Perkins Vocational and Technical Education Act, which supplies grant funding to states, to area career centers, and local school districts. Students participate in a series of courses beginning in the 11^{th} grade through the second year of college. Tech Prep courses culminate in the awarding of associate in arts degrees or technical certificates. During the four-year cycle, students may participate in dual enrollment courses and/or apprenticeship programs. High school courses are specifically articulated with the coordinating post-secondary institution in order to help students gain credits for work accomplished in highly specialized courses, such as agriculture, business, health sciences or computer networking systems.

The primary difference between dual enrollment courses and AP, IB or Tech Prep type credit based transition programs lies in the method of awarding credits. In the case of AP and IB courses, college credit is granted at the discretion of the college or university department through what are collectively known as "credit by examination" courses. College Level Examination Placement tests, otherwise known as CLEP exams, represent another common way to earn college credit through examination, again at the discretion of the colleges or universities, which set their own cut scores. Tech Prep participants, however, earn credit through articulated high school classes, but only after being admitted to a coordinated course of study at a community college or technical school. Although, dual enrollment courses may also be a part of a students' tech prep course of study, dual enrollment courses always generate a college transcript, issued by the two or four-year higher education institution sponsoring the course, complete with final grades. Students are issued a transcript with credits to use as they choose – as a part of a degree program at the issuing institution, as transfer credit to fulfill requirements for a degree, or as elective credit. Class participation, homework, quizzes, projects and examinations contribute to the final grade just as they would in any other college course. If taught by certified high school teachers, these courses also generate high school credit.

The literature uses multiple terminologies to label courses in which students earned college credits while a remaining officially enrolled in the high school. Dual enrollment, also known as dual credit or joint enrollment, describes "high school students who earn college credits for courses taken at a post-secondary institution" (Kleiner & Lewis, 2005, p. 1). Concurrent enrollment courses are defined as those college courses offered to high school students who enroll and receive both college and secondary school credits (Andrews, 2001). Generally for a student to earn dual credit, the instructor for the course must be certified to teach at the high school level, as well as meeting the qualifications for an instructor at the post-secondary institution sponsoring the course.

Dual enrollment programs, by definition, are "organized systems with special guidelines to allow high school students to take college courses" (Kleiner & Lewis, 2005, p. 1). Wide variations exist in the enrollment processes and regulations for high school students who wish to take dual enrollment classes. Colleges may restrict enrollment to high schools participating in their formalized dual enrollment programs. By adopting more liberal regulations, some colleges allow students to enroll in classes for college credit outside of the guidelines of their formalized dual enrollment program. Other institutions do not participate in cooperative programs with local school districts, but instead allow students to directly enroll in college courses. Another variation on this theme enables high school students, attending a school district without a formalized agreement with a college, to directly enroll in college classes on their own initiative and outside of their high school course load. Obviously, many permutations describe how students in high school can access college credit bearing courses.

Johnstone and del Genio (2001) further clarified the delineation between the various types of dual enrollment programs by labeling them "school based" and "college based". The course labels depended on the academic affiliation of the teacher. School based courses were taught by high school teachers, qualified as adjunct professors by the sponsoring college or university in the high school setting. College based courses were taught in the high school or college grounds, but always by a college or university employed professor.

Potential Impact of Credit Based Transition Programs on K-16 Initiatives

Educators and policy makers searching for weakness in the K-16 educational system might look no farther than the configuration and curriculum presently required in grades 11-14. Accordingly, Orrill asserts that our "state and district officials appear determined to populate the grade 11-14 emptiness with Advanced Placement and dual enrollment programs" (2003, p. 23). In response to the curricular confusion that represents in the last two years of high school with the first two years of college, the Carnegie Commission on Higher Education of 1973 recommended shortening the length of formal education to allow college entrance at the age of 16 or 17, rather than the traditional 17 or 18 years of age (Johnstone & del Genio, 2001). The Carnegie Commission also promoted the use of credit based transition programs, such as concurrent enrollment courses. More recently, the National Commission on the High School Senior Year suggested that dual enrollment programs ease transitions from high school to higher education. The National Center on Education and the Economy's 2007 report, "Tough Choices or Tough Times", goes farther in suggesting that students should exit out of high school at the end of 10^{th} grade and enter the community college system for two years before taking further examinations for entrance into a four-year college or university. Until such reforms are enacted through legislation, CBTP options continue to provide the main way to advance the education of students who have exhausted the minimal requirements of the high school course of study.

The literature suggests that credit based transition programs have the potential to significantly alter the secondary/post-secondary school relationship and to give a renewed purpose to the last two years of high school. The chronological placement of dual enrollment courses, within the two years prior to high school graduation, opened these programs to inquiry regarding their particular role in preparing students for the demands of college. Current research identified the high school course of study with the highest level of academic rigor to include AP, CLEP or dual enrollment - each an example of a CBTP. Nearly twenty-percent of the senior class of 1992 earned college credits while enrolled in high school through Advanced Placement, CLEP, or dual enrollment courses (Adelman, 2004, p. 56). According to a study of the combined NLS: 72, HS&B/So: 80-92 and NELS: 88/2000 cohorts, forty percent of students in the highest curriculum quartile earned one or more credits through a credit bearing transition program (Adelman, 2004, p. 56). Dual enrollment, as a type of CBTP, may provide at least one way to increase the intensity and rigor of the high school curriculum. These programs may facilitate high school to college transitions, improve preparation for college and motivate students to take more rigorous classes in high school. By allowing high school students to "begin real college work when they are ready" rather than waiting on the seat time required to finish the four years of high school, dual enrollment courses provided incentives for participation in rigorous academic courses (Haycock, 1999, p. 31). Credit based transition programs, especially dual enrollment courses, may serve the purpose of providing a supportive bridge toward college readiness.

Dual Enrollment Programs

A History and Prevalence of Dual Enrollment in the United States

One of the first instances of the melding of secondary and tertiary education occurred in 1928 when Pasadena Junior College and Pasadena High School merged into a single entity encompassing grades 11-14 within one physical plant. Contemporary dual enrollment programs appeared in the 1970's, but didn't gain momentum or much popularity until the mid-1980s (American Association of State Colleges and Universities, 2002). "Project Advance", launched at Syracuse University in 1972, claims honors as the oldest organized dual enrollment program in the nation. Growing from 3,900 students in 1998, to over 6,000 students in 2007, Project Advance provides concurrent enrollment courses in 134 high schools across five states – New York, New Jersey, Maine, Michigan and Massachusetts (Syracuse University, 2007a). Previous research has shown that approximately ninety-one percent of concurrent enrollment students transferred credits earned to other four-year institutions (Reisberg, 1998, p. 5; Johnstone & del Genio, 2001, p. 9). Syracuse University, through Project Advance, has led the growing national movement for dual enrollment program accreditation through support of the National Alliance of Concurrent Enrollment Partnerships, and has served as a role model for other partnership programs at the Indiana University, the University of North Carolina-Greensboro, the University of Pittsburg, the University of Wisconsin-Oshkosh, and the University of Minnesota (Syracuse University, 2007b).

In April 2005, the first national studies of the prevalence of dual enrollment programs across the nation were conducted by the National Center for Education Statistics (NCES). Through surveys and focus groups, data were collected (Kleiner & Lewis, 2005; Waits, Setzer & Lewis, 2005) which gave the nation a comprehensive understanding of the scope of these programs. This baseline data provided numerical information about student enrollment figures and participation levels of Title IV eligible post-secondary institutions involved with dual enrollment programs. Title IV eligible schools constitute those institutions participating in the federal student financial aid program to disperse Pell Grants and Stafford Loans.

Results of the NCES surveys showed that of the over four thousand post-secondary institutions responding, fifty-seven percent reported enrolling high school students in courses both within and/or outside of formalized dual enrollment programs. Forty-eight percent of all responding colleges reported active dual enrollment programs, defined as an organized effort to actively pursue and enroll high school students in college classes (Kleiner & Lewis, 2005, p. 4). Surveyed schools represented two and four-year, public and private, large, medium and small institutions.

To fully appreciate the number of students involved in dual enrollment programs across the country, consider that in 2002-03, five percent of all high school students in the nation had taken part in some type of college credit course offered through a post-secondary institution (Kleiner & Lewis, 2005, p. 7). Further analysis of the 2002-03 census revealed that 813,000 students participated in dual enrollment programs. Ten years earlier, according to the NELS: 88/2000 data, a weighted sample of 213,000 students had earned post-secondary credits through dual enrollment participation (Adelman, 2006, p. 99). While data from these two populations of surveyed students lack comparability controls, the data infer that between the 1990's and 2003 dual enrollment participation seems to have substantially grown in the United States.

The overwhelming majority of colleges, eighty percent, offer their dual enrollment courses on the college campus, while fifty-five percent of colleges offer classes only in the high schools. Of those programs holding classes in the high schools, over one quarter of the courses are taught by college instructors, thirty-two percent by a high school based adjunct professor, and the remainder by a combination of high school and college based teachers (Kleiner & Lewis, 2005, p. 9). Seventy-one percent of high schools in the NCES survey stated that they participate in dual enrollment programs (Waits, Setzer & Lewis, 2005, p. 4). Therefore, students participating in dual enrollment programs found courses offered both in the high school and college settings. Not surprisingly, colleges have reported their largest area of curricular growth in courses available to high school students (Haycock, 1999).

Although four-year institutions sponsored the first large-scale dual enrollment programs, these programs have had their greatest impact on the enrollment numbers in community colleges. According to Kleiner and Lewis (2005), ninety-eight percent of responding two-year schools reported high school students enrolled in dual credit classes. The American Association of Community Colleges gathers statistics on student enrollment in their accredited public and private two-year institutions. In the year 2000, enrollment of students under the age of eighteen accounted for five percent of the total enrollment in the community college system in the United States (Andrews, 2001, p. 16). This figure had increased dramatically from just over one percent of the student population in the same demographic in 1993. Surveys of community colleges in Illinois, for example, indicated that all forty-eight community college districts offer dual enrollment programs (Marshall & Andrews, 2002, p. 238).

Dual Enrollment Policies and Programs across the United States

Students participating in dual enrollment classes, while technically enrolled in post-secondary education and counted in the census as "full time equivalent" students, are not considered regularly enrolled freshman students and are not eligible for federally supported financial aid programs (Hughes, Karp, Bunting & Friedel, 2005). Registrars typically label dual enrollment students as non-matriculated or special registrants for admissions purposes. Such special treatment marks the initial post-secondary education experience, as well as first encounters with the rules and regulations governing transition programs. I will argue that students' primary objective for enrolling in a dual enrollment course is the acquisition of post-secondary credit. Gaining recognition for that credit outside of the granting institution requires that educational agencies and institutions cooperate and self-regulate the delivery and quality of the courses for which credit is generated. Herein lies both the controversy and advantages inherent in CBTP's for students and the post-secondary systems into which they place their trust.

Dual enrollment credits earned through community colleges transfer to other institutions of higher education through articulation agreements legislated through the state government. Courses usually transfer to other two-year colleges or to four-year institutions regardless of whether the course originated at the community college or the local high school (Townsend, 2001). Regulations specific to transfer credits, particularly for dual credit courses, may vary depending on the in house rules and regulations of a particular institution of higher education. The option to transfer credits from a two-year to a four-year institution provides both flexibility and assurance to the student participant that the credit earned will follow throughout a post-secondary career. When courses earn both high school and college credit, as is the case with concurrent enrollment courses, increased academic value for the students is also added to the high school curriculum.

In 2006, the Western Interstate Commission on Higher Education published its report, “Moving the Needle on Access and Success”, where it was found that 42 states had adopted policies governing dual enrollment programs, which was an increase from 23 states with programs established by state legislatures during a previous survey in 2000 (p. 7). The report also found inconsistencies in both CBTP policy development and dual enrollment program proliferation. For instance, in Illinois there are no state level policies to govern dual enrollment programs, but, as stated earlier, every community college in the state has established partnerships with local high schools or offers students the opportunity to enroll in courses before high school graduation (Andrews, 2001;WICHE, 2006). Without policies to govern programs, students could be at a disadvantage when trying to receive formal recognition for credits earned as dual enrollment participants. Illinois circumvented the issue by organizing articulation agreements between the community college and state university systems. Students enrolled in courses with the IAI (Illinois Articulation Initiative) designation are assured that the course will be granted credit when transferred to any one of Illinois’ public universities.

According to the WICHE report (2006), state policies governing dual enrollment programs provide guidance and regulation in the following six areas:

1) Eligibility Requirements: Grade point average, grade level in school, class rank, required standardized test scores, application forms, recommendations from high school officials, requirements to meet college entrance examination minimums, and specific course requirements are among those listed in state policy documents.

2) Recognition of Credit: Policies concerning the awarding of college credit and dual credit (high school and college credits) are regulated by the states and implemented by collaborative agreements between participating secondary and post-secondary institutions.

3) Financial Costs: State student aid pays the high school district and/or the college a full time equivalent rate for dual enrollment students. Wide-ranging variations exist concerning who pays tuition for courses and how much can be charged for tuition. Students who have not graduated from high school are not eligible for federal financial aid, but may receive tuition rebates from state grants received by the partner college. Costs of dual enrollment programs may be the largest detriment to their accelerated usage by low-income students and to the expansion of programs within states due to "double dipping" of student aid payments by state governments. On the other hand, states look at dual enrollment programs as potential cost saving devices, due to the possibility of shortened time to degree for students in the two-year or four-year state sponsored college systems.

4) Information Sharing and Counseling: Policies in 12 states require school districts to inform students about opportunities available through dual enrollment

programs. In Oregon, school districts must inform parents of students who are at-risk of dropping out of high school or who have already exited before high school graduation about dual enrollment programs.

5) Accountability Safeguards: Technology advancements have improved the possibility of tracking dual enrollment students in order to learn more about the long term effects of participation. Program standards and student tracking policies have been implemented in 10 states.

6) Participation Incentives: Students may be held financially accountable if they fail to pass dual enrollment courses for which state or local funds were paid for tuition, books, and/or fees. WICHE describes three states that offset student costs, but then expect repayment, in the event of student failure or non-completion.

The WICHE report offers detailed information on policy issues governing not only dual enrollment, but also Advanced Placement and Tech Prep course implementation. Recommendations offered in the executive summary include the modification of high school graduation requirements to include completion of at least one accelerated course - tech prep, AP or dual enrollment. Additionally, the report encourages states and local boards of education to eliminate policy language that might limit access or discourage participation in CBTP's, including dual enrollment courses. On the other hand, the report openly acknowledges limited research concerning the efficacy of transition courses on student outcomes in future college level courses. WICHE recommends that state and federal governments, along with private foundations, allocate funds to support research to investigate acceleration/transition programs, including cohort studies. WICHE fails to mention the Educational Longitudinal Study of 2002 (ELS), which is now in progress. This new longitudinal study, conducted by the US Department of Education in conjunction with the National Center for Educational Statistics, will provide researchers with an updated version of the NELS: 88/2000. Overall, the WICHE report offers an in depth analysis and census of policies and regulations governing transition programs in the United States.

As a consequence of the proliferation of dual enrollment programs, student involvement has likewise shown great increases over the past thirty years. For instance, student participation in dual enrollment programs in the State of Minnesota, where the University of Minnesota system plays a large role, grew one hundred ninety percent from 1985 to 1995. Virginia and Illinois saw growth of two hundred forty percent from 1991-1998 and 1997-9999 respectively. Student participation in Florida boasted a modest increase, in comparison, of sixty-three percent from 1991-1999 (Marshall & Andrews, 2002, p 237). Geographically speaking, the Midwest or Central regions have demonstrated the highest saturation of dual enrollment program participation in the country. Of the high schools responding to the national survey by NCES, eighty percent of those located in the Central region participated in dual enrollment partnership programs. The Northeast region was the least saturated with only fifty-eight percent coverage (Waits, Setzer & Lewis, 2005, p. 4).

Dual enrollment programs are commonly located in towns and urban fringe areas rather than rural or urban areas. Because programs have not taken root in some urban areas, dual enrollment programs do not proportionally affect minority student populations. Only fifty-eight percent of high schools with high numbers of minority students participated in dual enrollment programs, against seventy-eight percent of high schools with low minority student populations (Waits, Setzer & Lewis, 2005, p. 4). However, a greater percentage of large high schools, those with student populations of 1200 and above, participate in dual enrollment programs than do smaller high schools. (Waits, Setzer & Lewis, 2005, p. 4). The prototypical profile of dual enrollment programs is a large, suburban high school with low minority populations in the mid-western states.

Although many types of configurations exist, community colleges and universities offer dual enrollment course opportunities to students primarily in the last two years of high school. According to the NCES 2005 survey of dual enrollment programs, ninety-eight percent of all institutions offering dual enrollment courses allowed twelfth grade students to enroll (Kleiner & Lewis, 2005, p. 13). A slightly smaller number of college and universities offer dual enrollment opportunities to high school juniors. A similar survey, collecting information from high schools participating in dual enrollment programs, reported that ninety-two percent of responding high schools offered academically oriented dual enrollment courses (Waits, Setzer & Lewis, 2005, p. 8). Course offerings in dual enrollment programs typically include both vocational and academic emphases, however more students enroll in academically oriented dual enrollment courses than vocational/technical/career classes The fact that the majority of students who participate in this particular type of credit bearing transition program choose courses within the academic core (math, science, social science and language arts) merits further examination of their benefits to high school students.

Washington State’s dual enrollment program, “Running Start”, serves as a feeder system from the local community colleges to both the University of Washington and

Western Washington University. Unlike most other dual enrollment programs found across the country, Running Start allows students to enroll full time in college courses offered at community college campuses even though students have not officially graduated from high school. Students in this program “experience the expectations and lifestyle of college students” (Bailey & Karp, 2003, p. 16). Running Start served as a model for a spin-off in Hawaii between the Hawaiian Public Schools and the community college/university system in that state.

Utah created the “New Century Scholarship” program in 1999, which promoted the use of dual enrollment courses to accelerate college attendance and completion. After acquiring enough college credits to earn an associate in arts degree, students who graduated from high school were guaranteed a 75% tuition scholarship for two years to any state university in Utah (Boswell, 2001, p. 5). College credits could be earned through participation in dual enrollment, advanced placement or summer school at a post-secondary institution.

In the Northeast, New York City led all other metropolitan areas in establishing dual enrollment programs. “College Now” serves high school students in New York City through a partnership with City University of New York (CUNY). In 2001, aggregate enrollments at the seventeen CUNY campuses numbered 11,244, drawing students from one hundred sixty-one high schools in the NYC metropolitan area (Kleiman, 2001, p. 6). The College Now program has enabled both eleventh and twelfth grade students to participate in dual enrollment courses. However, the program has made plans to expand its influence to all NYC high school students by introducing new academic opportunities for ninth and tenth graders, “Think College Now”. The comprehensive 9-12 program seeks to prepare all students to graduate from high school in four years, and to enter college at proficiency levels that eliminate the necessity for remedial classes. The overall goal for the State of New York and the College Now dual enrollment program is to prepare students for successful completion of the New York State Regents Exam. City University of New York (CUNY) entered into an agreement with the New York State Department of Education and the New York City Public Schools, allowing any student who passed the Regents Exam with a certain predetermined score to automatically place into credit bearing classes (Kleiman, 2001, p.19). Preparation for successful completion of the Regents Examination includes participation in dual enrollment courses sponsored by CUNY and the NYC Public School's College Now program.

Concerns Regarding Viability of Dual Enrollment Courses and Student Preparation

College and university representatives have reported concerns over the levels of academic readiness demonstrated by students enrolled in credit bearing transfer programs. College professors have voiced uneasiness about dual enrollment students moving directly into advanced courses, and questioned student preparedness for those courses. Fearing the impact of large numbers of average high school students enrolling and earning college credit before official matriculation, college faculty perceived threats to their "teaching roles and traditional curricular authority" (Johnstone & del Genio, 2001, p. viii). Critics of dual enrollment, especially those courses offered at high schools by high school teachers, argued that the quality of courses could not equal that offered on campus by a college teacher (Boswell, 2001). To counter those apprehensions, programs such as Washington State's Running Start, required students to take college entrance and placement exams, and to pass them at proficiency levels required of traditional students

(Reisberg, 1998). State governments have instituted policies governing eligibility standards for student participants in dual enrollment programs. However, post-secondary institutions, particularly community colleges, exercised liberal latitude when determining which classes required entrance standards. Schools often settled upon certain rules according to the transfer value of credits to certificate or degree programs within or outside of the sponsoring college. Safeguards and policy notwithstanding, vast differences exist regarding the perceptions of university faculty and admissions officers when evaluating the integrity of dual enrollment programs, especially those based in the high schools. Dual enrollment courses taught by high school teachers, certified as adjunct professors, and taught exclusively to high school students have generated concerns regarding the quality of both instruction and the college experience. Four-year institutions, especially, harbor suspicions about the adequacy of the academic supervision afforded to the students in the school based college-credit courses (Conley, 2005). In a survey of colleges of varying degrees of selectivity, Johnstone and del Genio found that only forty percent of provosts and chief academic officers from responding selective universities accepted the premise that high school students should be awarded college credit for courses regardless if the teacher or the site of the course emanated from the high school (2001, p. 43); this contrasted with ninety percent of community college administrators.

Carol Dougan, a former community college teacher and administrator, shared her first-hand experiences with dually enrolled high school students who participated in her college classes (2005). Ms. Dougan commented on what she saw as a relentless trend by local schools and state agencies to push dual enrollment programs upon community college administrators, instructors and students. Other college administrators have viewed dual enrollment classes as a revenue source, teachers saw job security in larger class sizes, and students enrolled in order to save time and money toward their college degrees (Conley, 2005). Complaints from college faculty and administrators regarding high school student enrollment in college courses include the view that students are poorly prepared, receive below average grades, bring down the quality of classroom discussion and generally exercise immature behavior. Despite claims that students performed as well or better than their peers at the college level, Dougan recalled experiences with past dual enrollment students who failed at the four-year college level and returned to the community college to retake courses already completed a year or two before as a high school student. In order to remedy this potential failure, Dougan recommended that students put more effort into their high school classes in order to adequately prepare for college placement exams. Additional cautions were expressed by Dougan regarding high school students' abilities to think, reason and learn at the level of their college classmates due to physical and mental maturity issues.

Although Dougan's concerns were not totally unfounded, anecdotal comments cannot replace empirical data. The evidence challenges Dougan's contention that the dual enrollment students' behaviors were dramatically different or less mature than traditional first year community college students. Maturity doesn't magically occur upon receipt of a high school diploma. For students who intend on completing a program or transferring upon college entry, success rates for community college students earning either an AA degree or training certificate or transferring to a four-year institution range from 50-60% (Hoachlander, Sikora & Horn, 2003, p. iv). These data suggest that traditional students also struggle from poor preparation and maturity deficits, for which Dougan berates high school students in dual enrollment programs. Quality mentoring, appropriate information about course expectations, proper entrance test screening, and helpful encouragement can facilitate the transition to college courses more successfully for dual enrollment students in the community college setting. Dougan, while critical of high school students entering the community college classroom, failed to outline how differently these students actually performed from the average students in her courses. Dual enrollment students are essentially being accelerated, through the opportunity to attend college courses. In their high schools, they may or may not be amongst the brightest students. However, in relation to other college students, the high schooler should be expected to master taught material to a passable level for the course – the logical expectation of a successful placement examination.

Reisberg (1998) also sounded the alarm over the meteoric increases in both dual enrollment and Advanced Placement course participation and associated doubts over the rigor of these transition courses. Reisberg quotes college professors and admissions specialists on their handling of dual enrollment or other CBTP course credits. The consensus of those interviewed stated that dual enrollment courses were perceived as easier and more varied in quality and rigor than AP or IB courses, which follow a more standardized curriculum. However, Reisburg downplays the fact that dual enrollment courses earned credit, usually accepted by colleges. There are exceptions, however, with some colleges refusing to accept concurrent enrollment courses, such as those provided through Project Advance. Reisberg references Lafayette College, which doesn't acknowledge credit earned through the Project Advance program. Lafayette College representatives defended their position, because non-college instructors teach concurrent enrollment courses in off campus locations with non-college students. Advanced Placement courses also faced mixed reception, with some colleges like the University of Virginia encouraging their incoming freshmen students to participate in the program and others like Haverford College not accepting scores less than a 4 on a 5 point scale for credit. While not wholeheartedly endorsing AP or IB, Reisberg finds fault with dual enrollment, ironically the only acceleration program actually administered by institutions of higher education.

Bailey and Karp (2003) reported large increases in both participation and interest in dual enrollment, Advanced Placement, and tech prep programs, but very little if any reliable data on the efficacy of these programs in regards to student outcomes. Nevertheless, money has continued to flow from state, federal, local and philanthropic sources, such as the Bill and Melinda Gates Foundation, to fund CBTP initiatives and early college level education programs. Transition programs could provide acceleration opportunities for gifted students and equalize the playing field for disadvantaged students. However, oversight and regulation is vitally necessary in order to maintain quality and integrity for credits earned, and for families and students to make informed decisions about the type of courses best suited to their career aspirations.

Transitions, Integration and Survival in College

Reference Group Theory

In his 1957 text, *Social Theory and Social Structure*, Robert Merton described the process civilian men undergo when entering the ranks of the military. Enlisted men, hoping for promotion to officer ranks, desired to mimic their superiors' behaviors.

Merton described the predominant behavioral changes in these men as an acquisition of the new referent group's characteristics. When the soldiers assumed new mannerisms and values, they personally identified with the reference group and began to behave accordingly. Before actually joining the surrogate group, Merton hypothesized that the construct of anticipatory socialization governed the soldiers' behaviors (p. 265). Thereby, the soldiers experimented with new social mores, structures, rules, and attitudes before becoming a regular member of the officer corps.

Merton postulated that anticipatory socialization helped people adapt to new situations, especially where individuals can be easily accepted into or moved out of a previously unfamiliar group or social circle. When students anticipate entering college life, a similar move to an unfamiliar setting with behaviors and social structures calls for accurately infusing and adjusting oneself into a new setting. Students who wish to pursue a college education may encounter a psychologically strenuous adjustment period. Therefore, students who successfully anticipate the socialization required to fit into college life may experience less stress when leaving behind routines of life established during their pre-college days. For low income or lower socioeconomic status (SES) students, moving into the college routine often means adjusting to the rules and routines of a different social class. Merton's reference group theory corroborates the view that students who participate in college-like or pre-college activities before formal matriculation actually assimilate behaviors of college students through anticipatory socialization. Participation in transition programs, such as dual enrollment, may allow lower SES students to enhance their learning about middle class values in the college setting, better understand college-level expectations for homework, written assignments, and exercise a higher level of thinking skills. Furthermore, experimentation with college courses may solidify students' desires to attend college or may accentuate academic and social maturity deficits to be rectified before matriculation. A variety of factors may govern the degree to which anticipatory socialization affects students' college integration, including the location of the course (on campus or at the high school) and the amount of mixing allowed in the classroom between high school dual enrollment students and college enrolled students. Therefore, Merton's reference group theory, further defined by the construct of anticipatory socialization, forms one of the theoretical pillars for research on dual enrollment programs and their potential impact on persistence to degree.

Pascarella, Terenzini, and Wolfle (1986) theorized that anticipatory socialization is evident as a factor in students' participation in summer orientation programs before freshman matriculation and in subsequent decisions to persist or withdraw from college. The authors interpreted the power of anticipatory socialization as a

> process or set of experiences through which individuals come to anticipate correctly the values, norms and behaviors they will encounter in a new social setting. To the extent that such anticipatory socialization is effective, the individual should become more successfully integrated into the new setting and function effectively in it (p. 156).

The results of the 1986 study concluded that freshman orientation, as a form of anticipatory socialization to college, positively influenced persistence decisions, emerging as the third greatest total effect (r=.123), after controlling for student demographic attributes (p. 168). Students' exposure to the orientation sessions produced the greatest total effect (r = .316) toward persistence in the area of social integration (p. 168).

Pascarella, Terenzini and Wolfle's research sought to explore the impact of anticipatory socialization while utilizing variables directly correlated to the theoretical model created by Vincent Tinto (1993), who postulated that students, by anticipating the behavioral norms and goals of college students, transition more smoothly and with less stress than those who lack such experiences. Anticipatory socialization may help initially, according to Tinto, but does not eliminate all problems associated with transition to college.

Social class and parental influence impact whether anticipatory socialization produces positive results in post-secondary education settings. According to Simpson (1962), lower income class students may be more likely to participate in higher education if they interact with middle class students in the secondary school setting. The sample for Simpson's study included 743 boys from two high schools in two southern US cities. Family background was used as a control for selecting students from a total of 917 original respondents (p. 518). Survey questions allowed Simpson to determine the degree to which social class influenced aspirations for higher status occupations after high school. Key findings pointed to the marked influence identification with middle class values has on students from lower income settings. Through both classroom and extra-curricular activities, lower income class students were socialized into middle class norms and values, and experienced the aspirations and ambitions of social mobility exhibited by middle class students and their families. A clear demonstration of anticipatory socialization affected lower income class students who chose to enroll in college preparatory courses. Additionally, parental support for post-secondary participation proved a vital ingredient toward college matriculation and occupational prestige for students from both lower and middle class families. According to Simpson, 71.4% of lower income class students who had parental support and experienced middle class peer influences aspired to higher status occupations. Conversely, only 25.6% of lower class students, who had low levels of middle class peer interactions and low levels of parental support, indicated a desire to achieve a higher occupational status than their parents. Middle class students in this study produced even higher aspiration levels (81.9%) when socialized by peers and encouraged by parents. However, even with low parental and peer encouragement for social mobility, 30.1% of middle class youth desired a higher occupational level than their parents (p. 521). These descriptive statistics reinforced the importance of anticipatory socialization for lower income class students. The embrace of middle class norms, which stands as a proxy for valuing education and social mobility, influenced the decisions of students from lower income settings in ways that allowed them to better themselves. However, opportunities for lower class students to participate in dual enrollment classes with predominantly middle class students may only influence higher occupational aspiration if parents also actively encourage their children. Simpson's study indicated that if peer influence was at a high level, but parent encouragement was low, only 35.7% of students aimed for the probable results of post-secondary education (p. 521). Therefore, peer encouragement may not be enough for lower class students to take the next step and actually enroll in post-secondary education.

All things considered, I believe that dual enrollment courses may assist students to anticipate the norms and behaviors expected by college professors and campus routines, and ease the transition from high school to college. Through dual enrollment, students participate in college admission routines, placement exams, purchasing textbooks, and all of the general rituals of attending college. These events take place within a semi-structured support system, especially for those students who remain enrolled in high school. A true college experience awaits students in early college high schools, where the secondary school functions on the partnering college campus. For students participating in concurrent enrollment courses, the purposeful choice to enroll in a college class entails all of the activities listed above but within the familiar surroundings of the students' high school building. When students seek to acquire college credits through participation in a college class, the role of anticipatory socialization may help produce higher rates of persistence and degree attainment. Experience with college activities before actual matriculation may lead to higher levels of academic and social integration during the critical freshman year, also resulting in higher levels of persistence and degree attainment.

Theory of Individual Departure from Institutions of Higher Education

The literature clearly supports the premise that college persistence is affected by the skills and knowledge students bring with them to their initial matriculated college experience. However, prior to Adelman's seminal research utilizing longitudinal student data, Tinto (1975, 1993) postulated that student post-entry experiences influence persistence and degree completion to a greater extent than the totality of the educational and personal experiences students bring to higher education. Vincent Tinto's theory, first published in 1975 and subsequently revised in 1987, 1993 and 1997, offers an explanatory model of college departure (see Figure 2.1). The main premise of the theory was to determine how students separate and transition from the home and pre-college environment to the college social surroundings and academic demands. Tinto's original theory focused heavily upon the skills and knowledge students brought to the college experience as an indicator of persistence and degree attainment. Adelman's "Tool Box" studies (1999a, 2006) strongly support Tinto's original theoretical viewpoint by confirming the significant role that access to a rigorous high school curriculum plays on the attainment of a post-secondary education.

Tinto's revised model, however, indicated that post matriculation student experiences exerted a greater impact on whether students depart college than the actual skills and attributes they brought to the journey (Tinto, 1993). When considering the complexities of college matriculation and persistence to degree, students face multiple layers of effects as they contemplate continued persistence in the higher education system. Tinto's theory has the potential to assist researchers in evaluating the possible effects of dual enrollment courses on the pre-college events and on academic and social integration experiences gained from the college environment.

The structure of Tinto's 1997 model accentuates the recursive importance of intentions, goals, institutional commitments, and external commitments. By referencing goals and intentions, Tinto meant the educational aspirations of the students as they pertain to entering college. Institutional commitments were described by Tinto as the extent to which students align themselves psychologically with their college of attendance. The strength of the students' identification with the institution very much affects their commitment to remain at that institution. External commitments also come into play as obligations to family members, peers and occupations may siphon time and energy from the college pursuit. The model puts academic and social integration in the center. Personal discussions and interactions with teachers most directly affect academic

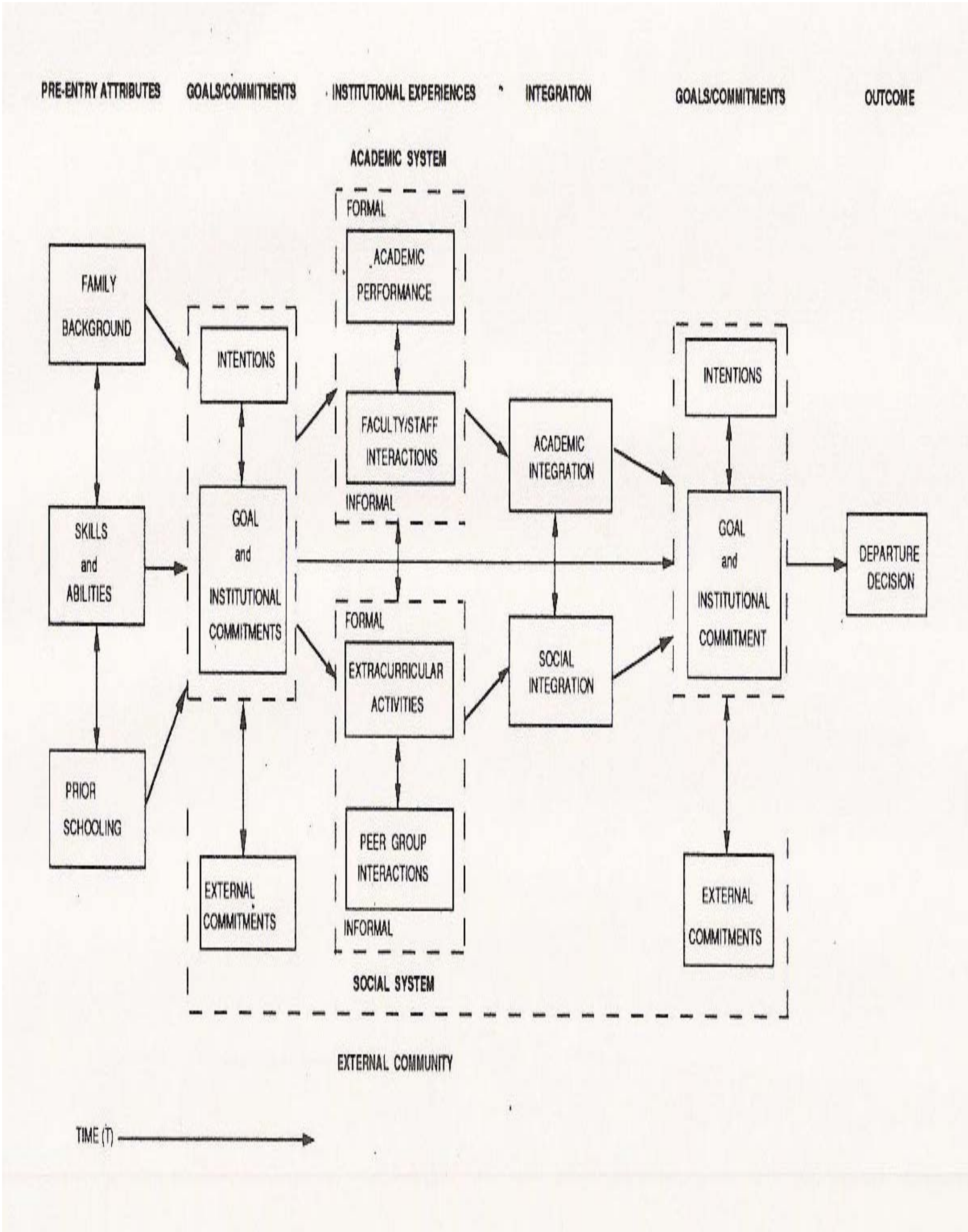

Figure 2. 1. A Longitudinal Model of Institutional Departure

Source: Tinto, V. (1993). *Leaving College: Rethinking the Causes and Cures of Student Attrition (2nd ed.)*. Chicago, IL: The University of Chicago Press, p. 114. Reprinted with permission.

integration, while social integration depends more on the types of peer relationships developed through the college experience, as well as students' sense of belonging on campus.

Dual enrollment courses may also play a role in the attributes influencing academic performance within the portion of the model labeled "institutional experiences." Goals and commitments to college may be strengthened by experiences with dual enrollment courses, and attending college courses with familiar high school classmates may strengthen peer group interactions. According to Tinto's model, these aforementioned interactions directly and indirectly impact academic and social integration. If dual enrollment classes perform both a high school and a college-oriented function, by promoting academic and social integration, their impact upon decisions to persist in college may be inferred by the structure of Tinto's model.

By referencing Syracuse University's Project Advance and other similar credit-bearing transition programs, Tinto supported the view that college courses taken during the regular academic program of the high school provided transitory benefits to students. Accordingly, dual enrollment courses "enable high school students not only to acquire college credit but also to obtain first hand insight into the character of academic life at an institution of higher learning" (Tinto, 1993, p. 158). Tinto's words substantiate the premise that both a theory of departure from institutions of higher education and the construct of anticipatory socialization work together to explain the power of dual credit courses upon student behaviors in the college setting.

Therefore, the predominant premise supporting my research of dual enrollment programs and their impact upon student achievement in post-secondary education looks to Tinto's theory of individual student departure. Tinto's theoretical model considers the impact of pre-college skills, in addition to those experiences affecting students after matriculation. Because dual enrollment programs occur at the cusp of high school and college, and include transcripted college courses, Tinto's theoretical model may help to explain the effects of dual enrollment course participation upon student persistence in college.

Separation and Transition to College Through Dual Enrollment

Having already discussed pre-college academic attributes, I now turn my attention to the parts of Tinto's model, related to the dynamics encountered by students participating in dual enrollment courses.

Tinto (1993) suggested that students who live at home or attend a non-residential post-secondary institution risk failure to thrive in college. A multitude of factors, including recurring interactions with former high school friends and family members (even those who support the students' decision to attend college), act as external forces, pulling students away from learning college behaviors and attitudes. Tinto's theory asserts that separation from prior high school experiences and peers bonds the student to college life and is essential for persistence. Students who constantly return to their homes, live too close to campus, engage in work activities on weekends, or continue with family obligations fail to find opportunities to engage in new college oriented activities and friendships, or those established may become transient. On the other hand, families may also form a strong support system to assist students toward persistence in college, a role that is particularly important for first time college attendees.

Dual enrollment classes held at colleges or universities may simulate the experience of students attending a commuter college, wherein ties to family and friends serve as a wedge between full commitment to the college life and a retro-gradation to family routine. Still, students enrolled in dual credit programs do separate themselves from their peers in high school and attend classes in a place removed from their familiar secondary school surroundings. In this way, separation and early acquisition of college behaviors and attitudes may occur through interaction with other college students or other dual enrollment participants. Dr. Melinda Karp, from the Community College Research Center at Teachers College, Columbia University, conducted a qualitative study in 2006 of 26 high school juniors and seniors enrolled in their first college courses through the College Now program sponsored by the City University of New York (CUNY). The purpose of Karp's research was to further understand whether dually enrolled students who self-identity as a college student have better rates of persistence in college. Karp postulated that participation in dual enrollment programs improved persistence because they provided opportunities for students to learn college behaviors and attitudes and allowed students to practice the role of a college student. Karp's study in role acquisition connects well with the sociological constructs of anticipatory socialization and social/academic integration advanced in Tinto's model.

If students form a college identity in high school, will students increase their odds of a smooth transition to college? Karp conducted student interviews at the beginning, middle and end of the semester, and observed classrooms of students enrolled in their first dual enrollment course. Results were coded to "identify themes and patterns in the data" (2006, p. 6). Nearly two thirds of the students in the study showed improvement in knowledge of college student behaviors (p. 7). The primary change agent was the perception by students that their dual enrollment course was a "real" college course. Nearly 70% of the students during the initial interviews didn't see themselves as college students. By the end of the course, however, nearly half had revised their opinions positively toward college identification (p. 9). Descriptive statistics were generated from qualitative coding of student interpretations, but uncertainty looms as to whether the improvement noted indicated a significant result. Nevertheless, Karp's findings may signify that dual enrollment courses, if taught in a manner and/or location materially unlike the high school environment, lead students to think of themselves as a college student in a way that facilitates the possibilities for a fruitful integration to college. The small number of students involved in Karp's study raised concerns of about generalizability.

Socialization Effects of Dual Enrollment Programs

Tinto's Longitudinal Model of Institutional Departure focuses on both the academic and social integration of students into college life. Although several components of Tinto's model have evolved since 1975, the influence of individual commitments to post-secondary schooling and to supportive social structures remains strong. Social and institutional commitments produce more significant indicators of persistence than the academic influences (Tinto, 1993; Hicks & Lerer 2003). For instance, students attending residential colleges and universities form social networks and become part of learning communities. These collaborations strengthen commitments to the post-secondary institution and to the social bonds of friendship and camaraderie (Pascarella & Terenzini, 2005; Tinto 1993).

In the early stages of the college experience, students often struggle to socialize into the presumed norms of the college group. Tinto (1993) hypothesized that a failure to integrate into either the social or academic systems in college ultimately results in departure. Students can integrate socially and fail academically, creating a non-voluntary departure. Likewise, students can achieve academically, but fail to create social networks, thereby also leading to voluntary departure. Of course, social networks can overshadow academic responsibilities. However, the social connections students develop during their first year in college directly affect decisions to persist or depart. Thomas (2000) found that social relationships positively affected college persistence. Using structural equation modeling, Thomas identified the direct and indirect effects emerging from the social interactions students had on campus and linked these to persistence.

Dual enrollment programs focus primarily on academic integration. But successes in these programs may ultimately be associated with issues of social integration. Interactions with faculty, guidance from staff, and relationships with classmates, may sustain students especially during times of doubt. According to Nora (2001-02), once students feel the presence of a social-emotional safety net in their college relationships, then " students begin to make the transition from high school students to undergraduates" (p. 46). Peer encouragement through academically based activities, such as small group projects, may promote both social and academic systems of integration and ultimately promote persistence in dual enrollment programs. According to Pascarella, Terenzini and Wolfle (1986), higher levels of social integration into college life "should lead to increased commitment to and lower likelihood of voluntary withdrawal from the institution" (p. 156).

Do high school students who are concurrently enrolled at a community college or university feel any socially influenced commitment to the post-secondary institution? Studies on community colleges have shown that social integration has a minimal impact on students, at least in relation to with academic integration. Community college social groups were less likely than those at four-year institutions to develop and continue over the usual two years of a community college experience (Pascarella & Terenzini, 2005). However, social interactions experienced in the first months after initial enrollment at the community college tend to mirror those at the university level, but decrease in importance over time (Napoli & Wortman, 2005). Students who lacked commitment to the institution, experienced weak social support systems, or found few opportunities for involvement in learning communities within the institutional framework may be at risk of departure from college (Lotkowski, Robbins & Noeth, 2004). These findings suggest that dual enrollment students were unlikely to form commitments to the post-secondary institution. Likewise, sponsoring institutions should not assume that dually enrollment students will choose to matriculate into their colleges. What remains unclear is the impact of institutional commitments on long-term persistence for dual enrollment students.

Tinto (1997) investigated the importance of classroom dynamics on persistence, specifically the interactions of students with their peers and faculty members. Tinto sought to explore whether any specific type of educational program made a difference in persistence, and, if so, what factors within the program created the effect. Questionnaires collected information from students in the first two years of their post-secondary education. Tinto determined that social integration affected persistence to a greater extent than any other factor. Students used social networks to develop peer support groups. Those who did not create positive, persistence-oriented peer groups among their classmates or within the university setting were more likely to drop out of school during the first year. Tinto also found that toward the end of the students' degree coursework, social integration held less importance to academic integration factors.

Classroom group work provides the means for developing social interaction and accomplishing academic tasks. Therefore, it is logical to assume that academic and social integration work together to promote persistence. Tinto's research holds promise for the use of his theoretical model for individual departure from institutions of higher education as an explanatory model for the determination of dual enrollment courses as a predictor or a catalyst for post-secondary persistence. Students in the high school setting tend to exhibit and depend upon social networks for support. When students make a statement regarding their intention to enter post-secondary education and do so by utilizing dual enrollment courses within the high school (concurrent enrollment), they participate in these courses along side members of their peer group. Social integration support systems, developed over each semester of dual enrollment courses, may build strength toward persistence. Along with acquired credits, they may create a "nest egg" effect for academic momentum.

The degree of social integration experienced by dual enrollment students seems dependent upon the configuration, location and delivery system of the courses offered. Students in Hawaii's Running Start reported through surveys that program participation had prepared them for the social expectations of college (Cleveland, 2001). Participants in the Santa Monica Community College dual enrollment program have also reported feelings of successful socialization integration as potential college students, an important factor in facilitating the transition to college (Hugo, 2001). Students in dual enrollment programs both experienced and demonstrated social behaviors in class that were materially different manner from that of other high school students (Colangelo, Assouline & Gross, 2004b). Many dual enrollment programs include courses that required students to spend time on the college campus. The results of the NCES 2005 national survey of dual enrollment programs found that eighty-two percent of academic content oriented classes, taught on the college campus, had both high school and college students in attendance. Results were similar for vocational classes offered on campus, with seventy-eight percent of these classes enrolling both traditional college and high school students (Waits, Setzer & Lewis, 2005, p. 14). Regularly attending class on the university or community college campus acclimated students to the post-secondary environment, enabled easier adjustment to full-time college enrollment, and established more realistic expectations (and real-time exposures) to the social aspects of the college experience (Bailey, Hughes & Karp, 2002). These investigations all point to possible positive impacts of social integration on dual enrollment students, as noted in Tinto's model.

Academic Integration Effects of Dual Enrollment Programs

The effects of academic integration upon decisions to persist in college traditionally revolve around students' abilities to achieve a grade point average (GPA) above the minimum required to remain a student at any particular institution. Any achievement below the minimum GPA would result in either probation or involuntary withdrawal from the college. According to Vincent Tinto's theory of individual departure from institutions of higher education, matters of academics were influenced by student commitments to persist in college, by academic performance, and by both the quality and the quantity of student interactions with faculty and staff (Tinto, 1993).

By achieving academic integration, students develop skills to succeed in college level work, they also tend to be a valued member of the college community, and acquire the intellectual wherewithal to engage in substantive communication with both faculty and peers (Barefoot, 2000). Research on community college students demonstrated large positive affects in the domains of academic integration and persistence behaviors (Napoli & Wortman, 2005). However, students who mastered the course content but exhibited either minimal academic self-confidence or a lack of academic goals remained at risk of withdrawing from the institution (Lotkowski, Robbins & Noeth, 2004). Successful transitions to college, according to the aforementioned research, involved more than academic rigor prior to matriculation. Students had to also learn and demonstrate a willingness to assume college behaviors and attitudes toward learning. Dual enrollment courses and programs facilitated high school to college transitions, improved preparations for college, and motivated students to choose more rigorous high school classes (Bailey, Hughes & Karp, 2002). Not surprisingly, Tinto (1993) endorsed CBTP, specifically mentioning Syracuse University's Project Advance as a program that provides "first hand insight into the character of academic life at an institution of higher education" (p. 158). Academic preparation, in concert with accepting responsibility for increased academic rigor within a less structured learning environment, seem to be a key element in ensuring that academic integration occurs for dual enrollment students.

Pascarella and Terenzini (1980) tested Tinto's model, in relation to the question of the role that academic and social integration plays upon persistence decisions. Surveys were administered to 1905 students randomly selected from the total population of incoming freshmen at Syracuse University in 1976. Pre-test surveys were collected from 76.5% of the total possible respondents: post-test surveys were received from 53.1% of the pre-test respondents (p. 61). Pre-college characteristics control variables were used to measure the affects of social and academic integration, along with institutional and goal commitments, on the dependent variable of persistence. Pascarella and Terenzini cited prior studies, which reported large attrition rates at the end of the first year of post-secondary education. The results of this research suggested that student-faculty relationships strongly contributed to persistence. Pascarella and Terenzini's results correlated positively with those of Nora (2001-02), who found the role of faculty and staff on student persistence in college was of greater importance than family and peers.

Nora (2001-02) exhaustively dissects Tinto's model, especially its connection with Arnold VanGennep's theory of the rites of passage. Nora hypothesized that Tinto's initial stages of the theoretical model overlapped and interacted with each other. Separation, transition and integration (Nora calls this last stage "incorporation"), affected incoming college students from the very first day on campus. Because all three phases overlapped so extensively, departure from college was possible during any or all stages (Nora, 2001-2002). The transition from high school to college was difficult for nearly all undergraduates if their home-based support system failed or was unavailable, and if new systems with college friends and faculty advisors had not yet been established. Many students drop out at the end of the first semester due to inadequate coping skills to handle the stress of the transition to college. Students make decisions to depart from college if they do not establish personal connections with faculty and fellow students on informal and formal levels of interaction. When students identified with faculty members and sensed that adults cared about their progress, they exhibited stronger commitments to the college and were more likely to persist and to graduate. According to previous research by Nora and Wedham (1991), the influence of faculty, teaching assistants and college staff showed a large effect on persistence; large enough to overshadow the impacts of academic difficulties and external commitments on the part of the student. Nora (2001-2002) postulated that social and academic experiences helped students through separation, transition and incorporation, and that persistence in college did not require students to reject their old support systems. Systems of support afforded to students at all stages of separation clearly affected student decisions to persist or depart.

First Generation Students and the Transition to College

The transition from high school to college can be difficult for students whose families have had some experience with navigating the post-secondary system, but the struggle that awaits first generation students can be especially acute. First generation and low socioeconomic status students encounter difficulties when adapting to either the rigors of academic life or the social mores of the middle class, and more severe problems interacting with family members or peers whose social patterns of behavior vary from those typically witnessed in the college setting. First generation students often find themselves unaware of the potential costs of personal and social dislocation, which can occur when students leave the familiarity of the home community to attend college. In the higher education environment, first generation students encounter peers who hold explicitly different cultural norms and values. According to London (1992), by assimilating college attitudes and sharing their new learning with family and high school friends, students begin to harbor concerns over how they will be embraced or rejected by their own family and friends. Concerns felt by first generation students about separation and social mobility may weigh heavily upon these young people and interfere with their ability to persist in college endeavors.

Piorkowski (1983) investigated difficulties experienced by first generation college students from low income, urban settings using case studies conducted by university counseling services and historical studies conducted in the 60's and 70's. Her interest centered on family disruptions and their effects on students' ability to concentrate, study, and succeed in college. Commuter students experienced more difficulties than students who lived on campus, according to Piorkowski's research. She coined the idea of "survivor guilt" to describe the feelings exhibited by first generation students from poverty who, by their entrance into college, attempted to improve their socioeconomic status. Piorkowski found that when families were non-supportive of a college education, their children would suffer from enough guilt to undermine their schoolwork.

Establishing a sense of social integration, even more than academic integration, is a top priority for first generation students. Following with Tinto's theories on the role of social systems in determining persistence, some scholars believe that establishing a positive self-identify as a college student is crucial to the success of all students, but especially for first generation and minority students (Rendon, Jalomo & Nora, 2000). During the critical first year of school, first generation students need more academic and social supports than other students, as they are more likely to drop out (Somers, Woodhouse & Cofer, 2000).

Compounding the difficulties, first generation students often experience a lack of acceptance (even prejudice) within the college community. Munro in 1981 found that socioeconomic status, race and gender "have indirect effects on persistence through academic and social integration" into college (Ruddock, 1996, p. 6). Attempting to span the boundaries of two social realities, one at home and one at school, first generation students look for support from teachers to develop a niche on campus (Somers, Woodhouse, & Cofer, 2000). The visibility of teachers in this crucial transition period to college was more prominent when students participated in dual enrollment programs. The passage to college for minority and first generation students should allow more time for the separation from the high school family and then move with careful design toward transition to and integration in the college family (Rendon, Jalomo & Nora, 2000). College level coursework and experiences while remaining in high school may provide more of a cushion of time for adjusting to the multitude of changes brought on by college enrollment. Not unlike commuter students whose families may create external pressures to drop out of college, at-risk students in dual enrollment courses need internal, personal motivation and support from teachers and counselors at school to sustain their enrollment and help plan their futures. Nevertheless, separation from the family traditions and lack of familial or peer support can backfire, too. Separation anxieties can stress students. Piokowski (1983) found that some first generation students drop out of school even after achieving passable or even exceptional grade point averages. The college culture, in this case, likely emphasized differences too diametrically opposed to the social norms, values or traditions of the students' home and community life.

First generation and minority students, under certain circumstances, sustain membership in both the old culture of their families and home communities and the new culture of the college environment. Rendon, Jalomo and Nora (2000) promoted the idea of spanning the two cultures, or biculturalism, which refers to the "ability to live within the social and ethical morals and rules of two cultures – college and community" (p. 5). For students who successfully retain their identities within two very different worlds, Tinto's idea of separation from the old and integration with the new may not be necessarily required for persistence. Some degree of social integration and commitment to the college experience can occur without the side effect of separation anxiety, especially with concurrent enrollment courses, which are taught within the confines of the high school. Such courses keep students in contact with their friends and familiar culture while still experimenting with college expectations and academic rigor.

Dual Enrollment's Role in College Integration

Dual enrollment programs may provide smoother transitions to higher education and increase the likelihood that students will complete degree programs (Harvey, 2001a; American Association of State Colleges and Universities, 2002). Pre-college education, as experienced by students in credit-bearing transition programs, "interacts with and directly influences students' initial commitment to an institution" (Lotkowski, Robbins & Noeth, 2004, p. 11). Accordingly, the level of integration established by early experiences with college influences decisions to persist or depart from the venture. As evidenced in Tinto's model, motivational factors both impact and predict persistence to degree. Psychological factors, such as the previously mentioned "anticipatory socialization", influenced the degree to which students prepared for transition into the college environment (Bailey, Hughes & Karp, 2002; Merton, 1957). Therefore, successful separation, transition and integration from high school to college all require the acquisition of new behaviors and attitudes. Furthermore, integration to the college environment proved "especially important for students whose families belong to the low socioeconomic or underrepresented groups" (Bailey & Karp, 2003, p.12). Participation in dual enrollment programs may provide the opportunity for all types of students to assimilate into the college culture, and to successfully exhibit appropriate and positive college behaviors and attitudes.

Dual enrollment programs may assist student persistence by more closely integrating the K-12 and post-secondary systems of education. The experiences of the dually enrolled students in Washington State's Running Start make them feel more capable when they transfer to the university system (Jordan, McKinney & Trimble, 2000). Dual enrollment experiences provided them with an opportunity for a more comfortable transition to college. Leaning how to navigate the higher education system may have equipped them with essential and life-changing skills. Students, who might delay entry to post-secondary school, or temporarily withdraw, need to know enough about the system to restart their post-secondary education at some future time. Students who participated in dual enrollment classrooms where traditional college students sat next to high school students, no matter the location of the course, demonstrated higher levels of social and academic integration to the post-secondary setting (Cleveland, 2001; Cleveland & Maslowski, 2002). According to the National Commission on the High School Senior Year, "once the K-16 system operationally accepts that students can handle alternative paths (dual enrollment and early graduation) to post-secondary education in the last two years of high school, there is no limit as to the ways those paths can be walked" (Harvey, 2001a, p. 32).

Students enrolled in college credit bearing courses often encounter conflicting answers to questions about their status upon matriculation. For dual enrollment participants, freshman status may not be based on traditional credit-counting methods (Jordan, McKinney & Trimble, 2000). Typically, thirty hours of credit propels students to the status of sophomore. How do colleges react to incoming first year students who are technically not classified as freshmen, or transfer students? Dual enrollment participants who had already earned associate in arts degrees experienced these types of uncertainties regarding college placement (Hanson, 2004). Although dual enrollment has been shown to "facilitate high school/college transitions" (Bailey, Hughes & Karp, 2002, p. 28; Bailey & Karp, 2003, p. 5), colleges themselves aren't always prepared to welcome students who don't fit into a traditional profile. This identity crisis has been more pronounced for students who participated in full time dual enrollment programs and who already separated from high school figuratively, if not literally. According to student reports, college advisors seemed uniformed about how to register students who entered with significant credits earned through dual enrollment programs. Students who participated in dual enrollment courses on a part-time basis had less trouble associating with other freshmen or accepting membership in the freshman class, while those students who had earned AA degrees grew frustrated with the redundancy of freshman orientation and rudimentary procedures they had already mastered through experiences in high school (Jordan, McKinney & Trimble, 2000)

Due to enhanced interaction with college professors, courses, and peers, dual enrollment experiences at the end of high school careers placed participating students in a "developmentally different" stage from their peers of similar age upon college matriculation (Jordan, McKinney & Trimble, 2000, p. 5). The 2003-2004 end of year report for the Running Start program stated that twenty-one percent of students participating and subsequently enrolling at Western Washington University had earned forty-five or more credits hours through dual enrollment courses (p. 4). Running Start participants likely attended classes at the community college level full time, while remaining officially high school students. Therefore, for these students, dual enrollment courses provide opportunities for academic and psychosocial growth not available to regular high school students. Such programs are undoubtedly blurring "the line between high school and college" (Hanson, 2004. p. 5).

Dual enrollment programs generally provide students with modified types of advising, and registration procedures. A liaison usually exists between the college and the high school, and some ancillary benefits generally accompany enrollment in the sponsoring institution of higher education. Some programs, however, expand upon the comprehensiveness of the support systems they offer students. These programs, typically labeled middle college high schools, are usually housed at the site of the cooperating community college. Students attend ninth and tenth grades, much like a typical high school student. However, at the eleventh grade level, the configuration of the school begins to change, allowing students to enroll in courses taught by community college instructors for college credit (Feemster, 2002). Twelfth grade students' integration with post-secondary routines goes farther as students are allowed to attend classes with the traditionally enrolled community college students (Seal, 2004). Middle college high school students are encouraged to persist on toward achievement of the associate in arts degree (Wechsler, 2001; Seal, 2004).

As previously mentioned, Syracuse University's Project Advance claims to be the longest running and earliest established dual enrollment program in the nation. Middle college high schools, however, have a much longer history. The first such collaboration between a junior college and a public high school occurred in 1928 between Pasadena Junior College and Pasadena High School (Wechsler, 2001). A more recent stalwart is LaGuardia Middle College High School, organized in 1974 in collaboration with LaGuardia Community College in New York City. Although configurations of middle college high schools differ from the majority of dual enrollment programs described thus far, the attributes that truly separate and enhance these special schools are the support systems in place for students and the characteristics of the students themselves.

Middle college high schools cater to students previously labeled at-risk of academic failure, defined in this instance as low performing but academically able students who may not have perceived themselves as capable of attending college (Bailey & Karp, 2003). The success of low to middle achieving students in dual enrollment programs depends on complex and comprehensive academic and social supports (Bailey, Hughes & Karp, 2004). Dual enrollment programs, especially those that integrate complex support systems, facilitate access to higher education for "middle and even lower performing students" (Bailey & Karp, 2003, p. 2). Therefore, middle college high schools create opportunities for students to participate in a special type of transition program that offers support systems to guide students across the bridge between K-12 and higher education.

High school students entering dual enrollment programs at the community college or university on a full-time basis are most likely to experience transition and incorporation. In some instances, such as with Washington State's Running Start program (where students take classes at the community college or university campus exclusively even while remaining officially enrolled at the high school), students experience early instances of separation and transition. However, if these students remained living at home they could assimilate characteristics of commuter students who do not persist in college as successfully as residential students. Parents of dual enrollment students, if supportive of their child's participation in accelerated academic programming, could bolster the student's confidence in separating from their peers at a vulnerable age. Students who engage in concurrent enrollment programs may find that their relations with faculty and peers allow for a smoother separation and transition to college-like behaviors.

Summary of the Theoretical Constructs

Nora (2001-2002) argues that the stages of Tinto's model are not succinct or stepwise, especially when they are used to evaluate the progress of students in dual enrollment programs. If Tinto's theory of individual departure from institutions of higher education really applies to dual enrollment participants, then students may find themselves going through the process of separation, transition and incorporation to college level academic work and behaviors, while at the same time remaining, for all intents and purposes, high school students. Hughes, Karp, Bunting and Friedel (2005) utilized Tinto's model in their research on dual enrollment programs and found that dual enrollment students "become acclimated to the expectations of college classes and may be more likely than their peers to be successful college freshmen" (p. 252). Better acclimation resulted from the relations developed with faculty and staff – an integral part of Tinto's explanation for academic integration. Nora (2001-02) believes that faculty plays an important role in providing a support system to facilitate successful movement through the transitionary stages. In large classrooms or lecture halls, students may feel inconspicuous and insignificant. In the high school setting, classes tend to be much smaller in size and meet daily. Intuitively, the high school arrangement allows students to establish relations with instructors and in this way could assist in the transition to college level work.

The "Goals and Commitment" section of Tinto's model emphasized the degree to which students form commitments to particular post-secondary institutions, and how strongly their motivations develop toward completion of particular academic programs of study. Students' goals and commitments likewise affect academic and social integration, in that ambitious goals lead to higher persistence and attainment in college (Tinto, 1975). By helping students see themselves as college students, dual enrollment may ease the transition to post-secondary education (Bailey, Hughes & Karp, 2002; Karp, 2006)

Tinto's theory of individual departure from institutions of higher education, while not a perfect framework for describing stages of social and academic growth, provides a useful organizing tool for understanding the outcomes of college attendance, persistence, and achievement experienced by students in dual enrollment programs.

College Achievement: Access versus Completion

Gaining Access to College

By their very nature, dual enrollment classes offer students a first taste of the college experience. Some programs result in more inclusive opportunities to experience college life than others, either by locating classes on campus or by exposing students to college professors. Regardless of the locale or the mode of delivery, using college textbooks and earning college credits create a materially different experience than the typical high school class. College courses taught by high school or college instructors enable students to act and think like college students, in addition to learning new social and academic skills (Bailey, Hughes & Karp, 2004).

For middle to low achieving students, experiences in dual enrollment courses help students, often for the first time in their lives, to think of themselves as being capable of completing college work and/or attending a post-secondary institution. This difference in thinking of oneself as “college bound” seems to have real effects. Public recognition of successful completion of college courses in a dual enrollment program “increases their (students) confidence and motivation to attend post-secondary school” (Bailey, Hughes & Karp, 2004, p. 6).

Students who earn college credits in high school have produced high rates of college entrance. For instance, students throughout the State of Arizona who participated in dual enrollment programs produced an eighty-three percent rate of entry into the post-secondary educational system (Puyear, Thor & Mills, 2001, p. 37). Compare that rate of post-secondary entrance to the NELS: 88/2000 graduating class of 1992, which attained a seventy-two percent rate of entry to college (Haycock, 1999, p. 8).

During the 1970's and 1980's, students and parents focused their attention on how to gain access to a college education. By the mid 1990's, however, concerns about college persistence and cost affordability came to the forefront of the post-secondary discussion (Swail, 2004). Discussions regarding college have more recently turned their attention to rates of completion rather than access to post-secondary education. Vincent Tinto recommended that the current public focus on access to college change toward a heightened interest in full participation and degree attainment (Ruppert, Harris, Hauptman, Nettles, Perna, Millett, et al., 1998). "True college opportunity includes having a real chance to succeed, which is clearly not happening" as the rates of graduation from four year colleges have only minimally increased since 1980, even though rate of entry has markedly accelerated (Venezia, Kirst, & Antonio, 2003, p. 46). While investigating the ills of the high school senior year, the National Commission on the High School Senior Year reported that students whose parents attended college "seem to be the only ones who understand what is required not just to graduate from high school, but to succeed in college" (Harvey, 2001a, p. 27). The stark reality for American students is that escalating and promoting access to college does not necessarily translate into increased retention toward degree completion.

Indicators of Persistence to Degree in the Four-Year College

Tinto's theoretical model draws further support from Lotkowski, Robbins and Noeth, (2004), who argue that the strongest indicators of college persistence are socioeconomic status, high school grade point average, college entrance examination scores, values of institutional commitment, individually-held academic goals, academic self-confidence, and family and community social support. Socioeconomic status, a reflection of parental knowledge of higher education, mattered the most toward creating the positive family environment needed for persistence in college (Adelman, 1999a). Vincent Tinto referenced his own theory of institutional departure by stating that in order to "translate access into forms of participation which lead to degrees," students must learn to use their skills, abilities, motivations, expectations, and financial resources. Tinto embraced the idea of developing resources of "educational potential" in students, affecting both college entry and success (Ruppert, Harris, Hauptman, Nettles, Perna, Millet, et. al., 1998, p. 78). Utilizing a different terminology, Adelman (1999a) translated educational potential into academic resources to describe the influence of the high school curriculum in college success. Persistence, according to these researchers, involves a complex set of interdependent variables.

Along with academic rigor found in individual courses, high school grade point average and standardized test outcomes provide additional indicators of future college persistence. Although the level of academic intensity in high school courses appeared to provide the greatest impact upon both persistence and degree attainment in the Adelman studies, student performance as measured by high school grades suggests a stronger relationship to academic momentum and degree attainment than scores on college entrance exams. High school grade point averages reflect effort within high school classes. Because the intensity of courses completed is positively associated with of persistence and degree attainment, students' efforts in these higher-level, more rigorous, courses seem to really matter. Conversely, without a higher output of effort, students earning high grades in less rigorous courses do not benefit much from any academic momentum to degree attainment. While achievement test scores serve as a natural outcome of preparation, the "quality of student effort reflected in grades…is a natural outcome of improvements in the academic curriculum participation" of students in the NELS: 88/2000 cohort (Adelman, 2006, p. 37). Clearly, students' accomplishments before entering post-secondary education imply positive associations with persistence and degree attainment in college.

Pascarella and Terenzini (2005), however, found that college grades "may well be the single best predictor of student persistence, degree completion, and graduate school enrollment in both national representative and single institution studies" (p. 645). Higher freshman year grade point averages resulted in higher levels of persistence in post-secondary education (Lotkowski, Robbins & Noeth, 2004). Because fifty percent of all students who enter higher education drop out before graduation, "persisting to degree is what really matters in the post-college world" (Swail, 2004, p. 3).

Clearly, dual enrollment courses, which may provide both high school and college credit, can affect post-secondary persistence. Support for this statement comes from Adelman (1999a, 2006), when he suggested a new definition of second year persistence. Adelman preferred to evaluate the number of credits earned in the first year of college as a strong indicator of academic momentum and persistence. Adelman recommended students earn a minimum of 20 credits in their first year of post-secondary education in order to persist to the second year (2006, p. 109). Furthermore, to help decrease course loads for first year students, who may struggle too much under too heavy an academic burden in the first two semesters of post-secondary education, Adelman recommended that students begin earning college credits, 6 hours at a minimum, through participation in Advanced Placement or dual enrollment courses before their initial post-secondary matriculation (p.

108). Of the students enrolled in four-year institutions at any time after high school graduation, 68.9% received bachelor's degrees, if they also earned 20-29 credits in their first year in college. The rate of bachelor's degree attainment dropped to 31.9% for students who earned 11-19 credits in their first year in college (p. 168). Ninety-one percent of students who attended a four-year school at any time and earned a bachelors' degree also earned 20+ credits in the first year of school (p. 56). As a result of statistical analysis four variables met the statistical significance threshold for first year in college performance and earning bachelor's degrees:

1) earning at least twenty credits;

2) first year college grade point average;

3) the high school courses completed;

4) socioeconomic status (p. 49).

Because dual enrollment classes earn credits that are registered on first year transcripts they play a critical role in enhancing academic momentum and genuine persistence to degree attainment.

Adelman (2006) embraced the idea of persistence to depict the journey students take through the post-secondary education system – but not necessarily within their school of first admission. Persistence, to Adelman, described students' actions and decision-making rather than social or academic integration. Persistence illustrates what students do to attain credits and ultimately a credential, and should not be measured in years, but rather in the "currency of the degree" or credits earned (Adelman, 1999a, p. 27). Educators, therefore, need to identify and understand persistence behaviors. Retaining students, according to Adelman, describes what post-secondary institutions do to keep students in a place that may or may not be the best environment for them to learn and otherwise thrive. Caution, therefore, should be shown when interpreting statistics describing dropout rates from universities. Not all departures end in a permanent abdication of all post-secondary plans. Adelman suggests that persistence occurs on a student's terms and that to label all departures from a post-secondary institution as failures is misguided, and without knowledge of re-entry behaviors. Therefore, only longitudinal data can provide the opportunity to investigate the true nature of persistence.

The rate of attrition at four-year institutions during the freshman year has been estimated at approximately twenty-five percent (Venezia, Kirst & Antonio, 2003, p. 9). High first year dropout rates among underrepresented students adversely affect chances of attaining a bachelor's degree. Correspondingly, bachelor's degree attainment rates for blacks and Latinos, aged 25-29, equaled sixteen percent of all blacks and ten percent of all Latinos (Haycock, 2001, p. 9). Degree attainment statistics remain stagnant for these two demographic groups. The US Census (2003) shows Hispanic rates of college completion to be exactly the same and black rates, increasing only one percent from 1998 to 2003 (Stoops, 2004, p. 5). Access and completion rates of non-whites and low socioeconomic status students have persistently remained lower than whites and Asians, although access rates have improved and even equalized between all races (Swail, 2004). Regardless of the narrowing gap in access, the difference in completion rates between whites and non-whites hovered at twenty percentage points (Adelman, 1999a). The effect of high dropout rates among underrepresented students affects their chances of attaining a bachelor's degree. First generation students are more likely to persist to degree, however, when starting out at a four-year institution (Nunez & Carroll, 1998).

The Role of Community College Attendance in Persistence to Degree

Beginning a post-secondary career at the community college level decreases the possibility of completing a degree by fifteen to twenty percent (Pascarella & Terenzini, 2005, p. 612). Cuccaro-Alamin reported in 1997 that students were "two times more likely to take more than six years to complete a bachelor's degree if they start at a two year college" (Pascarella & Terenzini, 2005, p. 613). Students who begin their careers in a community college with hopes of completing a bachelor's degree may find the road ahead less difficult when they participate in dual enrollment programs.

Although four-year institutions sponsored the first dual enrollment programs, community colleges have benefited and subsequently witnessed the greatest increase in their enrollment numbers from students in dual enrollment programs. According to Kleiner and Lewis (2005), ninety-eight percent of two-year schools reported high school students enrolled in classes. The American Association of Community Colleges reported in the year 2000 that enrollment of students under the age of eighteen accounted for five percent of the total enrollment in the community college system. This figure increased dramatically from just over one percent of the student population in the same demographic in 1993 (Andrews, 2001, p. 16).

Dual enrollment credits earned through community colleges can transfer to other institutions of higher education through articulation agreements legislated by state governments. Courses usually transfer to other two-year colleges or to four-year institutions regardless of whether the course originated at the community college or at the local high school (Townsend, 2001). Regulations on this transfer of credit, particularly for dual credit or concurrent enrollment courses, can vary depending on the rules and regulations of the particular institution. The opportunity to transfer credits from a two-year to a four-year institution provides both flexibility and assurance that the credit earned by the students will follow them through a post-secondary career. When courses earn both high school and college credit, as is the case with concurrent enrollment courses, the high school credit may be used for graduation credit and the college credit creates the initial post-secondary transcript.

Pascarella &. Terenzini (2005) reported that after two years of a community college education, students who began their careers with aspirations of a bachelors' degree were more likely to have lowered their degree expectations than students who began college at a four-year institution. Accordingly, initial attendance at community colleges was reported to reduce bachelor's degree completion rates and lower rates of college persistence. Attrition statistics from community colleges show that forty-five to fifty percent of all first year students failed to return for the second year (Haycock, 1999, p.8; Haycock, 2001, p. 8; Venezia, Kirst & Antonio, 2003, p. 9; Hoffman, 2003, p. 2). These high drop out rates disproportionably affect underrepresented subgroups of students. More than fifty percent of Latino and forty-one percent of black college students begin their careers at a two-year college (Adelman, Daniel & Berkovits, 2003, p.4).

Studies of degree attainment for students transferring from two-year schools routinely fail to take into account the students' aspirations and goals and therefore resulted in conflicting data. Students who began their college experience at community colleges and transferred before finishing the associate in arts degree demonstrated high levels of degree attainment. Multi-institutional attendance and transfer between two and four year institutions should not, therefore, be viewed as negative factors to persistence and degree attainment. Degree completion for students who transfer with the intent to complete a degree actually produced rates equal to or higher than students who remained at their initial post-secondary institution (Adelman, 1999a). Students who earned at least ten credits at a community college before transferring to a four-year institution earned bachelor's degrees at rates between sixty-nine and seventy-one percent higher than students who began their post-secondary experience at the university level (Adelman, 1999a, p. 82; Adelman, Daniel & Berkovits, 2003, p. 1). Although students could hypothetically earn ten or more college credits in high school, no research has been done on the role of dual enrollment courses in achieving a level of persistence to degree among students who acquired community college credits prior to transferring to a four-year institution.

Dual Enrollment and Indicators of College Achievement

After college entry, dual enrollment students continued to perform at levels as high or higher than students who did not take college courses before college matriculation. Data suggest that dual enrollment students earned higher grade point averages and showed higher persistence rates than students who did not participate in college courses before college matriculation (Hoffman, 2003). Compared to traditional students transferring to four-year colleges from community colleges, students in dual enrollment achieved first semester college grades that were higher than students who did not take college classes in high school, and the grade point averages of these same students experienced smaller drops in subsequent semesters, even when controlling for prior academic achievement (Bailey, Hughes & Karp, 2002; Bailey & Karp, 2003).

Bailey, Hughes and Karp's research suggests that dual enrollment courses have the potential to exert positive influences on student persistence by positively affecting students' college grade point averages.

Dual Enrollment Program Evaluations

Up until this point, I have provided an investigation of issues closely related to the various attributes of dual enrollment course participation and have linked dual enrollment courses and participation in dual enrollment programs to factors that have been shown to positively affect persistence and degree attainment in college. In this next section, research regarding dual enrollment program participation and student outcomes, sponsored by state agencies, community colleges, and four-year institutions, will be shared, in an effort to discern the impact of dual enrollment programs on student achievement at the college level.

Dual Enrollment Programs in the State of Arizona

Arizona law, A.R.S.§ 15-182, *Special Admission of Students Under Age Eighteen: Enrollment Information: Reports,* requires community colleges in Arizona to admit high school students under age 18, not yet graduated, and who have met the requirements for the classes for which they wish to enroll. The state statute also requires school districts to share this information with parents and students in grades 9-12 (Puyear, 1998). According to WICHE (20006), eligibility for dual enrollment courses is determined by requirements established by the sponsoring Arizona community colleges and pertaining directly to the particular college course. Policies have also been adopted at the state legislative level to govern the implementation of dual enrollment and advanced placement course offerings in high schools. Community college district boards authorize their colleges to award both high school and college credit for courses completed by high school students. The community college districts must issue a report on courses offered for high school students to the state legislature each year. Dual enrollment courses count towards high school and college graduation requirements. Each community college district negotiates with coordinating school districts to determine policies for the payment of tuition, either by the student or by the educational institutions. State policy requires community colleges to track students served by dual enrollment courses in relation to high school graduation rates, student matriculation rates at either the community college level or at the University of Arizona, and grades earned in subsequent courses offered in the same discipline at the colleges, and first year college grade point average.

Arizona's extensive tracking of students, for institutional accountability purposes, informed the study performed at the University of Arizona (Richardson, 1999). Utilizing fall 1997 Arizona resident freshmen as the sample, the Arizona study had 2,351 students, of which 48% formed the control group (had completed neither Advanced Placement (AP) nor dual enrollment community college courses (CC) before entering the University of Arizona); 33% of the study group had taken AP courses; 29% participated in community college credit courses before high school graduation; and 10% had participated in both AP and CC courses (Richardson, 1999, p. 2). In compliance with the Arizona state statutes, the data collected included high school GPA, SAT or ACT scores, and first year GPA's at the University of Arizona. The research did not differentiate or control for difference in high school course of study or for the number of AP or CC courses or credits earned. Students were coded on a "yes/no" basis if they participated in either or both types of accelerated course.

Descriptive statistics demonstrated that all of the freshmen in the study group experienced some drop in their GPA's from high school to first year at the University of Arizona. Students who did not take any accelerated course or who did not take AP courses in high school suffered drops in GPA from high school to college of an average eight-tenths of a point. Similarly, students who did not take dual enrollment courses experienced a .78 decrease in GPA from high school to college. Participants in AP and CC courses, however, saw their freshman year GPA's drop from .53 to .56 below their high school graduating GPA. The least amount of decrease in GPA was found in data produced by students who participated in both AP and CC courses in high school, with an average deficit of .39 of a point (Richardson, 1999, p. 3). No statistical significance was mentioned regarding these GPA changes, as only descriptive statistics were published. According to the report, regression analysis was used to control HS GPA and ACT/SAT scores and that "both AP or CC credit were positively and significantly associated with University of Arizona first year GPA" (Richardson, 1999, p. 3). However no level of significance or other statistical information was published. Limitations were admitted within the report, however. The researchers listed the following variables, which could have improved the utility of the results of the study: high school courses taken, socioeconomic status, indicators of student motivations, and number of AP and/or CC courses completed. The descriptive statistics and the regression did control for students' incoming aptitudes through their SAT and HS GPA scores. However, the lack of regression tables and significance levels leaves the reader wondering what importance the differences in GPA demonstrate. Furthermore, no controls were applied to account for variations in the types of programs these students entered at the University of Arizona- an important factor in determining the strength of the differences in GPA's.

Puyear, Thor and Mills (2001) and Puyear (1998) complied data from several different descriptive studies and census reports produced by community colleges across Arizona. The data showed increased numbers of students enrolling in college directly after high school, but only if the student had also participated in a dual enrollment program with a sponsoring community college. Puyear (1998) reported that only 50 % of graduating high school students from the Phoenix Unit High School District enrolled in college in 1993-94 and 1994-95, whereas between 68% and 73% of students who participated in dual enrollment courses matriculated in college immediately after high school (p. 6). Students in the Phoenix High School District enrolled in the Maricopa County Community College District. No controls were applied to these data, so the only deduction that could be made was that students who participated in DE courses entered college after their high school graduation at rates which were higher, but not necessarily significantly higher, than their non-participant classmates. Puyear et al. (2001) reported a later study of the same community college district in 1997. This study listed the average high school student graduation rates for seven different high schools whose students attended Maricopa County Community College District. Students who participated in dual enrollment classes at Maricopa boasted high school graduation rates considerably higher (90%+) than the average graduation rate (49%) for all seven high school in the area served by this community college district. College going rates for dual enrollment students at Maricopa for 1997 revealed that 83% of participants matriculated to post-secondary institutions in and out of Arizona (Puyear, Thor, & Mills, 2001, p. 37). The average matriculation rate for students attending the seven high schools in the study was not reported. Finch reported that students from Maricopa, who transferred to Arizona State University and had not participated in dual enrollment courses as high school students, experienced a drop in their first year GPA's from 2.85 to 2.32. However, dual enrollment students- as traditional freshmen - entered ASU with the average GPA of 3.22 and produced an average increase in GPA of .2 during the first year (Puyear, Thor & Mills, 2001, p. 37). This finding was contrary to previous results reported by Richardson at the University of Arizona (1999), where the average freshmen GPA declined regardless of the students' experiences with accelerated classes. While the reported of changes in GPA and graduation rates seem positive, the data only allow for a limited inference into the significance of the findings.

Dual Enrollment Programs in the State of California

The California state legislature passed statutes governing the implementation of dual enrollment, advanced placement, international baccalaureate, and tech prep programs and courses (WICHE, 2006). Successful completion of dual enrollment courses resulted in students earning high school and/or college credits (WICHE, 2006). In the Los Angeles area, dual enrollment programs were offered at Santa Monica College, which scheduled classes outside of the regular school day as a convenience to high school students. Santa Monica College reaches out to disadvantaged and minority youth in grades 11 and 12, in an attempt to bolster the rigor of their high school transcripts.

After Proposition 209 passed in November of 1996, which effectively ended affirmative action preferences in the University of California system, minority and disadvantaged high school students needed assistance in raising their GPA's to an acceptable level for college entrance requirements. Dual enrollment opportunities, such as those offered through Santa Monica College, provided a bridge and support for this targeted population. Hugo (2001) offered anecdotal evidence of changes in minority student's attitudes and behaviors as a result of their participation in the Santa Monica program. Interestingly, Santa Monica College's acceleration program encouraged students to enroll in comparable AP courses after completing their dual enrollment class, as a way to help build self-confidence to compete in the classroom during the regular school day. Offering dual enrollment courses outside of the school day – evenings and weekends – could create some potential problems for recruitment. However, the increasing numbers of participants at Santa Monica College indicate otherwise. Although Hugo reports that 73% of the students successful completed courses in 1998, the first year of the program, no further data were offered in the report (2001, p. 67).

Spurling and Gabriner (2002) prepared an evaluation of dual enrollment courses offered at City College of San Francisco for high school students in the San Francisco Unified School District (SFUSD), from the fall 1998 to the fall 2000 school terms. The research investigated the differences in college GPA's and numbers of community college courses completed with a grade of "C" or better after matriculation. Students in the study were limited to those who entered City College directly from SFUSD high schools, and eliminated those students from consideration who transferred from another community college, as well as students over the age of 20, or previously enrolled in a different high school district. Regarding the issue of course completion, dual enrollment students who required no remedial class work passed 69% of their courses with a "C" or better, compared to 62% of non-dual enrollment participants. No statistical significance was reported for this limited analysis. However, overall figures for students passing courses at City College, regardless of their need for remedial course work, suggested a significance finding ($p < .03$), as dual enrollment students outperformed their counterparts by 58% to 53% (Spurling & Gabriner, 2002, p. 2 - 3). Grade point average comparisons mirrored this result. Dual enrollment students generated 2.61 grade point averages, with no remedial placements, compared to a 2.34 GPA for non-participants. The GPA's for the participants and non-participants, regardless of remedial placement status, suggest that dual enrollment status affects student grades positively and significantly ($p < .0001$) (Spurling & Gabriner, 2002, p. 2). The GPA's of dual enrollment students for the first year at City College averaged 2.33, while non-participants averaged 2.10 GPA (Spurling & Gabriner, 2002, p. 4). The research methods utilized for this study sought to control for the pre-existing attributes of the students entering City College. However, the report failed to note the method by which controls were applied or how significance levels were determined. Separating students by their remedial course status served as a proxy for scholastic aptitude. More controls are necessary to further substantiate these findings, which supports the impact of dual enrollment coursework on first time community college students.

Dual Enrollment Programs in the State of Florida

According to the policy survey conducted by WICHE (2006), Florida, like California, adopted state statutes governing AP, DE, IB and tech prep programs. Florida requires both a minimum GPA and standardized test scores as entrance requirements for dual enrollment programs, and allows individual community college district to establish additional criteria. Credit for dual enrollment courses counts toward high school graduation and post-secondary hours. The state government set aside funding to pay for the tuition costs of dual enrollment classes, and in return expected local K-12 school boards to develop needs assessments and plans to meet student demands for access. School boards must also work with their partner community colleges to generate agreements governing the pre-screening of students wishing to participate in dual enrollment courses.

The State of Florida has instituted one of the most developed student tracking systems in the nation. Each student is assigned an identification number, which follows from school to school throughout the state and throughout the PK-16 educational system (Windham & Perkins, 2001). This complex system generates rich transcript data, allows researchers to evaluate student progress and demographic information in relation to student outcomes. Over 730,000 students who graduated from Florida's public high schools between 1997 and 2003 were utilized for the "Measuring Up 2004" report, sponsored by the State of Florida (WICHE, 2006, p. 37). These data were utilized by WICHE to develop an analysis of acceleration programs and their impact on student outcomes in post-secondary education.

The results from the statistical sample, as noted above, included no controls for selection bias, failed to track students to private or out of state colleges, and generated no inferential statistics. The sample also included only students who started post-secondary education directly after high school and can only be generalizable to Florida students who attended public universities or community colleges in Florida. Race and income status of students were used to gather information about accelerated program participation rates for minority and disadvantaged populations as well as tracking these students' progress and outcomes in post-secondary institutions. The data paint a picture of who participated and who benefited from dual enrollment and other types of accelerated programming. For instance, bachelor's degree attainment for students who participated in AP or DE classes was nearly identical – with 65% and 66% completion rates respectively. The degree attainment rates of students in accelerated programs was more than 20 percent higher than the rates of all students enrolled in the state university system at the time of the cohort study (WICHE, 2006, p. 39). These data were based on unequal percentages of students enrolling at either two or four-year colleges. Between 45% and 55% of students who participated in AP or IB courses in high school enrolled directly in a four-year college, whereas only 38% of DE students entered universities after high school (WICHE, 2006, p. 39-40). More DE students choose to enroll in community college programs (31%) (WICHE, 2006, p. 40). Therefore, although fewer DE students enrolled in university bachelor's degree programs, slightly more of them completed their degrees. Although no inferential statistics were available to clarify the likelihood of duplicating these results, or criteria, the results seem to point to the efficacy of dual enrollment programs in Florida.

An earlier study of Florida student cohorts was conducted by the Florida Department of Education. The sample included high school graduates from 1993-94 through 1997-98, and identified those who were enrolled in DE classes, graduated with at least a 3.0 GPA, and subsequently enrolled in Florida community colleges immediately following graduation with the specific intention of earning an associate in arts (AA) degree, rather than enter as a potential transfer student to a university. Students in the sample passed all three sections of the community college placement exam, therefore no remedial classes were included in their course of study. Additionally, students in the study did not enroll in any AP or IB acceleration classes in high school – dual enrollment course participation alone was required for the sample group. In summary, the research sample consisted of students whose academic characteristics were essentially identical. The only exception was that some students had earned no acceleration credit hours (Horne, 2004, p. 1).

According to the Horne's results, students with DE credits earned an average of 9 credit hours before entering the community college. Controls applied in this study equalized many factors influencing persistence and degree attainment, namely academic achievement in high school, rigor of high school courses, and intentions for the same degree path. Horne reported that students were tracked within their cohort groups for four years after entry into the community college system. An average graduation rate of 67.68% was posted by students with dual enrollment credits, versus a 54.06% rate for non-participants (Horne, 2004, p. 2). According to these statistics, dual enrollment seemed to improve the percentage of students graduating from the community college after four years of enrollment. However, Hoachlander, Sikora, and Horn (2003) conducted a survey of community college students using the Beginning Post-secondary Students Longitudinal Study (BPS: 96/01) and found that only 16% graduated with AA degrees, and taking, on the average, between 34 months and 41 months to complete the degree (the former time includes actual months enrolled and the latter includes all time elapsed from original date of enrollment). Because controls for college entry attributes were clearly defined in the Florida survey, student achievement should reflect a higher graduation rate than the rate found in the 2003 survey by Hoachlander et al. However, with higher aptitudes expected from the Florida survey, it might have been wiser to compute graduation rates for 2 and 3 years after matriculation. Allowing four years to complete an AA degree, when students have already earned 9 hours of credits, seems generous and dilutes the impact of dual enrollment course participation on persistence to degree. Adelman (2004) found that acquiring at least 9 hours of acceleration credits decreased time to graduation for bachelor's degree candidates from an average of 4.65 years, for students without any acceleration credits, to 4.25 years for students with any type of credit upon entry to college (p. 55). While not a direct comparison, the idea that acceleration credits could positively impact a four-year degree plan should only apply to students engaged in two-year degree plans. With such a large difference in the percentages of students completing programs (16% in the BPS community college cohort compared to nearly 68% in the Florida DE cohorts), the impact of dual enrollment students on degree attainment must include time to degree considerations.

If time to degree matters for students and their families, as a selling point for dual enrollment classes, then students' success in subsequent classes at the college level should tell researchers something about the general efficacy of dual enrollment courses. For instance, if a student enrolled and successfully completed English 101 as a dual enrollment course, the expectation is that the same student should enroll in English 102 because he completed the pre-requisites. Windham and Perkins (2001) researched what happens when dual enrollment students retake courses at the college level within the State of Florida. Outcomes for dual enrollment students were compared to those of non-participant students in both state universities and community colleges in Florida. Grades were collected from students who were enrolled in second level courses in a sequence, such as the English 101/102 noted above. Student grades were collected from cohorts beginning in the spring 1994 through the spring 1999 semesters. Using Social Security and ID numbers, the race, gender, and grades of students were tracked through nine of the most popular courses taken by dual enrollment students in the state, mostly courses in the humanities and English. Results of the data showed that compared to non-participants, dual enrollment students earned 3.2% more "A's", 4.3% more "B's" and 2.8% less "C's" (Windham & Perkins, 2001, p. 5). Chi square statistics for grades earned, as reported by the authors, were qualified as highly statistically significant, however "*p*" values were omitted from the report. Most importantly for the time to degree issue, only 3.31% of dual enrollment students chose or were asked to repeat a course (Windham & Perkins, 2001, p. 6). Windham and Perkins make a convincing case that dual enrollment course taking in high school succeeded in preparing students for subsequent courses in college with higher numbers of students earning higher grades than comparable student counterparts without the benefit of dual enrollment experiences. Controls for pre-entry academic aptitudes were not mentioned in this report, and therefore selection bias overshadows the strength of these results.

Dual Enrollment Programs in the State of Hawaii

According to Cleveland (2001), Hawaii's dual enrollment program owes its inspiration to Washington State's Running Start program. After learning of Washington's program, a group of educators representing the Hawaii Public Schools set about promoting legislation that would allow community colleges to offer courses to high school students for both high school and college credit. Currently, the only state statues in

Hawaii addressing acceleration courses pertain to dual enrollment programming. Hawaii's version of Running Start, launched in the spring 2001, is part of a three-semester pilot. According to WICHE (2006), Hawaiian students under the age of 21 may qualify for Running Start by attaining a minimum test result on a standardized exam. Credits earned through dual enrollment participation count toward high school graduation requirements and for post-secondary credits. An early entry program had been in place at the University of Hawaii for the past three decades, but was poorly attended due to the fact that classes could not be used for high school credit or toward high school graduation. Legislation for Running Start rectified that situation for Hawaii's high school students.

Although the state does not subsidize tuition payments for students participating in the dual enrollment program, a federal program – "Gear Up" pays for tuition fees, books, lab fees and transportation expenses of students who meet the qualification for free and reduced lunches in the public school system (Cleveland, 2001). Gear Up funds supported over 50% of the DE students in the summer session 2001. Only 12.5% of students receiving funds had fathers with bachelor's degrees (Cleveland, 2001, p. 9). By the summer of 2002, students' surveys revealed that large numbers of first generation students had been served by the Running Start program (60% of students' mothers and 53% of students' fathers had no prior college attendance records). A third of the students received financial assistance and, of that group, 52% qualified as first generation students (Cleveland & Maslowski, 2002, p. 5). Achievement in the classroom was reported by economic status with descriptive statistics. Grade point averages of Gear Up students (3.22) lagged behind other students by .23 points (Cleveland & Maslowski, 2002, p. 8). Perception of college readiness was stronger for students who did not receive Gear Up funding compared to more disadvantaged students (by a rate of 95% to 69%) as determined by student self-reports on program evaluation surveys.

Of particular interest were the students' perceptions of their preferred learning environment. All courses taught through Running Start were located on the community college campus. Nearly three quarters of the students interviewed in the spring/summer 2002 semesters indicated their preference to attend school on the college campus. Only nine percent would have preferred to stay at their high schools to take the dual enrollment courses. The atmosphere on campus may have attributed to the students' successful outcomes in their courses, with 98% of students completing classes with a "C" or higher in the summer of 2002 and earning an average GPA of 3.42 (Cleveland & Maslowski, 2002, p. 10). The findings of these initial reports lacked statistical significance, as controls were not applied for students' academic abilities. Furthermore, I was unable to locate any further follow up results conducted on the Running Start program in Hawaii. The program seemed to be reaching its target audience – native Hawaiian and low income students. All students achieved academically at a reasonable level of competency, above a "B" grade point average. Students' perceptions of their readiness varied greatly, depending on their socioeconomic status.

Dual Enrollment Programs in the State of Illinois

State statutes in Illinois address Advanced Placement and Tech Prep programs, but not dual enrollment courses (WICHE, 2006). This fact was particularly interesting when considering that dual enrollment programs exist at all Illinois community colleges, and these same community colleges collaborate with 73% of all high schools in the state

(Andrews, 2001, p. 14; Barnett, Gardner & Bragg, 2004, p. 20). When asked to contribute to WICHE's comprehensive audit of state policies, officials from the State of Illinois declined to have their state's information published in the report. Therefore, each segment of the WICHE policy summary finds Illinois responses absent. The Office of Community College Research and Leadership (OCCRL) at the University of Illinois at Champaign-Urbana published a descriptive account of Illinois' dual credit policies, which included details unavailable to the WICHE survey (Barnett, Gardner & Bragg, 2004). According to the OCCRL report, changes in Illinois state policy in 1996 allowed dual enrollment participants to generate state funding at both the local school district and college levels. Colleges used dual enrollment as a recruitment tool and reaped financial gains from it. Students generated state aid in both community college districts and public school districts, thereby creating a cash cow for the former while not adversely affecting the latter. Accelerated College Enrollment grants (ACE) were awarded through the community colleges as a further incentive for enrollment and to offset or completely reduce the cost of tuition for students. In 2001-2002, 67% of all dual enrollment students in Illinois (17,006) were assisted with their tuition bills through the use of ACE grants (Barnett, Gardner & Bragg, p. 11). Students had to meet certain criteria for admission into dual enrollment courses, including minimum grade point averages, age, scores on placement exams, and recommendations from their high school teachers.

Very little research exists on the efficacy of this network of Illinois high school and college partnerships. Andrews, however, has conducted extensive investigations on the expansion of dual enrollment programs in the state. Andrews (2001) found that DE program participation had increased 240% (from 1997-1999) (p. 14). Marshall and

Andrews (2001) used a climate survey in their 2000 study of students who participated in dual enrollment collaboration between Illinois Valley Community College and Marquette High School in Ottawa, Illinois. The dual credit program between Illinois Valley Community College and Marquette High School began in 1986 and served an estimated 500 students during that time (Marshall & Andrews, 2002, p. 241). Although the response rate was low, 73% of the overall responses to the Marshall and Andrews survey indicated positive students' experiences with courses and transferring credits from Illinois Valley's dual enrollment program. Most interestingly, the students all reported saving time toward completion of their bachelor's or associate in arts degree programs. Twenty-four percent of the respondents continued their education at Illinois Valley, the remainder attended colleges and universities in and out of the state (Marshall & Andrews, 2002, p. 241). Whereas the students attitudes toward the community college were predominantly negative prior to their attendance in the courses, 97% of the students rated the school as "outstanding" to "good" at the end of their involvement with Illinois Valley CC. Survey results indicated that students who participated in the dual enrollment program at Illinois Valley found benefits not only in transferring credits and graduating earlier from college, but also developed positive attitudes toward the community college experience.

Dual Enrollment Programs in the State of Minnesota

Both the state legislature and current Governor Pawlenty have taken a keen interest in acceleration programs for high school students. The governor has asked lawmakers to allocate millions of dollars to not only provide more AP classes to the state's high schools, but to "require every student to earn one year of college credit before their graduate" (Boldt, 2007, p. 1). According to the WICHE survey (2006), Minnesotans created new processes and laws for AP, DE and IB programs. Program eligibility requirements include established minimums for class standing (junior or senior year), class rank, and standardized test scores. Minnesota was the only state reporting the requirement that students determine the type of credit gained from completing a dual enrollment class; either high school credit or college credit, but not both would be awarded. One of only thirteen states who have established rules regarding payment for transportation to and from dual enrollment course sites, Minnesota students or their parents may petition for reimbursement from the state for mileage or other transportation costs. The State of Minnesota absorbs tuition costs for dual enrollment courses, and allows colleges and universities to advertise their programs to students in school districts but not to recruit students openly for these programs.

In 1987, the University of Minnesota established a "College in the Schools" (CITS) program, which has now spread through the state university system from Minneapolis to Duluth. Menzel (2006) completed a study on the effects of dual enrollment programs on the time it takes and the costs involved in completing a bachelor's degree. Survey results obtained from two cohorts of students (who were freshmen in the fall of 1999 and fall 2000) created the control group, while dual enrollment participants from these same two college classes formed the statistical sample. Menzel also surveyed current college and high school students with experience in the CITS program in order to assess their intentions regarding degree attainment and effects of the dual enrollment program on their post-secondary education. An overall 38% return rate on the surveys was recorded (Menzel, 2006, p. ii). Although her study suffered from a low return rate, Menzel noted that there was a lack of current research on time to degree as it impacts credit hours earned. Menzel cited an additional study conducted by Syracuse University on its Project Advance students, which showed that 10% of students in their programs graduated in less than 10 years (p. 9). In order to discern the effects of CITS participation on decreased time to degree and monetary savings, students who only participated in the CITS program were evaluated as a separate independent variable from students who participated in all types of credit-based transition programs, including dual enrollment in Menzel's research. CITS programming constituted a special type of dual enrollment program, namely concurrent enrollment.

Results of Menzel's research showed that an average of 65% ($p < .001$) of CITS participants surveyed graduated from the University of Minnesota –Duluth (UMD) in four years or less - a rate nearly double of the rest of the college population at UMD (2006, p. 68). These results were gathered from student self-reports rather than examination of transcript data, and therefore cannot be verified directly. Also, UMD student data were acquired from University of Minnesota (UM) 2004 NHS Student Graduation /Retention reports, which included information on graduation rates of all students within a particular cohort group. Included in these statistics from the University of Minnesota system were the very students surveyed by Menzel as a part of the CITS program. Because transcript evaluations were not conducted in this research, no attempt was made to separate CITS students from the entire population. Instead, the students were surveyed to determine their time to degree. Demographic controls were also absent from the research, although students in the CITS program were restricted by the State of Minnesota's requirements for dual enrollment participation, as previously mentioned. The small size of the analytic sample for the time to degree portion of the project, 171 respondents of 767 CITS participants in the surveyed years 2000 and 2001, equates to a 22% return rate (Menzel, 2006, p. 72). Menzel acknowledges the limitations of the study, including diminished generalizability due to this study's concentration on one particular program in one small geographical area of Minnesota. Although my interest in this study lies in suggested implications for decreased time to degree for CITS participants, the overall scope of the research study in using five different groups of CITS participants allows Menzel to pursue follow up work that will accomplish a more longitudinal look at the efficacy of the program. Menzel also recommended future research comparing and evaluating student progress toward bachelor's degrees for students belonging to "pure cohorts": students without acceleration credits, students with only IB, only AP or only dual enrollment credits. Menzel's research suggests that dual enrollment participation may positively affect students persistence and success toward college completion, and that the effect is similar to that experienced by students who have completed the highest level of rigor outlined by Adelman (1999). The Minnesota study suggests, at least for the students in the CITS program who responded to Menzel's five year follow up survey, that credits earned through dual enrollment may be associated with higher graduation rates.

Dual Enrollment Programs in the State of Missouri

The State of Missouri's legislature has passed state statutes on student participation in Advanced Placement courses. WICHE's 2006 audit of state level acceleration policy lists no additional information for Missouri. However, several universities in Missouri, both private and public, boast of thriving dual enrollment programs. One such program, St. Louis University's "Advanced College Credit 1818" (ACC), provided the backdrop for a longitudinal efficacy study in 1999. The ACC program sponsors college credit courses taught by qualified high school teachers in the local St. Louis area high schools. Delicath (1999) utilized both multiple and logistic regression methods to suggest the likelihood of students, who participated in either or both ACC and AP programs, in persisting past the first year in college as compared against non-participants. The analytic sample included 2,760 students who were first time post-secondary students with bachelor's degree intentions and who entered St. Louis University - a private, four-year, slightly selective Catholic university (Delicath, 1999, p. 382). Foreign and transfer students were not included in the analysis. Limitations of this study included the fact that students were evaluated for persistence only within St. Louis University. Because the research involved students from only one university, the results may reflect student characteristics unique to the university. Dependent variables for the study included first year persistence, six-year degree attainment rates, and time to degree. Independent variables included gender, minority status, ACT scores, number of ACC and AP credits, socioeconomic factors, and locality (commuter/resident and St. Louis area resident/non-resident). No information was provided on whether student reports from surveys or transcript data were utilized for the analysis.

Delicath's research combined both AP and ACC credits and separated them in different models for statistical evaluation. Backward, stepwise regression was used to eliminate variables in the first model of analysis: first year persistence. Both AP and ACC credits showed statistical significance greater than the study's standard $p < .05$ levels. Odds ratios showed slightly greater likelihood of persistence for students with accumulated AP credits (1.052) over those with ACC credits (1.060) (Delicath, 1999, p. 386). When combining both types of credit and comparing outcomes, delta-p scores suggested that students with ACC and/or AP credit produced a first year persistency rate of 85.57% versus 69.64 % rate for students with no acceleration credits (Delicath, 1999, p. 387). Very similar results were generated by logistic regression in the degree attainment model. The chances of an AP/ACC student graduating within six years were 68.68% against 49.2% for students without accelerated credits. The only model in which the effects of AP and ACC credits were separated was the linear regression model for testing time to degree. In this analysis, both variables met the $p < .01$ significance levels. Students earning only ACC credits required 5.1% less time to graduate than students without ACC credits, whereas students earning only AP credits required 2.7% less time to graduate than students without AP credits. Regression analysis indicated the greatest time saving for students with both AP and ACC credits. These students reduced time to degree to 4.16 years or a 7.8% reduction in time to graduation (Delicath, 1999, p. 393-394). Students without acceleration credits averaged 4.51 years to graduation. According to Delicath (1999), students graduating within three years after matriculation earned significantly more AP and ACC credits than students who graduated four or five years after their first entry into St. Louis University (p. 394). A final analysis separated out the impact of each type of acceleration credit and controlled for student aptitude by utilizing ACT test scores. Results suggested that ACC credit was the only variable that indicated a statistical significance level of $p < .01$, and that the number of earned ACC credits varied positively with persistence to the second year in college. When considering degree attainment, ACC credits, not AP credits, again produced statistically significant results when controlling for ACT scores ($p < .05$). ACC credits, gender and commuter status correlated positively with student graduation from St. Louis University.

Delicath's research suggests a need for a broader study of the interactions between demographic variables and AP and dual enrollment credits, especially as they affect college integration (persistence) and goal attainment (graduation rates). Students in this sample earned their dual enrollment credits only through their experiences in St. Louis University's Advanced College Credit 1818 Program. According to the results, dual enrollment program participation contributed to the persistence and degree attainment of students both separately and in conjunction with Advanced Placement course participation. More importantly, when student persistence and degree attainment were controlled by ACT scores, St. Louis University's Advanced College Credit 1818 Program credit hours significantly impacted these dependent variables, whereas Advanced Placement course credits failed to generate similar results.

A second Missouri-based study also evaluated students who participated in AP and dual enrollment (DE) courses and their post-secondary success. Research questions investigated differences in GPA, persistence to the second year of college, and whether the location of the dual enrollment course influenced students' achievement in post-secondary education. The last issue, course location, was of particular interest to me. Colleges usually utilize a variety of options for delivering dual enrollment courses. The NELS: 88/2000 data used in my research do not allow the research to parcel out or otherwise identify students by the location of course or employment status of the instructor (high school teacher or college professor). In this Missouri study, Eimers and Mullen (2003) explored whether courses offered in a community college or a university setting affected student outcomes. Previously discussed studies have investigated relationships between dual enrollment course participation, GPA, and persistence.

However, only the Delicath study utilized regression analysis effectively, in suggesting correlations between the amount and types of dual enrollment credits earned, persistence and degree attainment. Eimers and Mullen also used inferential statistics research methods to search for correlations and the likelihood of positive student post-secondary outcomes due to AP or dual credit course participation. Additionally, the study controlled for the nature of the high school curriculum, utilizing a set of courses called the "Missouri core" as a standard for rigor. The analytic sample included 7,913 first time, full time, degree-seeking students who had graduated from high school within one year of college entrance (Eimers & Mullen, 2003, p., 3). Sampled students attended one of four campuses in the University of Missouri system. The research separated those students who only earned dual enrollment from students who earned no acceleration credits. Advanced placement credit earners were similarly separated from those with no AP credit. Finally, students who earned both AP and dual enrollment credits were combined into a group and compared with students who had no previously earned acceleration credits.

Linear regression results of the GPA study suggested that the predicted end of first year GPA's of students earning AP or both AP and DE credits were higher than students earning only DE credits or those entering college without acceleration credits - when controlling for class rank and ACT scores ($p <. 0001$). In fact, the predicted GPA of the DE students was exactly the same as students entering with no credits - 2.97 on a 4 point scale. (Eimers & Mullen, 2003, p. 6). Descriptive statistics without the statistical controls indicated that DE students ranked third (2.92 GPA) behind students earning AP and DE types of credit (3.32) or AP credit only (3.28), and ahead of students with no incoming advanced credit, who earned a 2.70 GPA. Therefore, DE students actually achieved first year GPA's that were slightly lower than predicted by the regression analysis. Similarly, students with no credit performed .27 worse than predicted (Eimers & Mullen, 2003, p. 4).

Considering the location of the dual credit course and its possible impact on first year GPA or persistence, Eimers and Mullen found that students who attended two-year schools earned higher ACT scores and high school class ranks than students who attended universities for their dual enrollment classes. However, after matriculation, first year university students who previously attended two-year schools for DE classes achieved lower first year GPA's than students with prior experience at four-year institutions. These data proved to be consistent with the use of both descriptive statistics and predictive linear regression models. Even though students with prior community college experiences produced lower GPA's, logistic regression models found no difference in the likelihood that students who had earned credits at either type of institution would return to college after completion of the freshman year.

Delicath's study acknowledges that AP and DE students earned credits either before or after matriculation, a topic overlooked in Eimers and Mullen's research. Neither study, however, defines persistence in terms of momentum to degree or evaluates the number of credits earned as a factor in persistence toward degree. I agree with Adelman (2006) that moving forward to a second year in college may actually be meaningless in terms of momentum to degree unless credits accumulate during each year of school. Students with incoming credits should benefit from academic momentum.

Sustaining that momentum counts in the long run toward the ultimate goal – the bachelor's degree.

Dual Enrollment Programs in the State of New York

Previous mention has already been made of a variety of CBTP programs operating in state of New York, including Syracuse University's Project Advance, LaGuardia Community College's Early College High School, and CUNY's College Now. Yet, the WICHE (2006) report was devoid of any formal policy information on acceleration programs in New York State. Kleiman (2001) published descriptive statistics for CBTP students attending the Early College High School at LaGuardia Community College finding a 95% graduation rate from high school and 90% matriculation rate to college (p. 32). Although Kleiman asserted that these early college high school statistics rated significantly higher than comparable data gleaned from NYC high schools, no further data were shared in the report to substantiate these claims. Kleiman also discussed CUNY's College Now program in general terms, leading Colton (2006) to conduct a follow up report regarding the current status of this large and complex collaboration between the CUNY and the New York Public Schools. According to Colton's report, changes in the administration within the public school system and the New York City mayor's office have decreased the public school's involvement in the daily operation of the College Now program. A liaison no longer coordinates collaborations between the two educational systems. CUNY now completely controls the dual enrollment program, as well as the early and middle college high school initiatives. Relations were established between CUNY officials and high school principals, but inconsistencies in program administration led to the downsizing of the overall initiative during 2004-05. Nevertheless, with 32,400 students enrolled and over 55,600 different course offerings, CUNY boasts the nation's largest dual enrollment program reaching 240 of the 425 high schools in New York City and utilizing all seven CUNY campus sites (Colton, 2006, p. 4-5).

Colton offers a host of descriptive statistics concerning former College Now students matriculating to CUNY systems for their freshman college experience. These data include percentages of CUNY freshmen who attended College Now (system wide average was 38%, some campus participation reached 60%), total coverage of the program for NYC HS students (11% as of 2004-05), and academic achievement in the form of grades (80% earned "C's" or better and 82% persisted to a second year versus 72.5% of non-College Now students at CUNY) (Colton, 2006, p. 5). While these descriptive statistics may be interesting, no significance was assigned and no controls were evident for further inferential conclusions. Data collection leading to a determination of actual college achievement for students who have participated in College Now has proven problematic. Both the New York City Department of Education, which govern NYC high schools, and CUNY lack mechanisms to share student information. A dearth of student tracking created an impossible situation for researchers attempting to ascertain college graduation rates. Governmental agencies realized the need to share data, but have had difficulty creating a reasonable method of tracking school data in New York City, as well as within other dual enrollment programs across the country.

Calcagno (2006), and his associates at the Community College Research Center at Columbia University (Karp, Calcagno, Hughes, Jeong & Bailey, 2007, 2008), have evaluated student data from several student cohorts from the College Now program, including those entering CUNY in the fall of 2000 and 2001, and followed these two cohorts through the fall 2005 semester. The students in that particular data set had previously attended high school in one of 20 New York City vocational/technical high schools (Colcango, 2006, p.3). Logistic regression and controls were applied to isolate students who had participated in the College Now program from those who had not, as well as to control for student demographic characteristics, SES attributes, and various high school characteristics. The primary independent variable was College Now participation. Dependent variables were full time enrollment in the first semester, persistence to the second semester, and commitment to pursuing a bachelor's degree. Linear regression methods, applied to individual models, determined relationships between College Now participation and first semester college GPA. The dependent variables were organized into two categories. First, short term outcomes included BA pursuit, full-time first semester enrollment, first semester GPA, and persistence to second semester. Second, long term outcomes included fourth semester GPA, persistence to the second year, and total credits earned in three years of enrollment. I was particularly interested in evaluating credits earned through the third year, as this construct seems congruent with momentum to degree. Grade point averages, while an indicator of academic success and preparation for college work, may not matter as much in the long run as the number of credits acquired. A student could earn a high GPA without gaining many credits. Earning a high GPA and earning at least 28 credits per year presents challenges that participation in dual enrollment courses may or may not overcome.

According to Calcagno (2006), College Now participation produced statistically significant odds ratios and correlations ($p < .01$) with variables aligned with enrollment in a bachelor's degree program and number of credits earned by the third year. Only one other variable was found to produce a statistically significant coefficient- first term GPA ($p < .05$), however the coefficient was quite small at 0.133 (Calcagno, 2006, p. 6). The "credits earned" variable produced a high correlation coefficient (10.648) by way of linear regression (Calcagno, 2006, p. 7). These data seem to support the premise that dual enrollment participation may build momentum to degree, because students in the program continue to earn credits after entering post-secondary education. If third year credits related positively to College Now participation, then dual credit programs may enhance students' chances of successfully continuing on toward college degree completion.

Dual Enrollment Programs in the State of Tennessee

According to the WICHE (2006) report, Tennessee's legislative body adopted state level statutes concerning implementation of dual enrollment programs. The government has not addressed any other types of acceleration programs. WICHE's policy review contained only one mention of regulations pertaining to Tennessee - the right of students to apply for grants to offset the cost of dual enrollment tuition. According to Porter (2003), the Tennessee Board of Regents developed specific definitions to describe types of dual enrollment programming, while allowing colleges to individually set entry requirements for student participation. Grade point averages and SAT/ACT scores were the most common requirements, with minimum levels dependent on the college and the type of course – either academic or vocational.

Porter's study sought to directly link college persistence and degree completion to the number of college credits earned before high school graduation. The analytic sample included 12, 834 student records collected in 2002 from the student information systems housed within five universities in the State of Tennessee (Porter, 2003, p. 38). Dual enrollment students constituted 8.3% of the total student population analyzed (Porter, 2003, p. 46).

Dependent variables for the study included first and last semester GPA, retention and graduation rates and time to degree. Students who participated in dual enrollment courses were compared to non-participants. In contrast with similar studies examined in this review, Porter did not utilize Advanced Placement participation as a control variable. Rather, she compared college outcomes for students participating in both AP and dual enrollment courses. High school grade point average and ACT scores were used as control variables, as well as the number of college credits earned before high school graduation through dual enrollment programs.

Porter's study suffered from significant methodological problems in the area of data collection, which were directly related to the dependent variables of elapsed time to degree and graduation rates. Two cohorts of data were collected; one group that entered college in 1996 and the other that entered in 1998. Because data were collected in the summer of 2002, the 1996 cohort would have had 6 years to graduate before the data analysis began; only 4 years, however, would have elapsed for the entering class of 1998. Time to degree for the NELS: 88/2000 cohort averaged 4.56 calendar years or 4.75 academic years for all students, regardless of acceleration credits accumulations (Adelman, 2004, p. 18-19). Therefore, the number of degree completers from the 1998 cohort was diminished by the likelihood that the majority of students required more than 4 years to graduate. Even with a minimum of acceleration credits (1-4), students in the NELS study required 4.46 years to complete a BA (Adelman, 2006, p. 176). This fact revealed higher percentages of students still enrolled in college for the 1998 cohort.

Both of the cohorts in Porter's research were evaluated on the basis of on time, four-year graduation rates. Results of Chi Square analysis showed that 45.9% of the 1996 cohort's dual enrollment students versus 19.6% of non-participants graduated in four years time ($p < .001$) (Porter, 2003, p. 56). The 1998 cohort's on -time graduation rates for dual enrollment participants were slightly higher at 49.3% versus the non-participant's rate of 21.2% ($p < .001$) (Porter, 2003, p. 57). These data support the contention that earning credits before matriculation impacted the probability of on-time graduation. Porter also explored the implications of variations in total credit hours earned and the subsequent impact upon time graduation. Mean number of credits were calculated for students who graduated early or within four years, for those who were still enrolled at the time of data collection, and for those who had left their university of first enrollment. In each of the two cohort groups (1996 and 1998), the mean number of pre-college credits earned was larger for students who graduated early or on time. Differences in the number of credits earned, between the group of students who graduated on-time or early and those currently enrolled or dropped out of college, was statistically significant to $p < .001$ (Porter, 2003, p. 60).

Porter's research points to particular consequences of participation in dual enrollment programs. Earning credits in these programs provided a means to gain momentum toward degree attainment in a timely manner. These data on momentum to degree create more research interest than the reported GPA data. Porter contended that dual enrollment status produced a collinear or “joint relationship” with HS GPA and ACT scores (2003, p. 65). Participation in dual enrollment had no significant relationship with final GPA, as the OLS regression showed, but this should not be a point of concern. Because ACT and HS GPA’s of dual enrollment students were higher than non-participants and final college GPA’s of dual enrolment students were also higher than non-participants, the characteristics of dual enrollment students may have influenced the final GPA results more than dual enrollment status itself. Still, a primary question remains unanswered: Are the number of credits earned by dual enrollment students before matriculation or are the academic attributes associated with these dual enrollment participants the determining factor in attaining higher percentages of on -time graduation? The analysis of dual enrollment as a predictor of college graduation was weak, as the researcher combined all independent variables into one analysis and generally concluded that one or more of the controlling factors were predictors of college graduation. In summary, Porter’s report suggested that dual enrollment participation earned higher end of first year GPA’s, produced higher retention and graduation rates, and graduated more students on time or earlier than non-participants.

Dual Enrollment Programs in the State of Utah

The State of Utah, by means of both state legislative statutes and state board of education policy, has created one of the most ambitious dual enrollment programs in the nation. The New Century Scholarship, mentioned earlier in this literature review, includes monetary incentives for students who complete both an associate in arts degree and receive their high school diploma before entering college in the fall after their high school graduation. The popularity of the program has resulted in tremendous growth in the student population attending both community colleges and universities. College administrators working with Utah's dual enrollment programs have created a statewide collaboration, known as the Utah Alliance of Concurrent Enrollment Partnerships (Peterson, Anjewieden, & Corser, 2001). According to the WICHE (2006) policy survey, local schools in conjunction with their higher education partners determine enrollment eligibility for dual credit courses. Typical standards included junior or senior grade standing, minimum high school GPA, ACT and/or college departmental placement test scores, letters of recommendation, and approval signatures from both the high school and sponsoring college. Students may earn both high school and college credits, with high school credits eligible to meet graduation requirements. No tuition fees are assessed, although a one-time application fee may be charged to the student by the sponsoring college. Program performance data must be collected yearly and reported to the State, in order to prepare a census on the number of students enrolled in dual credit classes and to acknowledge the proportion of students who successfully complete classes for credit.

At Salt Lake Community College (SLCC), dual enrollment programs began during the 1989-1990 term. Over the next nine years, the program grew and structures were refined. A program evaluation, conducted in 1999, sought to answer the following questions:

1) What were students' perceptions on their concurrent enrollment classes?

2) What were students' plans for six months to one year after high school completion?

3) How had the dual enrollment program participation impacted students' plans for after high school? (Peterson, Anjewieden & Corser, 2001).

Survey data were collected from a stratified random sampling of 604 of the 4,817 students enrolled in the dual enrollment program. Nearly all respondents (97%) were satisfied with their dual enrollment courses. Within one year of graduation, 83% of participants intended to attend college. A credible 56% of students responding indicated that their involvement in dual enrollment classes had encouraged them to continue on with their college education. Only 1% of students indicated that the class participation had negatively affected their post-high school education plans. The average dual credit participant at SLCC had earned 13.5 credits toward the AA by the time of high school graduation (Peterson, Anjewieden & Corser, 2001, p. 29-30). Although this study included only descriptive statistics, the program results seemed to indicate that for students who had been unsure of their ability to perform college level work, the experience with dual enrollment at Salt Lake Community College may have promoted integration and momentum toward degrees. A subsequent survey of former SLCC dual enrollment participants found 55% of these students entered SLCC after high school and 37% of these earned AA degrees (Peterson, Anjewieden, & Corser, 2001, p. 30). The authors failed to account for numbers of students who entered SLCC with the purpose of transferring to a four-year institution or the percentage of students who entered with the purpose of obtaining an AA degree. Nevertheless, the message of this program evaluation indicated that students interpreted their SLCC coursework, and their personal achievement as college-level. For students in this program evaluation, dual enrollment provided a stronger bridge between high school and college.

Dual Enrollment Programs in the
State of Washington

Acceleration credit programs in the State of Washington offered students many options including programs supported by the state government, and by the Bill and Melinda Gates Foundation. State statutes have been adopted to govern Advanced Placement, dual enrollment, International Baccalaureate and tech prep programs. Admissions standards for dual enrollment courses have also been established through collaborations between local school districts and sponsoring higher education institutions. Generally speaking, the dual enrollment programs require a minimum class standing and a minimal standardized test score. Students could earn high school and college credit for successful completion of dual enrollment courses, with high school credit qualifying as graduation credits. Responsibility for tuition and fees falls upon the school district. State aid funds for participating students are funneled through the community college or university at which the students enroll, thereby creating a financial burden on the local school districts. Fees for college courses include a portion of the transportation costs necessary for students to travel to campus. Students in Washington have been allowed to enroll in only community college classes the during their final two years in high school, effectively leaving the high school experience behind for college life.

Washington State's premier dual enrollment program, Running Start, is primarily housed within the community college system. However, five state universities also enroll students - Central Washington, Eastern Washington, Washington State University, Northwest Indian College, and Evergreen State College. The University of Washington has created a College in the Schools program, modeled after the University of Minnesota's program. Central Washington University, in addition to participating in

Running Start, also sponsors the "Cornerstone" program in which high school students enroll in college courses taught by high school teachers certified as adjuncts at CWU. Western Washington University, Central Washington University, and the State Board for Community and Technical Colleges (the governmental entity that oversees Running Start) have conducted research on the efficacy of dual enrollment programs and outcomes (Western Washington University, 1999; Hanson, 2003, 2004, 2005).

The most recent report from the State Board for Community and Technical Colleges regarding Running Start, published in December 2005, showed that 10% of all juniors and seniors in the State of Washington participated in the program (Hanson, 2005, p. 1). One of the more appealing aspects of the program allows students to enroll in any course offered at the college, therefore not restricting students to courses designed especially for Running Start. The overwhelming majority (89%) of courses enrolled fell into the category of general education (Hanson, 2005, p. 5). The popularity of the Running Start program was reflected by the number of students enrolled – 16.022 individual students, which represented a 3% increase from the 2003-04 report (Hanson, 2005, p. 2). On-line course enrollment has also grown steadily since 2000, with 3,287 students choosing the cyber-medium for their studies (Hanson, 2005, p. 5). Students in the Running Start program have achieved at academic levels similar to or better than traditional students enrolled in the colleges they attend. According to the report, dual enrollment students completed 86% of attempted classes compared to the general population, which completed 83% of classes attempted (Hanson, 2005, p. 4).

The average Running Start participant, according to the state report, transferred to a four-year institution and completed a bachelor's degree while needing 33 fewer credits than their traditionally enrolled counterpart (a savings of time of one school year) (Hanson, 2005, p. 6). In fact, the average transfer student to the University of Washington (UW) brought in 46.6 credits from the Running Start programs. Even more impressive was the fact that, in 2004-05, 216 students transferred 75 or more credits into their University of Washington degree plans. According to Hanson (2005), thirteen percent of the incoming UW 2004-05 freshman class matriculated as sophomores or juniors (p. 9). After entering the UW in the fall of 2004, Running Start students persisted into their second year at a 90.3% rate, after earning an average of 41.2 quarter credits (compared to 42.9 credits earned by traditional freshmen and 37.1 credits earned by transfer students from the community college system). These descriptive statistics included no further analysis for significance testing. The persistence rate was not accompanied by comparisons for traditional freshmen or transfer students. Because 13% of Running Start students entered college above freshman level, the courses they enrolled in may have included upper class-level academics and should logically have been more demanding than the typical freshman level course. The state report offered no insight into the GPA or credit earning capabilities of these accelerated students. Such data would have added greatly to the richness and efficacy of a report that placed such importance on both the number of credits earned and the incoming status of students at UW. No explanation was provided on the question of why so many students (86.5%) entered at the freshman credit level when 41% had earned enough credit to start as sophomores (45 quarter credits).

Grade point averages of the class of 2004-05 were broken down by session and by status – Running Start, Traditional Freshmen, and Community College. The overall GPA of the Running Start students for the first year lagged behind the other two categories. Running Start students averaged a first year GPA of 3.12, while traditional freshmen earned 3.15 and community college students a 3.19. If one takes into consideration the number of students who had earned more than just the minimum of 9 credits that Adelman (2006) considered necessary for college momentum, these results seem ripe for inferential analysis to determine the statistical significance of the GPA when controlling for incoming student academic and demographic differences. Without such controls, however, these descriptive statistics are nothing more than interesting. Because the Running Start program offers no remedial level classes, students must be ready for credit bearing courses to enter. Therefore, the fact that 230 of Running Start students were required to begin their studies at a freshman level after earning enough credits at their community college or university dual enrollment program is cause for alarm. Further investigation is required to determine whether the University of Washington failed to recognize credits or some other mechanism was to blame.

At Western Washington University, college administrators also watch the progress of Running Start participants. According to Jordan, McKinney and Trimble (2000), students entering the Western Washington with 45 or more credits may have attended the community college full time for at least one year during the last two years of high school. These non-traditional freshmen students may have already been sociologically affected by their experience in college. Through interviews with students, the researchers surmised that because of their dual enrollment experiences, Running Start participants had acquired habits and attitudes of college students before the majority of their age-level peers. Participation in college classes with regular college students, as opposed to classes held with only high school, may have accelerated the academic growth and maturity of dually enrolled students. Western Washington University officials have struggled with the question of how to advise incoming freshmen who have accumulated so many credit hours. According to student survey responses, transfer credits have proven especially problematic, with some students required to re-take courses. One student in the interview group said,

> I was told not get my AA by my advisors from community college and from high school, because they said I wouldn't be able to transfer in as well, as easily. So I didn't get it, and half of my credits didn't transfer across. So I thought it was kind of a waste of my time that I took all those classes and I have to retake them now (p. 11).

The preceding vignette may explain the dilemma faced by the University of Washington students who cannot always expect their credit accumulations to directly transfer to their four-year colleges.

Patricia Geodecke, director of the "Cornerstone" program at Central Washington University, examined transcript data to generate descriptive statistics to characterize the students who participated in CWU's concurrent enrollment program. Beginning with 171 students in 2001-02, Cornerstone has served a total of 2,652 students. In addition to transcript data, one year follow up student surveys were made available on the CWU website. By the fall of 2006, 130 of the 819 past participants had submitted information through the on-line system (Goedecke, 2006, p. 8). Because some of the participants were high school juniors, the expected number of participants or the return rate for the surveys could not be determined. Student reported data indicated that 80% of the 130 respondents had matriculated to a four-year college or university, 13% attended a community college or technical school, and 4% declared no current enrollment in higher education (Goedecke, 2006, p. 8). Contradictory data, collected from the National Clearinghouse, indicate possible selection bias in Cornerstone survey respondents. Of the 179 Cornerstone participants who graduated from high school in 2002-03, 59% were enrolled in a four-year school, 25% enrolled in a community college, and 16% had not continued their education at the time of the data collection (Goedecke, 2006, p. 10). Transcript data provided more evidence of the positive impact of the Cornerstone program upon students after entering college. However, these descriptive data applied no controls for student characteristics or academic resources. First term grade point averages, for students who had participated in Cornerstone, were compared to freshman student GPA's in colleges across the State of Washington. In every case, graduates of the CWU concurrent enrollment program earned higher first term and first year GPAs than the average GPAs earned by all freshmen students at those same colleges. The data suggested that the Cornerstone program provided a solid academic experience for students to move forward into the university setting and compete with students from all across the state and the nation. End of the year GPA's for Cornerstone program students averaged 3.34 on a 4-point scale (Goedecke, 2006, p. 20). These data were higher than the end of first year GPA's reported for Running Start students transferring into the University of Washington. Again, with no controls for prior academic achievement or demographic characteristics, one cannot take these data too far. The raw statistics point to success for students in the Cornerstone program, but no data were produced regarding college graduation rates – the ultimate success measurement for students who enter higher education.

Limitations to the Current Literature on Dual Enrollment Programs

Each of the studies conducted across the country has described positive outcomes of student participation in dual enrollment programs. However, many of the research methods interpreted only descriptive statistics with no controls for pre-existing conditions. Of the reports that utilized inferential statistics, only Eimers and Mullen's report (2003) on dual enrollment students in the University of Missouri system completely separated out the effects of dual enrollment and Advanced Placement from students who participated in no acceleration credits before college matriculation. Their research controlled for prior academic achievement level and high school course loads to determine the statistical significance of dual enrollment participation upon college persistence. However, Eimers and Mullen (2003) failed to succinctly define persistence or to link persistence to credits earned. Most importantly, the study failed to consider the most desired outcome of college attendance - graduation rate.

The majority of the studies on dual enrollment participants reported matriculation rates, grade point averages (at the end of the first semester or first year), credits earned, and rates of persistence to the second post-secondary year. Calculating time to degree and graduation rates, however, continues to confound most researchers due to the complexity of longitudinal transcript studies that follow students through transfers and stop outs. Graduation rates and time to degree statistics were most commonly determined in the state and institutional studies, but only as they applied to the institution of first entry. As we know from Adelman (2004), 40.6% of students who earned a bachelor's degree attended one institution and 36.7% attended at least two colleges during their post-secondary experiences (p. 45). Typically, university or community colleges do not allocate funds and personnel or develop proper protocols to collect data and conduct effective program evaluation (Hughes, Karp, Fermin & Bailey, 2005). Without necessary procedures and mechanisms to follow students throughout their post-secondary careers, researchers view the full picture of college goal attainment with limited clarity.

As evidenced in the research evaluated for this review, the institutions offering or sponsoring the dual enrollment courses have also primarily conducted their own, in-house dual enrollment research. This "cheerleading" may have resulted in over-emphasizing positive outcomes and clouded objective reporting. Hughes, Karp, Fermin et al. (2005) noted that research on credit based transition programs must place controls on studied students in order to account for differences in their academic preparation. Lack of such controls may have yielded more positive research outcomes than would have materialized otherwise. The research needs to be longitudinal, following students throughout their post-secondary journeys, rather than being fixed on achievement gauges at the institution of first entry. According to Hughes, Karp, Fermin et al. (2005), researchers still do not know, "whether CBTP's actually achieve their goal of helping students enter and succeed in college" (p. 53). Many of the reviewed research projects emphasize increasing the numbers of participants in their dual enrollment programs. As more educational careers of students are affected by their dual enrollment participation and more state and local dollars are committed to these programming opportunities, I predict that greater program oversight will be needed. Accurate information regarding program efficacy should guide policy makers, educators, and families toward appropriate decisions regarding whether dual enrollment courses are the best option for students to maximize their academic abilities and advance post-secondary achievement.

The research committee for NACEP has designed and disseminated surveys to track students from the initial dual enrollment provider through to the end of the fifth year past their high school graduation. This common set of surveys, administered by dual enrollment programs sponsored in colleges, universities and community colleges across the country, has the potential to provide a nation-wide look at the outcomes of dual enrollment participation. However, these surveys are subject to at least one major pitfall, which is the inaccuracy of student self-reports regarding academic, personal, and familial information. Response rates, as noted in this literature review, routinely fall short of expectations and lose their power due to selection bias. Transcript data, while also harboring errors, provide more accurate measures of students' academic achievements. However, data collected from individual educational institutions typically do not follow students. The State of Florida has set a worthy example in its attempts to follow students from kindergarten through graduate school. According to Hoffman (2003), few states keep data on program participants to determine if underrepresented students have participated in dual enrollment programs at rates equal to their percentages in the general school population. As the WICHE (2006) policy survey so clearly showed, state governments have invested a great deal of time and, in many cases, funds to support dual enrollment and other types of acceleration programs. Unfortunately, for those who advocate for greater expansion and development of acceleration programs there remains a paucity of quality research regarding actual academic outcomes and knowledge of who benefits most from dual enrollment participation (Bailey & Karp, 2003). In the analysis of dual enrollment, "unknowns outweigh the knowns" when evaluating program effectiveness for long-term student achievement in higher education (Krueger, 2006, p.

6). Only the secondary data sets created by the US Department of Education and the National Center for Educational Statistics have the ability to trace students' educational enrollments and outcomes on a national stage with nationally representative data.

Conclusion – Why Study Dual Enrollment with a National Data Set?

The evidence presented by state and institutional reviews (whether theoretical, circumstantial or correlational) currently supports dual enrollment as a positive force on student achievement in post-secondary education. These primarily descriptive data have been used to show trends, but no statistical significance can be drawn from them. Therefore, the literature has revealed that the impact of dual enrollment programs on students in the high school and college setting remains largely untested and unknown. First and foremost, administrators connected to the evaluated dual enrollment programs have conducted the majority of the published studies. Methods for collecting data have resulted in low numbers of respondents. And the tracking of students remains a problem for researchers attempting to discern the role of dual enrollment programs on college outcomes. Aside from the State of Florida, which has now assigned an identification number to each enrolled K-12 student, no mechanism has been developed to collect and analyze state generated student data in a way that can allow for more sophisticated psychometric analysis. Students in Florida who move out of state for post-secondary education are automatically lost from the system. Only the studies by Delicath (1999) and Eimers and Mullen (2003) utilized linear and logistic regression respectively, and thereby applied statistical controls to student data. However, both of these studies again utilized samples of students from their own institutions' dual enrollment programs. Although not downplaying the results of their work, I am suggesting that program evaluations are best conducted by outside entities.

Furthermore, the studies conducted thus far have not attempted to collect nationally representative data on dual enrollment in order to assess student persistence by any outside entity of the college, university, or state higher education system in which the program is supported. The work by the Community College Research Center at Columbia University comes closest to an impartial evaluation through its work with the College Now program in New York City and the State of Florida's data on career and technical education students enrolled in DE classes. However, this particular study focuses on a specific course of study – career and technical education – and not general education classes, which are the most common courses chosen by students who participate in dual enrollment programs.

Although a variety of institutional or statewide research obviously exists, an objective study on a nationwide basis has not yet been attempted. Adelman's research in 1999, 2004, and 2006 clearly illustrated the power of inferential statistics married to an excellent data source. The NELS: 88/2000 variables, constructed by researchers working for the National Center for Educational Statistics (NCES) and the US Department of Education, enable a multitude of analyses of data representative of an entire national high school graduating class of 1992. Most importantly, the NELS variables statistically allowed for the separation of students who earned credits through dual enrollment from those who may have earned AP or CLEP or IB credits. Graduation rates and time to degree may be computed for students who have transferred in and out of different colleges or "stopped out" for a time before finishing their education. The length of time elapsed during the data collection permitted students to complete degrees up until the summer of 2000 – eight years after high school graduation. Work was completed by NCES on the NELS high school and college transcripts and individual student surveys to provide a rich environment for research. The NELS data allow for important statistical controls, thereby providing methodological advantages over the majority of studies in this review. Growing numbers of minority and low-income youth in America make it especially important for researchers to understand how stakeholders are affected by dual enrollment participation. Again, the NELS data facilitate this type of investigation, and may bring some clarity to the claims of dual enrollment providers and proponents.

Additional research is necessary in order to fully understand the possible effects of dual enrollment program participation on student persistence in the college setting. The groundwork laid by Clifford Adelman points to the potential for dual enrollment to complement and enhance the benefits of a rigorous high school curriculum. Further investigations, including Venezia, Kirst, and Antonio's Stanford University "Bridge Project" (2003), signal a genuine need to guide students across the academic divide that separates high school and college experiences. Credit based transition programs, such as dual and concurrent enrollment courses, may help remedy the "historic disconnect between the high school and the college in America" by forging robust and evolving associations between high schools, colleges and universities (Johnstone & del Genio, 2001, p. 62). However, without the use of an unbiased set of data collected through a national data set and sophisticated statistical methods controlling for student attributes and behaviors, a picture of the likely outcomes of dual enrollment students as they enter post-secondary education will remain unknown.

CHAPTER III
METHODOLOGY

NELS Data and the Analytical Sample

The NELS: 88/2000 public access data offer researchers the unique opportunity to examine a nationally representative sample of American students and to conduct panel, longitudinal, and trend studies. According to the Adelman (2006), the National Educational Longitudinal Study (NELS: 88/2000) data were gathered by the US Department of Education's National Center for Educational Statistics to form a nationally representative weighted sampling of 2.3 million 8th grade students in the spring of 1988 (p. 10). The bulk of the same students were surveyed as 10th grade students in 1990, at the predicted year of high school graduation in 1992, two years after high school graduation (1994), and finally eight years after high school in 2000. The NELS sample students attended over 1,000 middle or junior high schools and over 5,000 high schools across the United States (Curtin, Ingels, Wu & Heuer, 2002, p. 6). At the time of the data collection in 1992, the sample size had shrunk from 25,000 to 12,000 students. Therefore, the data set was freshened in order to reproduce a nationally representative set of 12th grade student information. The NELS high school seniors represented 78.5% of the entire first time post-secondary student universe in 1992-93 (Adelman, 2004, p. 4). At the end of the study, a weighted 1.19 million of the original 8th grade students had attended a four-year college at some time during the 8.5 years of the NELS data collection, and had produced a completed record of high school and college transcripts (Adelman, 2006, p.10). In addition to transcript and test data, survey data were collected from students, parents, teachers, and school counselors.

Large numbers of students in the NELS study participated in post-secondary education activities after high school. Nearly 82% of students in the NELS survey who graduated from high school on time in 1992 participated in some type of post-secondary educational program (Adelman, 2006, p. 10). Analysis of the NELS: 88/2000 students, who were included in the NELS 1992 cohort and in the NELS 2000 fourth follow up group, showed that 65.5% of the students participated in some type of post-secondary educational experience and completed a degree program. Of the NELS participants who entered post-secondary education before the final surveys were completed in 2000 (regardless of when or if they graduated from high school) only 19.9% attained a bachelor's degree (Adelman, 2004, p. 29).

The NELS post-secondary data, obtained two and six years after high school graduation, included numeric values associated with college credits earned by students concurrently enrolled in high school. These data constitute the primary independent variable for this research study. To gain a perspective of the number of students involved in acquiring acceleration credits, the following statistics are offered for comparison. Of the total number of participants in the NELS study, 19% of the students who went on to earn post-secondary credits after high school graduation in 1992 earned college credits while still enrolled in high school (dual credit or concurrent enrollment) and/or by examination (Advanced Placement – AP or college level examination placement – CLEP) (Adelman, 2004, p. vi). NELS 12th grade students who participated in AP courses entered post-secondary institutions at a rate that was 22% higher than those who did not complete any AP classes in high school (Adelman, 2006, p. 37). After separating out those students who participated in dual enrollment programs, regardless of the configuration or delivery system by which student credits were earned, the NELS transcript data indicates that a weighted 213,000 students earned college credits before high school graduation (Adelman, 2006, p. 99). This statistic represented 17.8% of 1.19 million students in the 2006 analytic sample prepared by Adelman. Because dual enrollment credits are by definition post-secondary credits, the number of dual enrollment students totaled only 1.2% less than the cumulative number of students who had earned post-secondary credits of any kind in Adelman's 2004 analytic sample. Although Adelman's 2006 and 2004 samples were not identical, dual enrollment credits must be separated from AP and CLEP credits in order to suggest any value of dual enrollment program participation on persistence and degree attainment. This separation, through statistical analysis, has not been previously performed and represents the primary purpose of my research.

For the purpose of this study, the universe of students in the NELS analytic sample were delimited by the following three conditions:

1) Students were members of the spring 1992 senior class

2) Students were known post-secondary participants by December 2000

3) Transcripts for high school and college during the three follow-ups in 1992, 1994 and 2000 were available.

I used both NELS: 88/2000 public-use and restricted data files, including student transcript records from high school and post-secondary institutions (PETS), to conduct statistical analyses essential to probing the research questions. I am indebted to the previous statistical work accomplished by NCES staff members who cleaned the data and created the original transcript variables. Clifford Adelman, during his tenure as senior research analyst at the Office of Vocational and Adult Education, a division of the US Department of Education, created several of the complex variables used in my statistical analysis from restricted NELS high school and post-secondary transcript data. I have taken full advantage of knowledge gained by Adelman and his staff through the production of the “Toolbox “and “Principal Indicators” research projects in order to combine and extend their results toward an explanation of the effect of dual enrollment on persistence and degree attainment.

Research Questions

Research questions guiding this study are as listed below:

1) Do students who have participated in dual enrollment programs have higher rates of second year college persistence than those who were not dual enrollment participants?

2) Do students who have participated in dual enrollment programs have shorter time to degree periods than those who are not dual enrollment participants?

3) Do students who have participated in dual enrollment programs experience higher levels of college degree attainment than those who are not dual enrollment participants?

4) Do students who have participated in dual enrollment programs experience positive affects upon college persistence and degree attainment after accounting for specific demographic attributes, when compared to those who are not dual enrollment participants after accounting for these same attributes?

The Variables

Using Tinto's model of individual departure from post-secondary education as a guide, I chose variables that closely represented the pre-college entry attributes and goal commitments of students (see Figure 2.1). Tinto considered experiences after college matriculation to be more important to persistence and departure decisions than garnered by students before college. Nevertheless, he included family background, skills and abilities, and prior schooling as precursor or pre-college entry attributes in his theoretical model. Adelman (1999, 2006) cited Tinto's theories as foundational to understanding the power of pre-college experiences upon persistence and degree attainment. Dual enrollment classes, even if they take place within the high school years, still use college level materials and college equivalent exams. College credit may be awarded to students who perform at prescribed levels of competence. Therefore, dual enrollment participation, as one type of Credit Bearing Transition Program (CBTP), may not only contribute to the strength of the portion of Tinto's model referencing schooling before college, but also may also infiltrate and influence students' experiences in post-secondary education, especially in the sub-area of academic performance (see Figure 2.1).

The primary independent variable in this dissertation isolated students who participated in dual enrollment programs from non-participants. The variable, known by the acronym TCREDD, identified dual enrollment participants from college transcripts by cross-referencing students' high school graduation dates. Credits earned on college transcripts before high school graduation were counted as dual enrollment credits. According to Adelman, dual enrollment courses, grades, credits, the institution granting credits, and the specific school term of credits earned were utilized to create the

TCREDD variable. NELS transcript files also isolated over 1100 different categories of dual enrollment courses. In reference to the creation of the TCREDD variable, Adelman stated that there was

> no way of knowing where the courses were taught (at the college/community college or high school) or who taught them (college faculty or high school faculty). We have no way of knowing whether the courses were taken under a formal dual enrollment agreement or whether the student simply acted independently (C. Adelman, personal communication, October 15, 2006).

In an effort to offer further explain possible influences of dual credit course participation upon post-secondary performance, control variables were evaluated for participating versus non-participating students. These control variables were separated into three distinct categories: demographic, high school and college control variables. Hughes, Karp, Fermin and Bailey (2005) recommended that an evaluation of credit bearing transition programs "begin with students' performance prior to program participation" and continue through college graduation (p. 50). For the purpose of this research, and in agreement with recommendations for data collection taken from Hughes, Karp, Fermin et al. (2005), the control variables considered for statistical analysis included the demographic variables of race, gender and English language learners, first generation student status, location of high school, and familial socioeconomic status (SES). High school control variables included educational aspirations, high school grade point average (GPA) and class rank, advanced placement (AP) course and test completion, senior year test scores (SAT/ACT), and a variable identifying the rigor of a student's completed high school courses. College control variables included acceleration credits, no delay in college entry, selectivity of first post-secondary institution, freshman grade point average, transfers from two year to four-year institution, and credits earned in the first year of college.

Four dependent variables were utilized to predict the efficacy of dual enrollment course participation upon the outcomes of post-secondary education. First, college persistence was measured by enrollment in the first two years with no stoppage periods of over one semester in length. Next, the number of credits earned by the end of the second year of college, in this study a threshold of 50 or more credits, was used to indicate momentum to degree and persistence. The third dependent variable measured the length of time required for students to obtain a bachelor's degree. Measurement of elapsed time to degree completion was closely related to the persistence variable through the number of credits earned. One of the main attractions of dual enrollment courses is the ability to earn college credit before starting upon a degree program. Credits earned toward a bachelor's degree program should logically reduce time to degree for student participants in dual enrollment programs. NELS transcripts enabled researchers to investigate time to degree for NELS participant college completers. Therefore, the extent to which dual enrollment participants completed bachelor's degrees in less than the average time elapsed for all college graduates, 4.56 calendar years or 4.75 academic years (Adelman, 2004, p. 18-19) is of special concern to this study. Finally, the highest degrees earned by dual enrollment participants were compared to students who did not take part in a dual enrollment program prior to matriculation. According to Adelman, 25% of students who earned at least 9 hours of credits through dual enrollment courses or AP/CLEP examinations earned a credential beyond a bachelor's degree (Adelman, 2004, p. 55**).** Cross tabulations will show comparable degree attainment results for the study sample of students who earned acceleration credits and of those who participated in dual enrollment programs.

Variables for the research model, along with the coding system utilized in this study, are listed in Tables 3.1, 3.2 and 3.3**.** The majority of the research variables were created from transcript data located in the Post-secondary Education Transcript Study (PETS) and PETS Supplement data files (Curtin, Wu, Adelman, Daniel & Scott, 2004a, 2004b). The Post-secondary Education Transcript Study collected high school and post-secondary institutional transcript data on NELS: 88/2000 student survey participants. Self-reported data can be unreliable, no matter the age of respondent. By primarily selecting transcript data for this research, the study can report-out by educational institutions rather than by self-reports from students or parents. Human error in transcription from transcripts to computerized data sources, however, cannot be discounted. The objectivity of transcript data, when compared to self-reports, helps to compensate for this error factor.

The following constitutes a complete list of all original NELS or PETS variables utilized for this study.

Primary Independent Variable

TCREDD – Dual enrollment participation

Post-secondary credits earned in coursework prior to high school graduation Excludes credits earned by examination: CLEP and AP (Adelman, 2004)

Demographic Control Variables

COMPSEX – Gender

1) Male; 2) Female

Table 3.1. List of Original NELS/PETS Variables and Recoded Variable Labels

Original Variable	Origin	Recoding Labels
Independent Variable		
TCREDD	PETS	DEPARTIC Dual enrollment participant
Demographic Control Variables		
COMPSEX	PETS	MALE, FEMALE*
RACE4	PETS	HISPANIC, API, BLACK, NATAM**, WHITE*
F2S107	NELSR	ENGFRST English is first language
PHSURBURAN	PETS	URBANHS, RURALHS SUBURBHS* Urban, rural, suburban high school
FIRSTGEN	PETS SUPP	NOCOLEX First generation student
SESQUINT	PETS	SES1, SES2, SES3*, SES4, SES5 Socioeconomic status in quintiles
High School Control Variables		
EDUANNEW	PETS SUPP	EDULBA, EDURBA. EDUBA* Educational expectations are lowered from a BA, raised to BA, are consistently to earn a BA
APTOTREV	PETS SUPP	APPART Participant in Advanced Placement class and/or Advanced Placement test
HSCURREV	PETS SUPP	HSRIGOR1, HSRIGOR2, HSRIGOR3*, HSRIGOR4, HSRIGOR5 High School academic intensity quintiles

Table 3.1. Continued

Original Variable	Origin	Recoding Labels
SRTSQUIN	PETS	SATACT1, SATACT2, SATACT3*, SATACT4, SATACT5 Senior test quintiles (SAT or ACT)
CRANKREV	PETS SUPP	RANK1, RANK2, RANK3*, RANK4, RANK5 Class rank/Grade point average quintiles
College Control Variables		
TCREDE	PETS	APCLEP Credits earned by examination (AP/CLEP w/out dual enrollment credits)
TCREDG	PETS	CREDMOM Earned 20 or more credits by the end of the first post-secondary year
DELAY	PETS	NODELAY No delay in entering post-secondary after high school - within 7 months after graduation
GPA1	PETS	GPA1YR First year grade point average of 2.88 or above
F4ATT4YR	NELSR	FOURYR Ever attended a four-year college
REFINST	PETS	FIRST4, FIRST2***, CERTIF*** Type of first college of attendance

Table 3.1. Continued

Original Variable	Origin	Recoding Labels
REFSELCT	PETS	SELCT1***, SELCT2***, NONSELCT*, OPENDR Selectivity of first post-secondary institution
ATRNSFR**	PETS	TRANS2TO4**, TRANS4TO2**, MIXTRNS** Transfers between two and four-year colleges
Post-secondary Persistence Variables		
PSC1992-3 & PSC1993-4 (combined)	PETS	CUMCRED Cumulative credits of 50 or more by the end of the second post-secondary year
CONTIN	PETS	NOSTOP Continuous enrollment with no more than one semester break
Degree Attainment Variables		
BACHTME	PETS	BATIME Elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less
HDEG	PETS	CERTAA, BADEG, BAPLUS***, ADVDEG*** Highest degree earned
Weights and Filters		
F4UNI2D	NELSR	Second follow-up status in 1992
F4F2P2WT	PETS	Known post-secondary education participant and member of NELS: 88/2000 F2, F3, F4 follow-up; 12th grade student in 1992

* = Reference group

**= Eliminated from final models

*** = Combined into new variable

Table 3.2. Final Listing of Variables for Logistic Regression Models

Variable Labels	Description
Independent Variable	
DEPARTIC	Dual enrollment participant
Demographic Control Variables	
MALE, FEMALE*	Gender variables
HISPANIC, API, BLACK, WHITE*	Race variables: Hispanic, Asian/Pacific Islander, Black, White
ENGFRST	English if student's first language
URBANHS, RURALHS, SUBURBHS*	Urban, rural, suburban high school
NOCOLEX	First generation student
SES1, SES2, SES3*, SES4, SES5	Socioeconomic status quintiles
High School Control Variables	
EDULBA, EDURBA, EDUBA*	Educational expectations are lowered from a BA, are raised to BA, are consistently to earn a BA
APPART	Participant in Advanced Placement class and/or Advanced Placement test
HSRIGOR1, HSRIGOR2, HSRIGOR3*, HSRIGOR4, HSRIGOR5	High School academic intensity quintiles
SATACT1, SATACT2, SATACT3*, SATACT4, SATACT5	Senior test quintiles (SAT or ACT)
RANK1, RANK2, RANK3*, RANK4	Class rank/Grade point average quintiles
College Control Variables	
APCLEP	Credits earned by examination (AP or CLEP and without any dual enrollment credits)
CREDMOM	Earned 20 or more credits by the end of the first post-secondary year

Table 3.2. Continued

Variable Labels	Description
NODELAY	No delay in entering post-secondary after high school - within 7 months after graduation
GPA1YR	First year grade point average (GPA) of 2.88 or above
FOURYR	Ever attended a four-year college
FIRST4	College of first attendance was a four-year school
SELCT, NONSELCT*, OPENDR	Selectivity of first post-secondary institution First college was selective, non-selective, or an open door school
Post-secondary Persistence Variables	
CUMCRED	Cumulative credits of 50 or more by the end of the second post-secondary year
NOSTOP	Continuous enrollment with no more than one semester break
BATIME	Elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less
Degree Attainment Variables	
CERTAA, BADEG, GRAD	Certificate or AA degree, bachelor's degree, graduate credits or advanced degree
Filter	
F4UNID2	Second follow up status, 12^{th} grade student in 1992
Weight	
F4F2P2WT	Known post-secondary education participant And member of NELS: 88/2000 F2, F3 and F4 follow-up; 12^{th}grade student in 1992

* = Reference group

Table 3.3. Model Variables and Coding System

Variables	Coding
Independent Variable	
Dual Enrollment Participant	1,0
Demographic Control Variables	
Gender	
Male	1,0
Ethnicity	
Hispanic	1,0
Asian Pacific Islander	1,0
Black	1,0
White	Reference Group
Social/Cultural Capital	
English is Students' First Language	1,0
Urban High School	1,0
Rural High School	1,0
Suburban High School	Reference Group
First Generation Student	1,0
Socioeconomic Quintile 1	1,0
Socioeconomic Quintile 2	1,0
Socioeconomic Quintile 3	Reference Group
Socioeconomic Quintile 4	1,0
Socioeconomic Quintile 5	1,0
High School Control Variables	
Educational Expectations	
Expectations are lowered from a BA	1,0
Expectations are raised to BA	1,0
Expectations are to earn a BA	Reference Group
Curriculum	
Advanced Placement Class/Test Participant	1,0
High School Academic Rigor Level 1	1,0
High School Academic Rigor Level 2	1,0
High School Academic Rigor Level 3	Reference Group
High School Academic Rigor Level 4	1,0
High School Academic Rigor Level 5	1,0
Senior Test (SAT/ACT) Level 1	1,0
Senior Test (SAT/ACT) Level 2	1,0
Senior Test (SAT/ACT) Level 3	Reference Group
Senior Test (SAT/ACT) Level 4	1,0
Senior Test (SAT/ACT) Level 5	1,0
Class Rank/GPA Level 1	1,0
Class Rank/GPA Level 2	1,0

Table 3.3. Continued

Variables	**Coding**
Class Rank/GPA Level 3	Reference Group
Class Rank/GPA Level 4	1,0
Class Rank/GPA Level 5	1,0
College Control Variables	
Credits and Momentum to Degree	
Credits earned by examination (AP/CLEP)	1,0
Earned 20 or more credits by end of the first post-secondary year	1,0
No delay entering post-secondary after high school	1,0
First year GPA of 2.88 and above	1,0
Institutional Selectivity	
Ever attended a four-year college	1,0
College of first attendance was a four-year school	1,0
First college was selective	1,0
First college was non-selective	Reference Group
First college was an open door school	1,0
Post-secondary Persistence Variables	
Cumulative credits of 50 or more by the end of the second post-secondary year	1,0
Continuous enrollment with no more than one semester break	1,0
Degree Attainment Variables	
Time to Degree	
Elapsed time to bachelor's degree is 4.56 years or less	1,0
Highest Degree Awarded	
Received certificate or associate in arts degree	1,0
Received bachelor's degree	1,0
Received graduate credits or advanced degree	1,0
Filters and Weights	
F4UNI2D	1,0
F4F2P2WT	>0

RACE4 – Race

Variable employs the following racial categories:

1) Hispanic; 2) Asian/Pacific Islander; 3) Black; 4) White; 5) American Indian.

F2S107 – Non-native English speaker

Identifies if the students' first language is not English. Reported by student.

PHSURBAN – Location of the student's high school in 1992.

Three choices were given in the variable: urban, suburban, or rural.

FIRSTGEN – First generation post-secondary student

Reported by parents: "neither parent had attended a post-secondary institution" (Adelman, 2006, p. 179).

SESQUINT – Socioeconomic status quintile

Reported by parents; "composite index of family income, parents' highest level of education, prestige of parents' occupations, and the presence of items such as books, regular newspapers, and a computer in the students' household" (Adelman, 2006, p. 181).

High School Control Variables

EDUANNEW – Educational expectations revised

5 levels - 1) bachelor's consistent; 2) raised to bachelor's, 3) lowered from bachelor's, 4) some college consistent, 5) sub-bachelor's/no college plans. This variable is a reconstruction of the variable EDUANTIC in order to produce a new variable organized into quintiles like HSCURREV, CRANKREV, and SRTSQUIN, also used in this research (Curtin, Wu, Adelman, Daniel & Scott, 2004b, p. 31).

CRANKREV – High school class rank/GPA quintile

Composite of class rank and grade point average. Because not all high schools compute class rank for students, "for a significant percentage of students, this datum is missing" (Adelman, 2006, p. 183). However grade point averages were imputed for 376 cases in order to decrease the number of missing cases to 23.44% of the total (Curtin, Wu, Adelman, Daniel & Scott, 2004b, p. 22).

SRTSQUIN – Senior year test score quintile

An "enhanced, mini-SAT" was administered and composite scores recorded in percentiles. In cases where the SAT score was missing, ACT scores were converted to SAT scores. Fourteen percent of students in the NELS are missing this score from their high school transcript data (Adelman, 2006, p. 183).

APTOTREV – Total Advanced Placement tests/courses taken

Although the US Department of Education worked for nine months to clean the data in order to achieve an AP participation level on par with that reported by the College Board in 1992 (11%), this variable shows only 9% to 9.5% of cases having taken an AP course or test (Adelman, 2004, Curtin, Wu, Adelman, Daniel & Scott, 2004b, p.11). According to Adelman, the differential statistics were a result of not coding AP classes for Biology, English, Chemistry and Physics in 1992. These courses were instead noted as honors or advanced and included by the NCES as cases indicating AP participation. Cases qualified for this variable were selected through a cross reference of students who met these three tests: 1) claimed to have completed an AP course, 2) intended to take an AP test, and 3) reported at least one AP test between the years 1990 and 1992 (Curtin, Wu, Adelman, Daniel & Scott, 2004b, p. 13).

HSCURREV – High school academic intensity quintile

Consolidated academic curriculum index. (Adelman, 2006, p. 35)

Includes: HIGHMATH – Highest level of mathematics in high school

SCIMOM – High school momentum in science and mathematics

FLAN – Number of units of foreign language in high school

ADVANCE – Number of Advanced Placement courses

In the PETS supplementary file, this variable had been modified from the original ACCURHSQ into quintiles in order to smooth out distribution of cases.

College Control Variables

TCREDE – Number of credits by examination

"Includes Advanced Placement, College-Level Examination Program (CLEP), and institutional examinations (only when credit toward a degree is awarded)" (Adelman, 2004, p. 139).

TCREDG – Credit momentum in the first post-secondary year

Students who earned 20 credits or more create momentum to re-enroll and persist into the second year of college (Adelman, 2006, p. 46, Adelman, 2004, p. 137).

DELAY – No delay in post-secondary entry

Students enter post-secondary education within a prescribed time period after high school graduation. Dummy variable created to meet the following descriptors: 1= seven months or less; 0 = more than seven months. Students' post-secondary transcripts indicating seven months or less time between HS graduation and PSE entry are considered "direct entry". Dual enrollment course participation does not affect this variable (Adelman, 2006, p. 186).

GPA1 – Grade point average in first calendar year of attendance

Variable was originally created in quintiles. For this research, the variable separates highest from lowest GPA's at a level of 2.99 and above, following the example from Adelman (2006, p. 187). Most important is the idea of first calendar year of attendance.

F4ATT4YR – Four-year institutional attendance

Information collected during the 3rd and 4th follow up surveys. Institutional characteristics of four-year colleges, as compared to survey responses, were used to determine attendance patterns (Curtin, Ingels, Wu, & Heuer, 2002).

REFINST – Type of first true post-secondary institution of attendance

Variable identifies types of schools from doctoral and research institutions to job corps and occupational centers.

REFSELCT – Selectivity of first institution of attendance

Five Values: Highly selective, selective, nonselective, open door, and not ratable Community Colleges and area vocational-technical institutes are open door schools (Adelman, 2004, p. 134, Adelman, 2006, p. 167, 186).

ATRANSFR – Transfers involving two and four -year colleges

This variable allows the creation of categories to indicate both traditional and reverse transfers. According to Adelman (2006), a transfer student is one who (a) started in a community college, (b) earned more than 10 credits from the community college before (c) enrolling in a four-year college and (d) earning more than 10 credits from the four-year college. (p. 18).

Dependent Variables

Post-Secondary Persistence Variables

PSC1992 – Post-secondary credits earned in 1992/93

PSC1993 – Post-secondary credits earned in 1993/94

These two variables were combined in order to create a new variable to describe cumulated credits at the end of the second year of post-secondary education

CONTIN – Continuous Enrollment in Post-Secondary Education

"non-continuous enrollment was defined as *more than* a one semester… stop-out period" (Adelman, 2006, p. 192).

Degree Attainment Variables

BACHTIM – Elapsed Time to Degree

Time from first entry to date student qualified for a bachelor's degree. "For the NELS: 88/2000, when there was a gap of more than 4 months between the last month of the term in which the student qualified for the degree and the date the degree was actually conferred, the qualifying month was used as the degree date" (Adelman, 2004, p. 135).

HDEG – Highest Degree Earned

Differentiation between students who received no degree, BA recipients, and students who earned an advanced degree (Adelman, 2004, p. 134).

Filter

F4UNID2 – Second Follow up Status

Member of the 1992 second follow up group; in 12th grade.

Weight

F4F2P2WT – All known post-secondary participants, member of F2, F3 and F4 follow ups, and who were 12th graders in 1992.

Rationale for Selection of Variables

Adelman's 1999, 2004, and 2006 studies emphasized the importance of an academically rigorous preparation in high school before entering into college. Dual enrollment courses produce transcripts detailing post-secondary credits for high school students prior to graduation. The variable, TCREDD isolates, by way of transcript evaluation, those college credits earned by dual enrollment course participation. TCREDD, likewise, excludes credits earned by external examination programs such as CLEP (College Level Examination Program) and Advanced Placement national examinations. As the primary independent variable for the causal model for my research, the TCREDD variable was coded as a dummy variable, identifying students who participated in dual enrollment programs (against non-participants), regardless of the exact number of college credits actually earned. In each regression equation, TCREDD was entered as the first block of the analysis.

In his 2004 study of the NELS data, Adelman first isolated the TCREDD variable in an attempt to investigate the idea of acceleration upon degree attainment and time to degree. Results suggested that one-quarter of students earning a graduate level degree had acquired nine or more college credits, either by an examination program or by way of dual enrollment course participation. Furthermore, earning nine or more acceleration credits also decreased by four calendar months the time necessary to earn a first bachelors' degree (Adelman, 2004, p. 55). The primary task of the causal model was to explain the direct and total effects of dual enrollment participation upon persistence and degree attainment. Isolation of TCREDD from other forms of acceleration credits in this research will provide an in depth look at the outcomes of dual enrollment participation without regard to the numbers of college credits earned.

Demographic Control Variables

Demographic descriptors formed the second block of variables for analysis. Student background variables included gender and ethnicity demarcations. Females were chosen as the reference group because data from both the NELS: 88/2000 and Beginning

Post Secondary 95/96 surveys demonstrated that females participated in post-secondary education, attained second year college persistence, and acquired bachelor's degrees at higher percentage rates than males (Adelman, 2006; Horn & Kojaku 2001).

Precott, (WICHE, 2006), investigated Florida high school students and their participation in CBTP's. White, Asian, Hispanic and Black students who completed Advanced Placement, dual enrollment, or International Baccalaureate courses were all more likely to enter four-year institutions after high school than into community colleges. The Florida study listed participation in AP, DE and IB courses (as well as non-participation) by racial groups. The data showed that the largest percentage of student participants, for both AP and DE classes, were Asian students – 42.2% for AP classes and 20.7% for DE classes (WICHE, 2006, p. 41). White students posted the second highest percentages for participation in both types of accelerated courses.

Although Asians participated in numbers disproportionately higher than any other racial group in the Florida study, I utilized White students as the reference group in the logistic regression equation. Individual racial groups (Hispanic, Asian/Pacific Islander, Black, Native American, White) were dummy coded and regressed individually in each of the twenty-one models. In his most recent monograph, 'The Toolbox Revisited", Clifford Adelman produced data concerning participants in the NELS: 88/2000 cohorts. According to Adelman (2006), by the time the 1992 surveys were completed on the NELS participants (refreshed twice), White students made up 71.5% of the total cases. Latino students dropped to 10.4%, black students gained numbers to 12.7%, Asian students dropped to 3.7%, and American Indians rose in numbers to 1.7% of the total survey participants (p 12).

Family background variables, identified in Table 3.3 as “social and cultural capital”, included students whose first language is English (ENGFRST), location of the high school (URBANHS, RURALHS, SUBURBHS), students whose parents had never attended a post-secondary institution (NOCLOEX), and the variate SESQUINT, constructed to describe familial socioeconomic status (SES quintiles). According to Adelman (2004), English speakers in the NELS: 88/2000 entered four-year post-secondary institutions at a higher rate than students’ whose first language was not English (55.7% compared to 39.6%) (p. 10). However, among the 10% of the students who were non-native English speakers, attendance rates at four-year and two-year institutions failed to produce statistically significant results. For the purpose of this research, the variable F2S107 will indicate students’ whose first language is English.

Location of high school influences the number of CBTP options available to students. According to Waits, Setzer and Lewis (2005), more high schools located in small towns offered dual enrollment courses than in any other setting during the 2002-03 school year. Census data in their report show that 79% of all high schools located in small towns offered dual enrollment courses, as compared to 74% of suburban and 65% of urban high schools. The rate at so-called rural schools was 70% (Waits, Setzer & Lewis, 2005, p. 22). Data from the NELS: 88/2000 surveys, using the variable PHSUBURBAN and recoded for urban high schools (URBANHS), rural highs schools (RURALHS) and suburban high schools (SUBURBHS), will expose the effects of dual enrollment course taking based upon high school location for students graduating ten years before the Waits et al. study (see Table 3.1). Additionally, the NELS data may describe frequency counts differing significantly from those found in the Waits et al 2002-03 study.

Many prior research studies (Horn & Kojaku, 2001; Warburton, Bugarin & Nunez, 2001, London, H., 1992, Nunez & Carroll, 1998), have demonstrated that first generation college students experience low post-secondary participation, persistence and completion rates, as well as difficulties in college preparation. The BPS 95/96 data showed that only 8% of first-generation students participated in AP program classes, compared to 36% of students whose parents went to college (Warburton, Bugarin & Nunez, 2001, p. 2). Comparable statistics for dual enrollment students, by first generation status, had not been calculated utilizing any large secondary data source before this current dissertation. In this research, the PETS supplement variable FIRSTGEN (recoded as NOCOLEX) is used as a dummy variable to demarcate students whose parents had no post-secondary experience against those who had some experience or who attained a degree. Data were obtained through parent surveys and, compared to the student reported variables in the NELS, secured a reliable view of parent's highest levels of educational achievement.

Students whose parents lack any prior interaction with post-secondary education experience minimal intergenerational pressure to persist in college. Although attrition rates raise concerns during the first year of college for all students, first generation students depart from four-year institutions at twice the rate of students whose parents attended college (Hoffman, 2003, p. 1). Furthermore, prior research has indicated that low socioeconomic students were ten percent less likely to persist in college than middle-income students (Somers, Woodhouse & Cofer, 2000, p. 10). Interactions between first generation, low-income status, and high school preparation may create opportunities to break the cycle of low participation and low completion rates in post-secondary education. Implications from Tinto's theory of individual departure from institutions of higher education, especially in the area of preparation and forming goals and commitments to higher education, influenced the inclusion of both first generation and socioeconomic levels into this analysis. According to Somers, Woodhouse and Cofer (2000), first generation students with strong aspirations to attain a bachelor's degree were seventeen percent more likely to persist toward a degree than non-first generation students with similar aspirations (p. 10). Intention to persist may be more important to first generation students than to students with familial support and expectations for attendance and completion of post-secondary education. Participation in acceleration programs, such as dual enrollment, may form associations between preparation for college and persistence momentum.

Social class differences have played a part in determining the types of terminal degrees earned by college students. First generation students were most likely to aspire to a bachelor's degree, while students whose families had prior college experience were more likely to desire a post-graduate degree. These academic and educational goal differences further reflect the "lower levels of educational aspiration of first generation families and our society" as a whole (Somers, Woodhouse & Cofer, 2000, p. 11). In light of recent state level and federal financial efforts to bolster enrollments in transition programs, policy makers are likely to be interested in investigating the relationships between first generation/low SES students and dual enrollment participation/degree attainment. In this research, the variable SESQUINT was used. The fact that this variable was collapsed from centiles to quintiles allows the data interpretation to use the same metric for this variable and several of the high school variables.

High School Control Variables

Karp, Calcagno, Hughes, Jeong, and Thomas (2007) encouraged the use of controls for student demographic characteristics and the inclusion of variables describing educational motivation of students in order to decrease the effects of academic achievement on the outcomes of dual enrollment participation. Because their research did not control for motivations governing the student's decision to enroll in dual enrollment courses, the results are suspect. The authors reflected their concerns:

> if dual enrollment participants are fundamentally different from non-participants even after adjusting for observable covariates, then the estimated effect of the program may, in part, be attributable to preexisting differences (p. 20).

A research model identifying a variable that associates with the motivations and/or educational anticipations of dually enrolled students might prove insightful. Educational anticipations (EDUANNEW) a construct related to Tinto's model of student departure, was included in this study among the high school variables. Unless students see themselves as capable of both entering and completing a post-secondary experience, impetus to pursue further education after high school may, in fact, decline. Preparation for post-secondary education begins in the middle school and includes aggressive mentoring and counseling of students throughout their high school careers (Harvey, 2001a, 2001b; Lotkowski. Robbins & Noeth, 2004). As noted earlier, nearly 80% of the class of 2008 is expected to enter post-secondary education (Adleman, 1999a). Expecting to gain college entrance and expecting to finish a degree describe fundamentally different constructs (Venezia, Kirst, & Antonio, 2003). Therefore, a variable that addresses students' expectations of completing bachelor's degrees is important to consider.

The intensity of the high school curriculum and subsequent effects upon college persistence and degree attainment formed the focus of the "Toolbox" studies completed by Clifford Adelman in 1999 and 2006, and a similar secondary data study conducted by Horn, and Kojaku in 2001. For the purposes of this research, high school curriculum variables were selected for the third block in the regression equations to reflect differences in outcomes for students engaged in rigorous high school studies versus those whose preparation fell below the "rigor" threshold. The New Basics curriculum, identified as the minimum for graduation according to Horn and Kojaku (2001), serves as an indicator of academic rigor in this research. The US Department of Education has organized the New Basics curricula for high school students into four different levels of rigor. The "Core New Basics" curriculum includes four years of English, three years of mathematics, and three years of a combination of science and social studies. When considering students participating in the Beginning Post-Secondary (BPS) survey of 1995-96 who completed the Core New Basics curricula, 20.8% of the students were required to take remedial courses in college. However, if these students completed a rigorous curricula in high school (the Core New Basics plus advanced science including biology, chemistry, and/or physics, four years of math including algebra 1, geometry, algebra II and pre-calculus, three years of foreign language, and at least one honors or Advanced Placement course), the percentage of students required to enroll in remedial courses drastically dropped to 3.4% (Warburton, Bugarin & Nunez, 2001, p. 24). The academic rigor of curriculum completed by students in grades 11 and 12 has affected college degree completion rates. In the BPS survey, 95% of students who completed the "rigorous" curriculum remained enrolled or completed a college degree in the spring of 1998 compared to 78.6% of students who just completed the New Core Basics curricula (Warburton, Bugarin & Nunez, 2001, p.37). Specifically, students must have completed 4 years of English, 3 years of math, 3 years of science and 3 years of social science courses to achieve the New Core Basics threshold.

Horn and Kujaku (2001) and Adelman (2006) suggest that an even higher level of rigor in the high school curriculum could be achieved by adding three years of foreign language, one additional year of mathematics and at least one Advanced Placement course to a student's four-year course load. The NELS: 88/2000 HSCURREV variate was specifically constructed to emphasize the importance of foreign language, Advanced Placement, mathematics and science courses as indicators of academic intensity.

Adelman's ACRES variate was created in 1999 by combining HSCURRQ (high school curriculum), ADVANCE (AP class participation) CLSSRNKQ (Class Rank/GPA), and SRTSQUIN (Senior Test Score) variables. Prior research suggested that test results improved as the rigor of the completed high school curriculum increased. According to Adelman (2006), "Test scores are a natural consequence of the academic intensity of curriculum and quality of student effort reflected in grades" (p. 37). Due to the strength of the ACRES variate, the level of rigor evident in the high school curriculum emerged as the most important predictor of post-secondary degree attainment (Adelman, 1999 and 2006). Adelman's secondary data studies (conducted in 1999, 2004 and 2006) emphasized the importance of high levels of academic preparation in the high schools before entering into college, especially as they relate to persistence and degree attainment. Advanced placement course participation produced only moderate effects on degree attainment, and not by participation along, but by combining participation and other rigorous academic behaviors. Adelman (2006) noted that Advanced Placement course participation alone produced only moderate correlations with degree attainment, compared to the affect that other high school curriculum factors (such as science and math courses and test scores) had on degree attainment

Adelman's variable, ACRES, will not be utilized as a composite variable in this research. Instead, each of the contributing constructs, identified in this powerful composite will be regressed individually. The variable APTOTREV measured the effects of the combined strength of AP course participation and test completion. Four additional variables HSCURREV (high school curriculum intensity), CRANKREV (class rank and GPA), APTOTREV (AP class or AP test participation), and SRTSQUIN (high school test scores) were individually rather than collectively entered into the second regression model as high school control variables in order to specifically analyze their unique influence upon the high school achievement of students who participated in dual enrollment programs.

High school grade point average, as a separate variable, was not selected for analysis in this research project. Karp et al. (2007) believe that final high school grade point averages include grades earned through dual enrollment courses and through courses offered both before and after completion of DE courses. Thus, the possibility exists that the process of controlling for grades will "actually lower the estimate of the relationship between dual enrollment and subsequent educational outcomes" (Karp, Calcagno, Hughes, Jeong & Bailey, 2007, p. 22). In this study, high school GPA is combined with class rank to produce a new metric for the overall outcome performance of courses completed (CRANKREV).

College Control Variables

College variables included credits earned through CLEP or AP examinations (TCREDE) and credits earned in the first year of college through regular coursework (TCREDG), a measure of first year grade point average (GPA1), a measure of the time between high school graduation and first matriculation in college (DELAY), and an account of the types post-secondary institutions attended (F4ATT4YR – ever attended a four-year school, ATRANSFR – transfers between two and four year colleges, REFINST – type of first college of attendance, and REFSELCT – selectivity of first post-secondary institution). Prior research shows that each of these variables has some association with persistence and degree attainment of students in a post-secondary setting (Adelman 2004, Adelman 2006). In the logistic regression models, college variables were entered in the fourth block of the equation.

Adelman challenged researchers to modify their understanding of persistence. Instead of considering only enrollment in a subsequent term or school year, Adelman contends that a minimum number credits, earned in the first and second year of college, produce momentum toward degree attainment. In this research model, the variable TCREDE accounts for credits earned before college entrance but awarded on the transcript through examination. A second variable, TCREDG, tallied credits earned by the end of the first calendar year after matriculation. The first year credit momentum variable has proven to be instrumental in identifying students who persist to graduation (Adelman, 1999, 2004, 2006).

According to Bradburn, Berger, Li, Peter and Rooney (2003), 83% of college graduates included in the Baccalaureate and Beyond Longitudinal Survey (B&B: 2000/01) entered college less than one year after completing high school (p. 19). Only 7% of NELS: 88/2000 students who delayed entry to post-secondary education after high school graduation for more than seven months earned an associate in arts or bachelor's degree (Adelman, 2004, p. 39). Immediate entry into post-secondary education, namely within one year of high school graduation, positively affects students' time to degree, especially when compared to students who waited two years after high school to begin their college education (Bradburn, Berger, Li, Peter & Rooney, 2003). The strength of these indicators of persistence and degree attainment called for the inclusion of a specific variable, DELAY, to address this question of entry to college. Dual enrollment courses, as coded in the NELS data, did not affect the timeframe for determining first entry to college. Allowing as many as seven months to elapse after graduation enables students to enter college in the winter or spring terms without adverse affects upon graduation.

Another important variable dealt with in this study is related to post-secondary student grade point averages – GPA1. Grade point averages in the freshman year of college play a vital role in persistence to degree. Of those students in the BPS: 98/01 survey whose grade point average in the first semester of college was 2.25 or lower, close to half of the (42%) failed to persist to graduation (Swail, 2004, p. 5). However, first generation students who completed a rigorous curriculum in high school attained grade point averages in the freshman year similar to those of non-first generation students (Warburton, Bugarin & Nunez, 2001). In "The Toolbox Revisited" report, Adelman showed that high freshman year grades increased the probability of earning a bachelor's degree by 22 percentage points (2006, p. 48). Furthermore, when considering the final logistic analysis of variables employed in his study, Adelman found that first year college grades and continuous enrollment (no stop outs) ranked as the highest positive indicators for bachelor's degree attainment. The dichotomous variable created for Adelman's 2006 study used 2.88 as the grade point average cut off (p. 187). After college entry, dual enrollment students continued to perform at levels as high or higher than students who did not take college courses before college matriculation. The data suggest that dual enrollment students earned higher grade point averages and demonstrated higher persistence rates than students who did not participate in college courses before college matriculation (Hoffman, 2003, p. 3). Compared to traditional students who transfer from community colleges, the first semester college grades of dual enrollment students rated higher than students who did not take college classes in high school, and their grade point averages experienced smaller drops in subsequent semesters, even when controlling for prior academic achievement (including high school grade point average and SAT scores) (Bailey, Hughes & Karp, 2002; Bailey & Karp 2003). When students in dual enrollment programs enrolled in upper level college classes within the same discipline as the courses completed for college credit in high school, 60% of dual enrollment students earned grades of A's or B's compared to 52% of traditional students (Windham & Perkins, 2001, p. 5). These statistics remained true no matter if a student had matriculated to a community college or a university. Corroboration for these data comes from the State of Florida, which conducted a survey of nearly twelve thousand students who participated in dual enrollment programs. Only three percent of these students repeated courses due to low grades (below a C), however no controls for prior academic achievement were mentioned in the study's results (Windham & Perkins, 2001, p. 7).

Of all types of CBTP's, only dual enrollment programs afford students direct contact with a cooperating community college or a four-year institution. As stated previously, these post-secondary institutions are not considered the students' college of first attendance. Including variables to describe the types of post-secondary schools that the dual enrollment students chose to attend may lead to a greater understanding of the impact such courses might have upon degree attainment. Community college graduation rates routinely fall behind those of four-year institutions of all types, not only because many students attend these schools with no intent to gain an AA degree, but because these same students may be simply less prepared for college-level work.

Selectivity of institutions discriminates between four year and two year public and private post-secondary schools. Of NELS: 88/2000 students who completed an AA or a BA degree, only 24% had attended a two-year school, but 74% had attended some type of four-year college (Adelman, 2004, p. 39). If students who participated in DE classes enter community colleges after matriculation at rates higher than the general population or higher than students who participate in other types of CBTP's, then a case might be made that dual enrollment program participation leads to further social stratification through lower rates of graduation among participants. In order to analyze social implications of dual enrollment participation, I selected two variables to identify types of colleges attended and the degree of selectivity (REFSELCT and REFINST). Distinguishing between the types of outcomes experienced by dual enrollment participants, whether attaining a two-year degree or certificate, or attending four-year schools and completing a bachelor's degree, has the potential to explain outcomes for students with different post-secondary pathways. Although four-year school attendance has demonstrated positive correlations with degree attainment, this study investigated multiple pathways for students engaged in dual enrollment courses. A census of Florida's CBTP participants demonstrated a six fold greater likelihood of entering a state university or four year college after high school than non-participant students (WICHE, 2006, p. 39). Therefore, the variable, F4ATT4YR was employed to identify students who had attended a four-year institution at any time in their college careers. The variables REFSELCT and REFINST determined where students with dual enrollment credits entered post-secondary education, either at the two-year or four-year level, and the selectivity of the colleges attended. The purpose of identifying the location for dual enrollment students' college of choice is to investigate the tendencies these students might have to enroll in one particular type of post-secondary institution over another.

The analytical sample for this study included students who entered any type of post-secondary institution at any time in their careers. This panel weight, therefore, included students who attended a community college and subsequently transferred to a four-year school (ATRANSFR). Adelman (2004) found that students who transferred from a two-year to a four-year institution increased their probability of earning a BA degree by 21% ($p < .05$) (p. 67). The variable F4ATT4YR does not exclude students who entered a four-year college immediately after high school and then elected a reverse transfer to the community college. Therefore, I included the variable ATRNSNFR, which identified both reverse and traditional transfers between both two and four year schools. If students exercised a reverse transfer option and earned more than 10 credits in the two-year institution, the percentage of students completing degrees drops to 38.2% as compared to students who earned less than 10 credits in a community college after beginning their post-secondary career in a four-year college. The latter group posted a 73.6% graduation rates (Adelman, 2004, p. 48). The inclusion of credits earned through CBTP's and TCREDD, along with knowledge of students' post-secondary matriculation destination, may show how dual enrollment and/or other types of pre-college credit affects the students' credit acquisition levels of students at community colleges. Reverse transfers have both positive and negative effects upon persistence and degree attainment. For example, summer school enrollment in a community college may provide a convenient way to gain credits toward general education requirements and move the student forward toward degree completion. However, when students exercise this option due to probationary problems with grades or other infractions, earning credits outside of the four-year institution may prove detrimental to BA attainment. I planned to use the ATRANSFR variable in a traditional scenario of a student who begins post-secondary education at a two-year college and then transfers to a four-year school, taking into the consideration the number of post-secondary education credits earned at the community college.

Dependent Variables

Post-secondary Persistence Variables

Persistence through the end of the second year in college aptly describes one of the dependent variables in this study. For the NELS students, the particular second year of college attendance in question was 1994. In terms of persistence to degree, the second academic year allows students the opportunity to regain any momentum they may have lost due to low credit production in the first year (Adelman, 2006). Data generated by "The Toolbox Revisited" study revealed that students who were awarded bachelor's degrees also earned an average of 57.4 credits by the end of the second year, whereas students who earned an average 31.6 credits in the same amount of time were less likely to graduate (Adelman, 2006, p. 56). One question for this study is whether dual enrollment participation enhances credits earned through the end of the second post-secondary ear. Of all students in Adelman's 2006 study, the average number of credits earned by the end of the second year was 49.5 (p. 55). For purposes of this study, I used the rounded amount of 50 credits as a minimum number to represent second year momentum toward degree attainment. Variables PSC1992 and PSC1993 were combined into a new variable, CUMCRED, which identifies all undergraduate credits earned by the end of the second year, and specifically flags students with an accumulation of 50 or more credits.

Continual enrollment is defined as no more than one semester of time out of school. I included this dependent variable, found in the PETS data in the form of CONTIN, because in the final logistic model of the original "Toolbox" study of 1999 and "The Toolbox Revisited" report of 2006, a related variable, NOSTOP, was the strongest independent variable. In my research, CONTIN indicates the continuous enrollment of NELS participants to the second year of college past high school graduation (1994). I will recode it as a dichotomous variable, identified as NOSTOP. Continual enrollment, including enrollment in summer school, increased the likelihood of degree completion for the NELS sample by 43.4% ($p < .001$) (Adelman, 2006, pp. 74-75). The Baccalaureate & Beyond 2000/2001 survey showed that 52.6% of college graduates with less than six months absence from school completed their degrees within four years after their first enrollment (Bradburn, Berger, Li, Peter, & Rooney, 2003, p. 28). Although my research does not specifically consider credits earned in summer terms, these summer credits nevertheless accumulate and impact total credits earned. Previous research results seem to indicate that students who stop attending college for more than one semester at a time lose their momentum toward degree. Although there may be a myriad of reasons for stop outs or interruptions in college attendance, Tinto's model points to external commitments that pull students away from integration and goal commitment. As discussed in the literature review, the sociological conditions surrounding students' decisions to attend college include familial factors such as socioeconomics and first generation status.

Several research studies of dual enrollment programs have highlighted time to degree as a dependent variable (Menzel, 2006; WICHE, 2006; Delicath, 1999, Porter, 2003). In each of these studies, dual enrollment was identified as a factor enabling students to complete their bachelor's degrees in four years or less. Time to degree is a marketing concern for dual enrollment programs because parents and students see less time in college as decreasing overall costs of attaining a college degree. Including BACHTME as a dependent variable within the NELS provides a national view of the possible benefits to students who enroll in CBTP's. Menzel (2006) found that students weren't concerned about the benefits of early graduation as they began their college careers. However, the financial burdens placed upon families, with rising costs per credit hour, may increasingly influence decisions to enroll in acceleration programs. The popularity of the New Century Scholars program in Utah points to the logic of this reasoning. My research, however, does not intend to answer the question of motive, but rather to look for trends in the amount of time it takes dual enrollment participants to complete degrees. BACHTME was coded as a dichotomous variable with 4.56 years or less as the threshold marker for time to degree. Adelman found that the average for all students completing a bachelor's degree was 4.56 calendar years (2004, p. 18). Further research using the NELS data in 2006 yielded time to degree results for students who earned acceleration credits (AP, CLEP or DE). In this later research, it was discovered that students who had earned no acceleration credits graduated, on the average, in 4.67 years, while those earning between one and four acceleration credits graduated in 4.46 years (Adelman, 2006, p. 176).

Degree Attainment Variables

The final dependent variable in this study, HDEG, looks into the types of degrees earned by dual enrollment participants. According to US Census Bureau statistics collected in 2005, average earnings of adults eighteen years and older who held bachelor's degrees were 47% higher than adults with only a high school diploma. For adults with advanced degrees, the differential was even larger. Adults with high school diplomas earned only 37% of the income earned by people with master's degrees or higher (Bergman, 2007). Goal attainment of students may be linked to persistence in college, according to Tinto's model. Those who fail to complete a degree not only earn less, but also must readjust their long-term career goals to other options that may not require a degree. Income is not the only socioeconomic measure by which adults with bachelor's degrees benefit. Unemployment rates also fluctuate according to educational attainment levels. Although the national unemployment rate averaged 4.4% in 2005, adults who had earned bachelor's degrees enjoyed much lower joblessness rates (2.3%)

(College Board, 2006, p. 5). Adelman (2004) found that one quarter of students who graduated with advanced degrees had also earned nine or more credits through Advanced Placement, CLEP, or dual enrollment programs (p. 55). In this research, I utilized the HDEG variable to determine the relation between students in any type of CBTP and students specifically enrolled in dual credit programs in relation to achieving a bachelor's degree or higher. HDEG was modified into a variable with four ranked categories – certificate or AA degree, BA degree, BA plus additional graduate work, and advanced degree. I combined the final two categories (BA plus additional graduate work and advanced degree) into a new variable (GRAD).

Filters and Weights

In order to answer the research questions and create the appropriate analytical sample, two filters were utilized before any statistical methods were employed. The analytical sample for this study identified and isolated students who were members of the senior class of 1992 and who attended a post-secondary educational institution at any time before December 2000. The filter, F4UNI2D, identified members of the second follow up survey in 1992 who were seniors in high school at the time. The second filter, also functioning as a panel weight for the study, was F4F2P2WT. This variable identified all known post-secondary participants who were also 12^{th} grade students in 1992 and who were participants in each of the follow up surveys and transcript collections in 1992 (F2), 1994 (F3), and 2000 (F4).

Causal Model

For purposes of this study, I constructed a research model to describe the direct and total effects of the independent (dual enrollment course participation) and control variables upon the dependent variables (persistence, accumulation of credits, time to degree, and degree attainment) (see Figure 3.1). The model takes into consideration the following factors from Vincent Tinto's theory of individual departure from institutions of higher education: pre-entry attributes, goals/commitments, institutional experiences, integration and outcomes (see Figure 2.1). Due to the complex relationship of dual enrollment experiences to high school and college experiences, the model assumes that several factors of Tinto's model act in tandem. Dual enrollment, occurring during high school before college entry, interfaces with demographic variables existent during the high school experience. Likewise, dual enrollment courses generate college transcripts, which effect first year grade point averages and earning college credits before high school graduation.

Tinto's model emphasized integration and commitments into college as important factors in persistence. Experiences of students in dual enrollment courses provided students with their earliest college activities. When students successfully completed dual enrollment courses and gained credits, their experiences may be perceived as an indicator of future college activity. When students immediately entered college after high school graduation, their persistence rates increased (Adelman, 2006). This model proposes to test the theory that dual enrollment courses provided similar integration and commitment characteristics, as would college classes taken in the initial year of post-secondary education.

The causal model for this study also acknowledged the possible effects of anticipatory socialization in students' decisions to persist in college. As previously stated, dual enrollment courses provided an initial experience with college level courses,

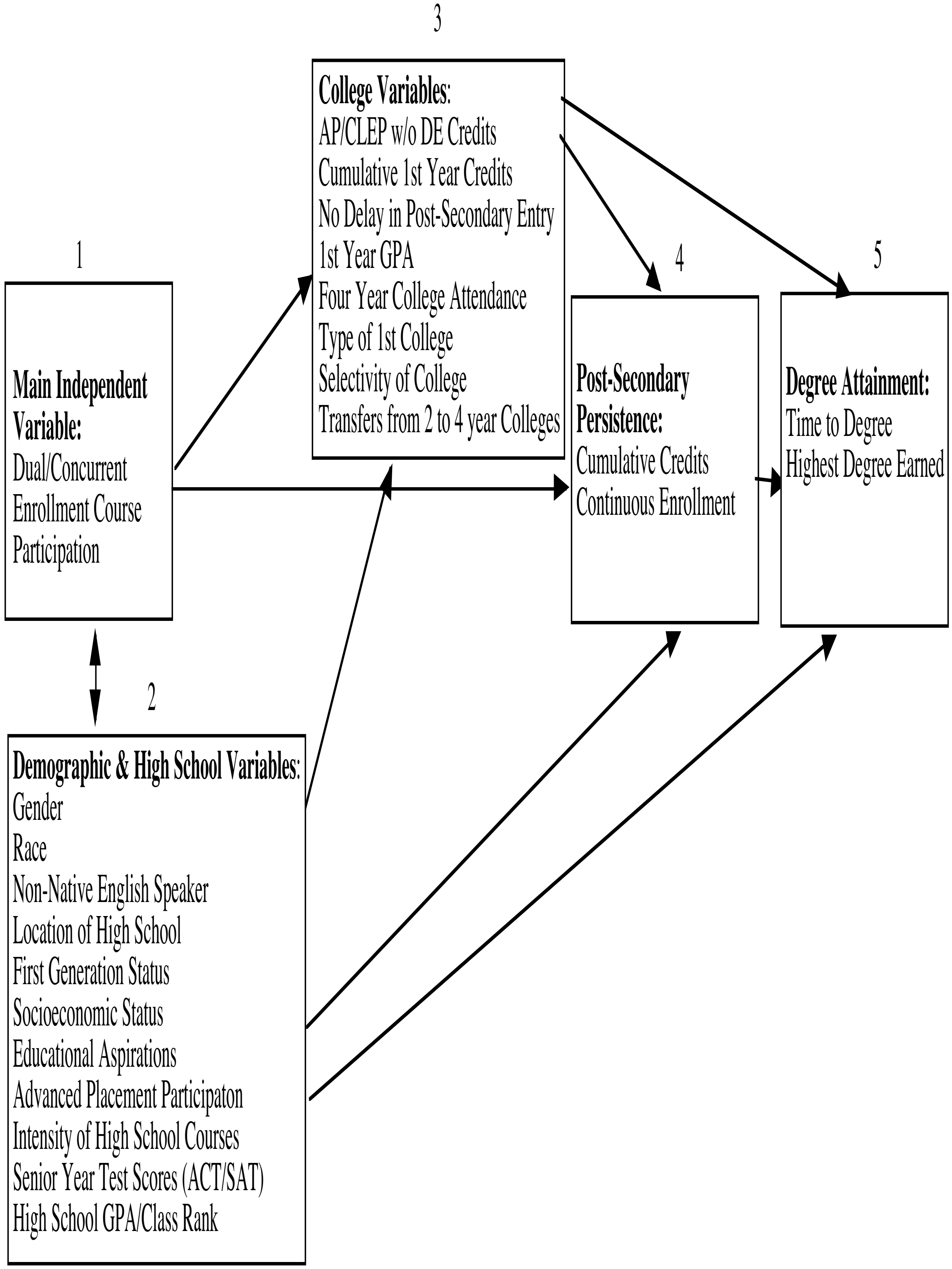

Figure 3.1. Causal Model – The Direct and Total Effects of Dual Enrollment Course Participation on College Persistence and Degree Attainment

prior to high school graduation and formal matriculation in higher education. Students in dual enrollment courses experienced the climate of a college course – purchasing textbooks, and receiving a college transcript at the end of each semester. More importantly, students began to acquire college credits, thereby enhancing their odds at persistence in college. Experiences in college courses, even in the high school setting along side their peers, may provide an opportunity to form group associations with other students aspiring to engage in accelerated schooling opportunities before high school graduation. Such peer associations, manifested through experiences with dual enrollment courses, may give students what Robert Merton (1957) characterized as anticipatory socializations. Pre-college socialization attributes include aspirations to belong to a social group, or to a particular social status. Activities facilitated by dual enrollment class participation may promote integration into a post-secondary academic setting.

Logistic Regression Models and Equations

Using a causal model to investigate effects of a wide range of control variables on dependent variables created twenty-one different combinations of direct and total effects. As shown in Figure 3.1, for each outcome variable a series of regressions were conducted following the pathways indicated in the causal model. In order to ascertain direct and total effects of dual enrollment participation, logistic regression equations were developed, and corresponding charts of resultant data created as a result of statistical calculations performed by SPSS and AM software.

The basic model for the statistical analysis is:

$y_i = b_0 + b_1 \, DE_i + b_2 \, D_i + b_3 \, H_i + b_4 \, C_i + \varepsilon_i$

where y_i is the dependent variable, DE represents whether the student participated in dual enrollment classes in high school; D, H_i and C_i are vectors that include demographic, high school and college variables respectively; ε_1 indicates random error; and b_0 , b_1 , b_2, b_3, and b_4 represent parameters to be estimated by the logistic regression analysis. In the final two analyses, HDEG and BACHTME served as the dependent variables. CUMCRED and NOSTOP, utilized as dependent variables for several of the logistic regression models, were entered in the final two logistic models as $b_5 P_i$, shown below as control variables of post-secondary persistence.

$y_i = b_0 + b_1 DE_i + b_2 D_i + b_3 H_i + b_4 C_i + b_5 P_i + \varepsilon_i$

The main interest of this study lies in b_1DE, the parameter linked to Dual Enrollment participation and its impact upon students' persistence and degree attainment.

Referring again to Figure 3.1, logistic regression analysis was used to evaluate the following effects of the primary independent variable – dual enrollment course participation (TCREDD):

the direct effects upon the college variables (3)

the total and direct effects upon the post-secondary persistence variables (4)

the total and direct effects upon the degree attainment variables (5)

The main independent variable (1) was regressed alone in the first statistical regression block against each dependent variable describing post-secondary and degree attainment in order to answer the initial three research questions. In each subsequent regression step, the main independent variable was regressed, in concert with all demographic and high school control variables (2), against the dependent variable for that particular equation. Fourth and fifth layer variable blocks included college variables (3) and post-secondary persistence variables (4), each of which functions as control variables. College and post-secondary variables performed as both control and dependent variables. Degree attainment variables (5) were used only as dependent variables. In total, twenty-one different models were utilized to ascertain the likelihood or probability that involvement in dual enrollment programs affects various student outcomes in post-secondary educational endeavors. The model data will be thoroughly analyzed in chapter 4 and interpreted in chapter 5.

The strength of utilizing a causal model for logistic regression analysis resides in the capacity of the instrument to analyze many different variables in varying combinations. The model itself was not designed to create the strongest combination of effects, but rather to test the strength of dual enrollment participation on a variety of outcome variables, while controlling for many different student attributes and circumstances. Therefore, the logistic models will not eliminate those variables failing to statistically contribute to the strength of the relationship, but will maintain all variables and watch their strength increase or decrease regardless of the statistical significance of their contribution to each model. Creating the strongest combination of variables for each dependent variable was not the intent of the research, but may well be cause for future investigations.

Statistical Methods

Logistic regression analysis forms the basis of the research method, due to the dichotomous nature of the dependent variables. Parameter estimates or unstandardized coefficients indicate positive or negative strength of each variable in the equation. ExpB coefficients (odds ratio) signaled effect sizes of each of the variables in the model. Delta-

p statistics, converted into percentages, determined the probability that participation in the category defined by either the independent or control variables impacts outcomes as defined by the dependent variable. Likelihood Ratio Test statistics indicated whether at least one of the independent variables contributed significantly to the overall model. A computed pseudo R^2 statistic suggested total variance explained by the final regression model, although in logistic regression pseudo R^2 commands less importance than the R^2 of linear regression. Ultimately, the statistical analysis sought to uncover the strength of dual enrollment course participation upon the criterion variables, as well as the relative strength of the various control variables.

The NELS: 88/2000 data were collected by the National Center for Educational Statistics via stratified cluster sampling methods. Therefore, relative weights were applied to the data analysis to offset biases in standard errors, which typically result from such complex sampling methods. Utilization of complex weights with the NELS data, as compared to other similarly constructed longitudinal data sets, grew out of necessity, due to the fact that the student cohorts were refreshed twice. The following lists the most frequently utilized weights from "The Toolbox Revisited" report: (Adelman, 2006, p. 135)

F4F2P2WT – For all known post-secondary participants who were 12th graders in 1992

F4F2HP3W – For all post-secondary participants with complete records who were 12th graders in 1992 and for whom high school transcripts are also part of the file

F4F2P3WT – For all post-secondary participants with complete records who were 12th grade students

My research used the weight F4F2P2WT, which identifies students who participated in post-secondary education and belonged to the cohort of students in the 12th grade in 1992. Using filters and weights linked to cases with complete records would have further decreased the numbers of cases available for statistical examination, thus reducing the power of the analysis.

Due to the very large number of students represented by the raw weighting scheme employed by the NELS data, relative weights were calculated in order to better reflect the authentic number of sampled students, holding representation of each individual to their respective demographic group constant. Relative weights were created for each model equation by dividing the raw weight F4F2P2WT by its mean. These relative weights, created for each combination of variables in each regression model, were used in the final step of the statistical analysis.

Although the bulk of the data analysis was conducted through the use of SPSS version 15.0, the final statistical analysis was performed with AM statistical software, in order to account for complex design effects and to more accurately determine standard errors and the statistical significance of the results. Curtin, Ingels, Wu, and Heuer (2002) calculated the mean design effect (DEFT) for all students in the NELS fourth follow-up in 2000 as 1.954 (p. 137). Design effects for the NELS allowed analysis of survey data obtained through non-simple random sampling measures. According to Adelman (2006), for any logistical models, "a DEFT based on the population with non-missing values on all variables in the model was calculated in order to adjust the standard errors produced by statistical packages" such as SPSS (p. 136). Following this line of logic, I utilized the AM software, developed by NCES, to calculate accurate parameter estimates and standard errors. The variables PSU (primary sampling unit - cluster or school in NELS), STRATA (type and regional location of the school), and RW (relative weights) were used to run the final logistic regression analysis in AM, in order to account for the fact that cluster sampling of students from the same school and region or type decrease the variance in the overall sample.

Cross tabulations of the population of students identified as dual enrollment participants in contrast with those who did not participate will be reported by percentage of the group meeting the attribute of each variable in the causal model. Chi-square statistics will report significant differences in the percentage of dual enrollment students versus non-participants. Significance of the Chi-square statistics was designated at the $p < .05$, $p < .01$ and $p < .001$ levels.

After completing the SPSS and AM computer analysis, odds ratios and Delta-*p* statistics were calculated utilizing parameter estimates and the means of the dependent variables. Statistical significance of the parameter estimates was noted at the $p < .05$, $p < .01$ and $p < .001$ levels. ExpB coefficients (odds ratio) indicated the effect sizes of each of the variables in the model and suggested an increase or decrease of the odds, for instance, of persisting in post-secondary studies or earning a some type of degree or certificate, when compared to students included in the reference group for each control variable. Odds ratios were created using the following mathematical formula (Myers, Gamst & Guarino. 2006, p.232)

$e = 2.718$

b = unstandardized regression coefficient

e^b = odds ratio

Odds ratios were calculated for those variables within each model that yielded statistically significant results. The ExpB coefficient for each independent dichotomous variable describes "the ratio of odds for the dummy variable group to the odds for the reference group" (Pampel, 2000, p. 23). For example, for first generation students (dummy variable group), the odds of achieving a bachelor's degree (dependent variable) are a certain percentage higher or lower than students whose parents attended college (the reference group). Transforming odds ratios into percentages, I used the equation as follows:

$(e^{b} - 1) \times 100$ = "the percentage change of the exponentiated logistic regression coefficient" (Pampel, 2000, p. 23).

Delta-*p* statistics, according to Cabrera (1994), function as the "most suitable method to estimate the overall change in the dependent variable" and the size of that change, if variables are created with similar metrics. (p. 245). Delta-*p* statistics were created "to compute changes in the probability resulting from a unit change in the dependent variable" using the following mathematical formula (Cabrera, 1994, p.246):

P_0= Sample mean of the dependent variable

b= Parameter estimate for each variable

$L_0 = ln\ [P_0 / 1 - P_0]$

$L_1 = L_0 + b$

Delta p = Exp L_1 / [1 + Exp L_1] - P_0

Delta-*p* statistics are interpreted in reference to the omitted category. In this case, the logistic models will predict if dual enrollment participation increases or decreases the probability of the construct (defined by the dependent variable) by a certain number of percentage points when compared to students who did not participate in dual enrollment courses. Statistically significant results within each model were bolded and marked with asterisks indicating significance at the $p < .05$*, $p < .01$** and $p < .001$*** levels.

Log likelihood statistics, obtained from the initial or constant model and each of the subsequent logistical regression models, provided data to analyze goodness of model fit or the Pseudo R^2 statistic. The formula utilized noted in Pampel (2000, p. 53) to determine Pseudo R^2 statistic in the analysis follows:

LL_0 = log likelihood statistic for the constant

LL_1 = log likelihood statistic for the first regression model

$(LL_0 - LL_1)/ LL_0$ = Pseudo R^2

In order to transform logit estimates from non-linear to linear relationships, probabilities for both full logistic regression models and IV/DV only were computed using the equation shown below from Pampel (2000, p. 17). Results of these equations describe the probability of the construct of the dependent variable, such as post-secondary persistence or degree attainment, occurring for dual enrollment participants.

$P_1 = 1/(1 + e^{-(b0 + b1X1)})$

b_0 = the parameter estimate of the constant (DV)

$b_1 X_1$= the parameter estimate of the primary independent variable (IV)

$L_1 = b_0 + b_1 X_1$

$P_1 = 1/(1 + e^{-(L1)})$

According to Pample (2000), statistics designated by the symbol P_1, describe probabilities of the dependent variable if the student is a dual enrollment participant. Values close to 1.0 indicate a stronger relationship between the variables and greater likelihood that dual enrollment participation is a factor in accomplishing the construct of the DV. Smaller probabilities, those whose numeric value lie closer to zero, decrease the likelihood.

In addition to these model probabilities, I computed the difference in the probability of dual enrollment participation and non-participation students meeting the standard of the dependent variables in this research. Using the mean of the dependent variable, I calculated the logit for the omitted group (non-participants), and both the logit and probability statistic for the dummy variable (DEPARTIC). Finally, the mean of the dependent variable was subtracted from the probability statistic for the dummy variable, leaving a difference in probabilities between the participant and non-participant. The probability statistic allows for controlling the influence of the blocks of variables as they enter the equation. These probabilities generated numeric values similar to and confirmed by the Delta-*p* statistics.

The probability differences were figured for each step 1 of the direct and total logistic models for CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year), NOSTOP (continuous enrollment with no more than one semester break), BATIME (elapsed time to bachelor's degree is 4.56 years or less), CERTAA (earned certificate or associate in arts degree), BADEG (earned bachelor's degree), and GRAD (earned graduated credits or advanced degree). Additionally, I computed differences in probabilities for step 3 (controlling for high school variables) and step 4 (controlling for college variables) for all dependent variables. These statistics may suggest the role of the control variables in enhancing or decreasing the probabilities of dual enrollment verses non-participants in meeting the construct of the dependent variables. Because the research was looking for any influence dual enrollment participation may have upon college entrance (per Tinto's model) analysis of these two steps in the logistic models was critical. Calculations necessary for determining the differences in probabilities of dual enrollment participants and non-participants in the logistic regression models were obtained from Pampel (2000, p. 27-28) and are as follows:

$L_0 = ln\ (P_0\ /\ (1 - P_0))$

$L_d = L_0 + b_d$

$P_d = 1\ /\ 1 + e^{-(Ld)}$

$P_d - P_0$ = Difference in Probabilities of the Independent Variable in relationship to the Dependent Variable.

Limitations of the Data and Coding

Missing Data

The original NELS Restricted data sample included a total of 19,893 students. After application of the filters, the total students available for this analysis were 4,514. Such a large reduction in the sample size was due to the fact that it was necessary to obtain transcript information from students. Time to degree and highest degree attainment variables included high numbers of missing cases, further adding to the decrease in the data set. Also, the original NELSR and PETS dual enrollment participation variable (TCREDD) included only 860 valid cases when dichotomously coded for participation (see Table 3.4). That number was further reduced to 425 once the filters were applied. However, the valid percent of the total possible participants for both the original and filtered samples were comparable: 9.7% of participants in the

Table 3.4. Frequencies of Independent Variable for DEPARTIC, Dual Enrollment Participation

Frequencies of Dual Enrollment Participants Before Filters Applied to Data

DEPARTIC

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NON-PARTICIPANT IN DUAL ENROLLMENT	8027	40.4	90.3	90.3
	DUAL ENROLLMENT PARTICIPANT	860	4.3	9.7	100.0
	Total	8887	44.7	100.0	
Missing	System	11006	55.3		
Total		19893	100.0		

Frequencies of Dual Enrollment Participants after Filters F4UNI2D and F4F2P2WT (Panel Weight - for all known post-secondary participants who were 12th graders in 1992)

DEPARTIC

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NON-PARTICIPANT IN DUAL ENROLLMENT	4089	90.6	90.6	90.6
	DUAL ENROLLMENT PARTICIPANT	425	9.4	9.4	100.0
	Total	4514	100.0	100.0	

original 19,893 case sample and 9.4% of the 4514 case sample. These statistics resulted from the fact that 55.3% of the original cases were missing (see Table 3.5). Compared to the national census of 2002-03, conducted by Kleiner and Lewis (2005), which yielded a 5% dual enrollment participation rate of high school students, the NELS: 88/2000 data may have actually over sampled students involved in these programs.

Cohen, West, Aiken and Cohen (2003), suggest that if the number of missing cases on any particular variable amounts to less than 3% with a total sample size of over

Table 3.5. Variables with Missing Data of Over 3% of Total Valid Cases

Independent/Control Variables	**Percent**
First Generation Student	
Missing	*8.9*
Educational Expectations	
Missing	*4.1*
Advanced Placement Participation	
Missing	*11.8*
High School Academic Intensity Quintile	
Missing	*12.8*
Senior Test Quintile	
Missing	*12.5*
Class Rank/GPA Quintiles	
Missing	*15.9*
Earned 20 or more credits by the end of first post-secondary year	
Missing	*8.5*
First year grade point average of 2.88 and above	
Missing	*10.8*
Ever attended a four year college	
Missing	*15.1*
Transfers between two and four-year colleges*	
Missing	*68.5*
Dependent Variables	**Percent**
Cumulative credits of 50 or more by the end of the second post-secondary year	
Missing	*19.6*
Elapsed Time to bachelor's degree	
Missing	*54.2*
Highest Degree Earned	
Missing	*41.6*

*Eliminated from final regression analysis

200, excluding missing cases will not adversely affect the integrity of the statistical results (p. 36). List-wise deletion, applied through logistic regression, therefore, may not impact the statistical results of variables with less than 3% missing cases. For the present study, the sample size after filters applied of 4514 is well above the 200 case threshold. Descriptive statistics for the final predictor variables produced missing data in the range of 4.1% to 20 % (see Table 3.5). Transfer variables were removed from the analysis due to the very large number of missing cases (68.5%). Missing data percentages of well above 15% for the dependent variables CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year), BATIME (elapsed time to bachelor's degree is 4.56 years or less), and HDEG (highest degree earned) create concerns for reducing the number of valid cases and the power of the regression equations. Standard errors for each variable will be noted in parentheses beneath the parameter estimates on the regression tables found in the Appendix. Increased standard errors result from decreasing the cases through list wise deletion and increasing numbers of variables within the models. The impact of missing cases and resultant sample size of predictor and outcome variables, as related to the primary independent variable, will be addressed in chapters 4 and 5.

Relative weights, computed in the final logistic regression analysis, and the DEFT readjustments included in the AM software program, are designed to mediate any negative effects of missing data and the complex sampling methods employed in obtaining the original NELS participants.

Limiting the study to the parameters outlined in the analytical sample through the two filters, and including only cases with missing data on the variables used in each of the twenty-one different regression analyses, resulted in a decrease in the number of valid cases to a range of 4490 (for CONTIN as a dependent variable) to 2037 (for BATIME as a dependent variable) before logistic regression. At the low end, these statistics represent a maximum decrease of 45% in the total cases from the original 4514, and consequently a reduction of the overall power of the analysis and the results.

Coding of Variables

The HDEG variable, from which the variables CERTAA (earned a certificate or training certificate), BADEG (earned a bachelor's degree) and GRAD (earned graduate credits or an advanced degree) were developed, was coded for statistical analysis by the NCES researchers in a way that identified the highest degree earned by each NELS: 88/2000 student respondent, as noted in final transcript data collected in the year 2000. Therefore for this study, student cases earning more than one college degree were included in the dependent variable that represented the students' highest levels of educational accomplishment. The effect is that students who earned an advanced degree or graduate hours were not included in the dependent variable for BADEG (earned a bachelor's degree), as this was not their highest credential. The decision to include students in only one criterion for highest degree was to investigate the impact of dual enrollment participation on degree attainment, and specifically for students whose terminal degree was of a certain level of accomplishment. Although researchers cannot know the reasons for students' decisions to terminate further educational endeavors, it is possible that eliminating cases from the regression equations based on this narrow view of bachelor's degree attainment may have limited the power of the dependent variable, BADEG.

Validity of Results

Time-Limits Validity

The NELS: 88/2000 data predispose themselves to at least three types of validity threats. Time-limits validity poses a threat to generalizability of results when current circumstances present a clearly different picture from the earlier time when the data were collected. In this case, the NELS base year data are now nearly 20 years old. Over that time, the demographic makeup of 8th grade students in the United States has changed by racial and socioeconomic subgroups. The population of the country has shifted geographically from the Northeast/Midwest to the South/Southwestern sectors of the United States. Longitudinal data from the NELS: 72 and HS&B surveys from the 1970's and 1980's have been used to show rates of college persistence and degree attainment for Hispanic and Black students (Ruppert, S., Harris, Z., Hauptman, A., Nettles, M., Perna, L., Millett, C., et al., 1998). However, the data may not be relevant to make assumptions about students in the 2000's. Extending this analogy to the NELS: 88/2000 data, the experiences of 1992 seniors in high school when compared to students graduating in the spring of 2008 are arguably different in many respects, especially in terms of the increased availability of and participation in accelerated course options. Hispanic student populations have grown considerably in the past sixteen years, which may also diminish the generalizability of these results.

Error Bias

The NELS: 88/2000 data have been subject to two freshenings, in order to maintain status as a nationally representative sample of 10th and 12th grade students. The statistical manipulation on the original 8th grade sampling decreased the number of cases included in the NELS data from 25,000 in 1988 to 17,000 in 1992. Although the statisticians' purpose in refreshening was to maintain the integrity of the initial NELS 8th grade sample, longitudinal studies like this one routinely experience problems with bias error. External validity by definition refers to the ability to generalize to a targeted population. Bias error results when subjects of a study who actually complete questionnaires or skill tests constitute a group of individuals what is different from the target population in significant ways. This naturally poses problems for generalizability.

Population Validity

The racial composition of the NELS: 88/2000 data was intentionally misaligned with the population 8th grade students across the nation. Asian and Hispanic students were intentionally over-sampled at the schools participating in the stratified cluster-sampling scheme, in order to account for an anticipated under-sampling of these two racial groups. According to Adelman (2006), by the time the 1992 surveys were completed, White students made up 71.5% of the total cases, Latino students dropped to 10.4%, African-American students gained numbers to 12.7%, Asian students dropped to 3.7%, and American Indians rose in numbers to 1.7% of the total survey participants (p. 12). Valid frequencies of the sample for this research, which filtered for 1992 participation, revealed slightly fewer White students (68.6%) and Black students (8.3%), but more Hispanic and Asian students – 13.4% and 9% respectively (see Table 3.6). Native American students in this analytic sample represented only .6% of the cases and were dropped from the analysis.

Adelman's research in 2006 did not indicate the number of missing cases represented within the analytic sample, or whether these descriptive statistics reflected

Table 3.6. Valid Sample Frequencies of Analyzed Variables

Variable	Valid Percent of Sample
Male	46.1
Female	53.9
Hispanic	13.4
Asian Pacific Islander	9.1
Black	8.3
White	68.6
Native American*	.6
English is First Language	88.3
Urban High School	33.4
Rural High School	24.9
Suburban High School	41.7
First Generation Student	27.8
Socioeconomic Quintile 1	12.8
Socioeconomic Quintile 2	16.1
Socioeconomic Quintile 3	19.4
Socioeconomic Quintile 4	22.4
Socioeconomic Quintile 5	29.3
Expectations to Earn a BA	52.0
Expectations Lowered from BA	30.4
Expectations Raised to BA	17.5
Advanced Placement Participant	11.3
High School Academic Rigor Quintile 1	14.9
High School Academic Rigor Quintile 2	21.3
High School Academic Rigor Quintile 3	19.3
High School Academic Rigor Quintile 4	20.7
High School Academic Rigor Quintile 5	23.8
Senior Test (SAT/ACT) Quintile 1	9.8
Senior Test (SAT/ACT) Quintile 2	13.9
Senior Test (SAT/ACT) Quintile 3	21.5
Senior Test (SAT/ACT) Quintile 4	24.8
Senior Test (SAT/ACT) Quintile 5	29.9
Class Rank/GPA Quintile 1	19.0
Class Rank/GPA Quintile 2	19.2
Class Rank/GPA Quintile 3	20.4
Class Rank/GPA Quintile 4	17.9
Class Rank/GPA Quintile 5	23.5
Credits earned by examination (AP/CLEP)	11.9
Earned 20 or more credits by end of the first post-secondary year	65.4
No delay entering post-secondary after high school	85.3
First year GPA of 2.88 or above	41.2

Table 3.6. Continued

Variable	Valid Percent of Sample
Ever attended a four-year college	71.6
College of first attendance was a four-year school	54.8
College of first attendance was a two-year school*	40.9
First college was selective	17.0
First college was non-selective	39.8
First college was an "open door" school	43.2
Transfer from four-year to two-year colleges*	54.2
Transfer from two-year to four-year colleges*	39.9
Mixed types of transfers*	6.0
Cumulative credits of 50 or more by end of second post-secondary year	54.8
Continuous enrollment with no more than one semester break	64.7
Elapsed time to bachelor's degree is 4.56 years or less	53.7
Earned certificate or AA degree	21.4
Earned BA degree	52.2
Earned BA degree and graduate credits*	16.0
Earned advanced degree*	10.4
Earned graduate credits or advanced degree	26.4

*Variable not used in final regression analysis

valid percentages. However, refreshed students were included in the secondary data set produced by the US Dept. of Education. Changes in representation of all ethnic groups, from the base year in 1988 to statistics collected in the 1992 survey, accentuated the need for this study to clearly account for the targeted population. Comparing statistical findings for participants in the base year of a longitudinal study may not mathematically transfer to findings generated from subsequent years.

CHAPTER IV
RESULTS

Description of the Study Sample

Utilizing NELS data, I isolated all students who were involved in the second follow up survey (12^{th} grade in 1992) and were known post-secondary participants. Although these two filters greatly diminished the number of participants in the study, isolating students who had transcript data to the point of degree completion was necessary in order to answer questions about degree attainment and time to degree. Even without filters, the actual number of student respondents who had participated in dual enrollment courses, according to transcript data, constituted 860 of a possible 8887 valid cases (see Table 3.4). While reducing the number of possible cases for analysis by nearly 50%, filters lowered the representative percent of the sample's dual enrollment population by only three-tenths of a percentage point. In Adelman's 2004 monograph, "Principal Indicators of Student Academic Histories in Post-secondary Education 1972-2000," he isolated student participants in dual enrollment programs for the first time using the NELS: 88/2000 data. Adelman suggested that a weighted 213,000 NELS: 88/2000 students participated in dual enrollment programming (2006, p. 99). After applying the filter F4UNID2 (second follow-up status; 12^{th} grade student in 1992) and the weight F4F2P2WT (known post-secondary education participant and member of the NELS: 88/2000 F2, F3, and F4 follow-ups; 12^{th} grade student in 1992) to the variables in the causal model, the analytical sample produced a statistic of 106,591 students participating in dual enrollment. This number represents a decrease in 50% from Adelman's estimate, an amount nearly identical to the 49% reduction in cases produced from the original data for this research. The total weighted cases in the analytic sample represented 1,090,176 students in grade 12 in 1992 who were also known post-secondary participants in the subsequent follow up surveys of 1994 and 2000.

Determinations of threshold levels for recoding the variables CREDMOM (earned 20 or more credits by the end of the first post-secondary year) NODELAY (no delay in entering post-secondary after high school), GPA1YR (first year GPA of 2.88 and above), CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year), NOSTOP (continuous enrollment with no more than one semester break) and BATIME (elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less) were garnered from results of past research on factors impacting post-secondary success and degree attainment (Adelman, 2004, 2006; Bradburn, Berger, Li, Peter & Rooney, 2003). Frequencies, after filters were applied, showed that the percentage of students in the sample who met the threshold for each of these variables rose above 50%, except in the case of GPA1YR (see Table 3.6). Especially noteworthy are the 85.3% of sampled cases meeting the standard for 7 months or less time between high school graduation and entrance to post-secondary education (NODELAY). The percentage of cases meeting the threshold may be attributed to the fact that one of the filters selected all known post-secondary participants in the sample. As noted in chapter 3, 83% of students sampled in the Baccalaureate and Beyond Longitudinal Survey (B&B: 2000/01) entered post-secondary education less than one year after high school graduation (Bradburn, Berger, Li, Peter & Rooney, 2003, p. 19). Therefore, this sample's incidence of direct entry to post-secondary education may not be exceptionally high, but at least suggests alignment with findings of previous research. The statistical significance of the differences between the B&B: 2000/01 results and this current NELS sample, regarding direct entry to college, will not be determined in this paper.

Details regarding representative percentages of dual enrollment versus non-dual enrollment students' for each of the variables used in this study are found in Table 4.1. These statistics were created via cross tabulation of the dual enrollment variable upon each of the control and dependent variables in the causal model. Pearson's Chi-square results indicated statistically significant relationships at $p < .01$, $p < .05$, or $p < .001$ levels for dual enrollment participating and non-participating students in the sample who met the categorical or numeric criteria of the following control variables: FEMALE, SES1 (socioeconomic status quintile 1), SES2 (socioeconomic status quintile 2), EDUBA (educational expectations are consistently to earn a BA), EDURBA (educational expectations are raised to a BA), SATACT 1 (senior test quintile 1), CREDMOM (earned 20 or more credits by the end of the first post-secondary year), GPA1YR (First year grade point average of 2.88 or above), FIRST2 (college of first attendance was a two-year school), NONSELCT (first college was non-selective), and NOSTOP (continuous enrollment with no more than one semester break) (see Table 4.1). Four of these variables were used as reference categories in the final logistic regression equations: FEMALE, EDUBA, FIRST2, and NONSELCT.

Data in Table 4.1 further created a profile of students who participated in dual enrollment classes within the analyzed sample. The demographic variables presented information regarding the racial and cultural background, as well as gender, of the dual enrollment students. The proportion of males to females participating in dual enrollment programming is starkly different. The percentage of non-participant males to females

Table 4.1. Cross Tabulations of Dual Enrollment Participants and Non -Dual Enrollment Participants for Variables in the Causal Model

Variables	Dual Enrollment	Non-Dual Enrollment
Total Original Cases	860	8887
	9.7%	90.3%
Total Analyzed Cases	425	4089
	9.4%	90.6%
Demographic Control Variables		
Male	40.2%	46.7%
Female	59.8%	53.3%
χ^2 (1, N=4514) = 6.400, p< .05		
Hispanic	13.2%	13.4%
Asian Pacific Islander	12.9%	8.7%
Black	7.1%	8.4%
White	66.1%	68.8%
American Indian*	0.6%	0.7%
English is first language	85.6%	88.6%
Urban High School	33.4%	33.4%
Rural High School	22.1%	25.2%
Suburban High School	44.5%	41.4%
First generation student	30.2%	27.6%
Socioeconomic Quintile 1	12.3%	12.9%
Socioeconomic Quintile 2	12.5%	16.5%
χ^2 (1, N=4479) = 4.453, p< .05		
Socioeconomic Quintile 3	19.6%	19.4%
Socioeconomic Quintile 4	20.3%	22.6%
Socioeconomic Quintile 5	35.2%	28.6%
χ^2 (1, N=4479) = 8.000, p< .01		
High School Control Variables		
Expectations are lowered from a BA	29.0%	30.6%
Expectations are raised to a BA	13.6%	17.9%
χ^2 (1, N=4329) = 4.589, p< .05		
Expectations are a BA	57.3%	51.5%
χ^2 (1, N=4329) = 4.956, p< .05		
Advanced Placement participant	12.7%	11.1%
High School Academic Rigor Quintile 1	14.5%	15.0%
High School Academic Rigor Quintile 2	19.5%	21.5%
High School Academic Rigor Quintile 3	16.2%	19.6%
High School Academic Rigor Quintile 4	22.5%	20.5%
High School Academic Rigor Quintile 5	27.4%	23.4%
Senior Test (SAT/ACT) Quintile 1	6.7%	10.2%
χ^2 (1, N=3952) = 4.437, p< .05		

Table 4.1. Continued

Variables	**Dual Enrollment**	**Non-Dual Enrollment**
Senior Test (SAT/ACT) Quintile 2	14.2%	13.9%
Senior Test (SAT/ACT) Quintile 3	21.2%	21.5%
Senior Test (SAT/ACT) Quintile 4	24.2%	24.9%
Senior Test (SAT/ACT) Quintile 5	33.7%	29.5%
Class Rank/GPA Quintile 1	17.4%	19.2%
Class Rank/GPA Quintile 2	17.4%	19.4%
Class Rank/GPA Quintile 3	20.6%	20.3%
Class Rank/GPA Quintile 4	17.7%	17.9%
Class Rank/GPA Quintile 5	26.9%	23.2%
College Control Variables		
Credits earned by examination (AP/CLEP)	13.9%	11.7%
Earned 20 or more credits by the end of the first post-secondary year	68.0%	65.1%
χ^2 (1, N=4429) = 29.984, p< .001		
No delay in entering post-secondary after high school	94.3%	84.3%
χ^2 (1, N=4429) = 29.984, p< .001		
First Year GPA of 2.88 or above	46.5%	40.6%
χ^2 (1, N=4025) = 5.063, p< .05		
Ever attended a four-year college	73.0%	71.5%
College of first attendance was a four-year school	50.1%	55.3%
College of first attendance was a two-year school*	46.0%	40.3%
χ^2 (1, N=4417) = 5.045, p< .05		
First college was selective	18.5%	12.2%
χ^2 (1, N=4414) = 6.883, p< .01		
First college was non-selective	30.9%	40.8%
χ^2 (1, N=4414) = 15.195, p< .001		
First college was an open door	47.5%	42.7%
Transfer from four-year to two-year college*	56.5%	53.8%
Transfer from two-year to four-year college*	38.2%	40.1%
Mixed types of transfers*	5.2%	6.1%
Post-secondary Persistence Variables		
Cumulative credits of 50 or more by end of the second post-secondary year	58.5%	54.4%
Continuous enrollment with no more than one semester break	69.9%	64.1%
χ^2 (1, N=4514) = 5.543, p< .05		

Table 4.1. Continued

Variables	Dual Enrollment	Non-Dual Enrollment
Degree Attainment Variables		
Elapsed time to bachelor's degree is 4.56 calendar years or less	53.0%	53.8%
Earned certificate or AA degree	22.3%	21.3%
Earned bachelor's degree	49.3%	52.5%
Earned bachelor's degree and graduate credits*	15.2%	16.1%
Earned advanced degree*	13.1%	10.1%
Earned graduate credits or advanced degree	28.4%	26.2%

* Variables not utilized in final analysis

varied by 7 percentage points, whereas the differences in participant gender groups was nearly 20 percentage points in favor of female participants. In this analytic sample, females outnumbered males in taking advantage of acquiring college credits before college matriculation. Chi-square statistics suggest a statistically significant difference in the rates of females participating in dual enrollment programs compared to males ($p < .05$). Asian Pacific Island students constituted 9.1% of the entire analytic sample. However, 12.9% of participants in dual enrollment classes belonged to this racial group. Hispanic students' enrollment in dual credit courses was the largest of all minority groups with 13.2% of participants. Black and White student participation in dual enrollment programs was slightly lower than the representative population. None of the individual racial groups participation in dual enrollment courses were statistically significant.

Cultural descriptors indicated higher percentages of dual enrollment students among those who did not speak English as a first language, attended suburban high schools, and the socio-economically affluent. Chi-square statistics indicated statistically significant differences in the rates of dual enrollment students' whose family socioeconomic status (SES) fell into the 2nd and 5th quintile range as compared to non-participants in those same SES quintiles. First generation students constituted one –third of all dual enrollment participants in the analytic sample. Compared to Warburton (2001) who found that first generation students represented 8% of students in Advanced Placement classes, the NELS sample included a considerably higher percentage of dual enrollment students representing this demographic.

Dual enrollment students displayed behaviors conducive to academic success. Proportionally 5.3% more students who engaged in dual enrollment courses expected to earn a bachelor's degree than students in the analytic sample –a statistic 5.8 percentage points higher than non-participants. Taking into consideration high school academics, a slightly higher percentage of dual credit students also enrolled in advanced placement courses compared to the entire sample and to non-participants. Dual enrollment students' academic profiles were represented more heavily in quintiles 4 and 5 of the academic rigor variable and quintile 5 of both the SAT/ACT and the class rank/GPA variables. These high school statistics point to a sample of students who were positively motivated by educational endeavors and who academically achieved at rates higher than non-participating students.

After high school, dual enrollment participants continued to distinguish themselves from non-participants and in relation to the analytic sample compared to non-participants. Larger percentages of dual enrollment students earned accelerated credits, either through CLEP or by way of AP examinations, and earned the threshold level of 20 college credits by the end of the first year. Dual enrollment participants entered college seven or less months after high school in very high percentages (93.4%). More dual enrollment students achieved a first year GPA of 2.88 or above than did non-participants or the sample population. Again, dual enrollment students in this analytic sample distinguished themselves as actively engaged in college academics in ways that created credit momentum and high levels of learning, as demonstrated by GPA.

The type of college a student enters after high school and attends for the majority of their college career impacts the probability of completing a post-secondary program. Attending a four-year college ultimately determines the attainment of a bachelor's degree. Dual enrollment students attended four-year colleges in larger percentages than non-participants, but were not represented as well when considering whether a four-year school was the first school of attendance. Cross tabs identified six percent more dual enrollment students than non-participants attending two-year schools as their first institution of higher education. Greater percentages of dual enrollment students attended selective colleges and open door school than did non- participants. Smaller percentages of dual enrollment students transferred from two-year to four-year colleges, while larger percentages of dual enrollment students executed reverse transfers (from four-year to two-year colleges). Although students who participated in dual enrollment programs in high school did not immediately enter four-year colleges in rates similar to non-participants, their college careers included an experience at a four-year school to a greater degree than non-participants. While four-year college attendance provided the opportunity to graduate with a bachelor's degree, completing any type of degree or certificate proved to be more preferable than attending a school and failing to complete a program.

Momentum toward a degree can be measured by acquired credits and by the length of time necessary to complete a program. The slower the progress, the more likely the student might abandon a program. According to statistics generated from this analytic sample, greater percentages of dual enrollment participants met the 50 or more credit threshold for the end of the second post-secondary year and were continually enrolled in college with no more than one semester of non-attendance than were students who did not participate. Slightly fewer dual enrollment students met the average time to achieve a bachelor's degree than did non-participants. Admission to colleges, earned credits, and on-going enrollment are attributes that may assist students' progress toward a credential. However, the focus of the causal model for this research lies in achieving the goal of graduation from college. More dual enrollment students earned certificates or associate in arts degree and fewer earned bachelor's degrees in relation to non-participants and the total population. However, a greater percentage of dual enrollment participants earned advanced degrees or graduate credits and advanced degrees than did students who did not participate in dual enrollment programs. Whether these data transfer to statistical significance will be the focus of a later analysis.

Missing Cases

Several key variables in the causal model contained significant numbers of missing cases. Because listwise deletion automatically eliminates missing cases from the analyzed cases, the power of the regression equation is decreased, as evidenced by the increasing size of standard errors. As was stated in chapter 3, typically missing data in the range of 3-10% pose few problems in data sets with thousands of analyzed cases. But, there are no exact rules for how many cases must be valid in order for an effective statistical analysis to take place. Vogt (2007) suggests two different formulas as guides for multiple regression analysis – sample size should be at least "50 cases plus eight times the number of variables" in the equation or minimum sample size should be "104 plus 1 for each additional variable" in the equation (p. 176). In either case, larger numbers of cases increase the likelihood that results will have reliable or improved statistical power and reduced error. Logistic regression requires even larger samples. Pedhazur suggested a minimum of 30 times the number of variables in the equation (Myers, Gamst and Guarino, 2006, p. 222). Regarding my particular analytic sample, the smallest number of cases in any of the twenty-one logistic regression models was 2067 for the dependent variable, BATIME (elapsed time to bachelor's degree). With the largest number of variables (38) included in the model for direct effects of dual enrollment upon the variable BATIME, a total of 1,140 cases were required under the third rule listed above. Therefore, the equation with the least number of cases satisfied the rule of thumb for proportion of cases to variables. Before each regression, only cases with 60% or higher valid responses on each variable in the equation were selected for evaluation. Even with these safeguards, evaluation of missing cases and concerns for potentially high standard errors for individual variables within the regression models will be addressed at this point.

As noted in Table 3.5, several variables utilized in the causal model exceeded the levels of missing data that can be ignored in the statistical analysis. Each variable exceeding the 3% level was recoded to identify missing and non-missing cases. Cross tabulations were performed with each of the identified variables and DEPARTIC (dual enrollment participation), COMPSEX (male/female) and RACE4 (racial identification).

Table 4.2. Statistically Significant Missing Data in Original Variables

Variable - DEPARTIC	**Dual Enrollment Missing**	**Non-Dual Enrollment Missing**
SRTSQUIN	15.5%	12.1%
χ^2 (1, *N* =4,514) = 4.091, $p <.05$		
TCREDG	5.2%	8.6%
χ^2 (1, *N* =4,514) = 5.827, $p <.05$		
*ATRANSFR	55.1%	69.9%
χ^2 (1, *N* =4,514) = 39.560, $p <.001$		
BACHTME	48.9%	54.8%
χ^2 (1, *N* =4,514) = 5.245, $p <.05$		
HDEG	33.6%	42.4%
χ^2 (1, *N* =4,514) = 12.106, $p <.001$		

Variable - RACE4	**API**	**Hispanic**	**Black**	**White**
SRTSQUIN	11.4%	15.4%	16.3%	11.5%
χ^2 (5, *N* =4,514) = 19.722, $p <.001$				
TCREDG	8.0%	12.9%	14.7%	6.4%
χ^2 (5, *N*=4,514) = 68.411, $p <.001$				
GPA1	10.5%	15.4%	16.3%	8.8%
χ^2 (5, *N* =4,514) = 52.721, $p <.001$				
*ATRANSFR	59.6%	67.4%	72.2%	69.0%
χ^2 (5, *N* =4,514) = 25.660, $p <.001$				
PSC1992-93/PSC1993-94		5.9%	4.4%	
χ^2 (1, *N* =4,514) = 5.690, $p <.05$				
BACHTME	41.4%	74.2%	66.7%	50.3%
χ^2 (5, *N* =4,514) = 173.199, $p <.001$				
HDEG	31.6%	59.4%	53.6%	37.8%
χ^2 (5, *N* =4,514) = 138.721, $p <.001$				

Table 4.2. Continued

Variable - COMPSEX	**Male**	**Female**
HDEG	44.8%	38.9%
χ^2 (1, N =4,514) = 16.241, p <.001		

*Variable not used in final regression analysis

For a listing of variables yielding statistically significant relationships with either dual enrollment participation or with gender or racial categories (see Table 4.2). While acknowledging that the dependent variables in this research contain high numbers of missing values, one must also take into consideration the historical context of the numbers of students pursuing and acquiring post-secondary credentials. In 2004, Adelman completed a comparison of three large secondary data sets - NELS 1972, HS&B/SO: 80/92, and NELS: 88/2000. Cross tabulations of these data showing the levels and rates of achievement in terms of degree attainment are found in Table 4.3. For listings of valid frequencies of students in this current analytic sample earning various types of post-secondary credentials see Table 3.6. Percentages of students earning post-secondary degrees or certificates, produced through cross tabulations on each variable created from HDEG (highest degree earned), total 100%. It is important to note, however, that 1877 of the possible 4514 cases (41.6%) were missing data on the HDEG variable and therefore either did not complete a post-secondary credential or students' transcripts did not indicate completion of a credential (see Table 3.5). Therefore, 58.4% of the total cases in the current analytic sample completed some type of higher education program. Comparable missing data from Adelman's work was not published, however

Table 4.3. Highest degree attained by 12th graders in the high school classes of 1972, 1982 and 1992 who earned more than 10 post-secondary credits

	Certificate or AA	Bachelor's Degree	Advanced Degree and/or Graduate Hours
Class of 1972	14.6%	35.5%	12.3%
Class of 1982	18.9%	31.9%	13.4%
Class of 1992	15.5%	33.6%	15.1%

Source: Adelman, C. (2004). *Principal Indicators of Student Academic Histories in Post-secondary Education 1972-2000*. Washington, D.C.: U.S. Department of Education, Office of Vocational and Adult Education. p. 20.

his outputs show that 64.2% of 12th grade students in the NELS: 88/2000 sample who earned at least 10 post-secondary credits had completed some type of credential (2004, p. 20).

The variable, HDEG (highest degree earned), produced statistically significant relations between missing cases and dual enrollment participation, race, and gender. Chi-square results suggest a statistically significant difference in the percent of the sample registering missing HDEG values, with non-participants showing significantly higher rates of missing cases than dual enrollment participants. Male subjects in the NELS survey posted higher rates of missing data for highest degree attainment, significant at $p < .001$, when compared with missing female cases on the same HDEG variable.

The lone high school control variable with a statistically significant relationship of missing scores to the main independent variable DEPARTIC (dual enrollment participant) was SRTSQUIN (senior test SAT/ACT quintiles), at a relatively low Pearson's χ^2 of 4.091 and p value of .043. Missing data for the college variable

CREDMOM (earned 20 or more credits by the end of the first year in post-secondary) also suggested a statistically significant difference in the percentage of missing cases for dual enrollment participants against non-participants. As Tables 3.5 and 4.2 indicated, the college variable ATRANSFR (transfers between two and four-year colleges) was dropped from the analysis due to very high numbers of missing data. Utilizing this variable in the logistic model would have decreased the valid cases to a level that would have fallen below an acceptable amount.

SRTSQUIN (senior test SAT/ACT quintiles) also produced statistically significant relationships between missing test scores and belonging to specific racial groups. Black and Hispanic students were more likely to have missing senior test scores than any other group. Cross-tabs showed that missing first year credits (TCREDG) and missing first year GPA's (GPA1) were in greater numbers among Blacks and Hispanics than any other racial groups found in the composite RACE4 variable. In fact, for each of the variables whose missing data produced statistically significant Chi-square statistics in relationship to the RACE4 (racial identification) variable, Black and Hispanic students registered the highest percentage of missing data.

Data Analysis

Twenty-one stepwise logistic regression equations were developed and analyzed in order to fully explore the relationship of constructs found in the causal model. Model equations one through ten evaluated the relationship between dual enrollment participation and each of the college variables in the causal model. At this point, the ATRANSFR (transfers between two and four-year colleges) variable was removed from the equations due to high missing values. Model equations 10 through 14 evaluated the total and direct effects of dual enrollment on the two post-secondary persistence variables (CUMCRED – cumulative credits of 50 or more by the end of the second post-secondary year and NOSTOP – enrolled continuously with no more than one semester break to the end of the second year). Model equations 14 and 18 evaluated the total and direct effects of dual enrollment participation upon elapsed time to a bachelor's degree (BATIME). Model equations 15 through 17 and 19 through 20 evaluated the total and direct effects of dual enrollment upon degree attainment (CERTAA – earned a certificate or AA degree, BADEG – earned a bachelor's degree, and GRAD – earned graduate credits or advanced degree). Statistical significance of the unstandardized regression coefficients (*b*) was indicated at the $p < .05$, $p < .01$ and $p < .001$ levels. The results of these stepwise logistic models will be discussed as they relate to the dependent variables of each model. Means and standard deviations for each variable used in the regression models are found in Table 4.4.

ExpB (log odds) values will be interpreted within the context of each model. Bolded values, computed from unstandardized logistic regression coefficients (estimates), are statistically significant at $p < .05$, $p < .01$ and $p < .001$ levels. An interpretation of an ExpB value compares the primary independent variable to the reference group, and is an indicator of the odds of experiencing an event represented by the dependent variables of the stepwise logistic regression models.

Further data transformation were accomplished using two different formulas for calculating the probabilities of the construct of the dependent variable in each logistic regression equation. The strength of the model probability statistic was evaluated as variables were added in each step of the equation. Additionally, the probability of

Table 4.4. Initial Variable Means and Standard Deviations

Variables	Mean	Standard Deviation
Dual Enrollment Participant	.0942	.29207
Male	.4606	.49850
Female	.5394	.49850
Asian Pacific Islander	.0911	.28774
Hispanic	.1338	.34051
Black	.0831	.27605
White	.6856	.46434
English is Student's First Language	.8829	.32157
Urban High School	.3339	.47167
Rural High School	.2494	.43271
Suburban High School	.4167	.49306
First Generation Student	.2783	.44823
Socioeconomic Quintile 1	.1282	.33430
Socioeconomic Quintile 2	.1612	.36775
Socioeconomic Quintile 3	.1940	.39549
Socioeconomic Quintile 4	.2239	.41692
Socioeconomic Quintile 5	.2927	.45505
Expectations are lowered from BA	.3045	.46023
Expectations are raised to BA	.1751	.38009
Expectations to earn a BA	.5204	.49964
Advanced Placement Class/Test Participant	.1127	.31630
High School Academic Rigor Quintile 1	.1495	.35661
High School Academic Rigor Quintile 2	.2131	.40953
High School Academic Rigor Quintile 3	.1931	.39475
High School Academic Rigor Quintile 4	.2067	.40502
High School Academic Rigor Quintile 5	.2376	.42570
Senior Test (SAT/ACT) Quintile 1	.0984	.29793
Senior Test (SAT/ACT) Quintile 2	.1392	.34617
Senior Test (SAT/ACT) Quintile 3	.2151	.41093
Senior Test (SAT/ACT) Quintile 4	.2482	.43204
Senior Test (SAT/ACT) Quintile 5	.2991	.45792
Class Rank/GPA Quintile 1	.1901	.39243
Class Rank/GPA Quintile 2	.1922	.39409
Class Rank/GPA Quintile 3	.2035	.40267
Class Rank/GPA Quintile 4	.1790	.38344
Class Rank/GPA Quintile 5	.2351	.42413
Credits earned by examination (AP/CLEP)	.1194	.32430
Earned 20 or more credits by the end of the first post-secondary year	.6537	.47586

Table 4.4. Continued

Variables	**Mean**	**Standard Deviation**
No delay entering post-secondary after high school	.8528	.35436
First year grade point average of 2.88 and above	.4119	.49224
Ever attended a four-year college	.7163	.45083
College of first attendance was a four-year	.5493	.49771
First college was selective	.1699	.37560
First college was non-selective	.3983	.48960
First college was an open door school	.4318	.49538
Cumulative credits of 50 or more by the end of the second post-secondary year	.5482	.49774
Continuous enrollment with no more than one semester break	.6469	.47799
Elapsed time to bachelor's degree is less than 4.56 years	.5375	.49871
Received certificate or associate in arts degree	.2139	.41012
Received bachelor's degree	.5218	.49962
Received graduate credits or advanced degree	.2643	.44105

Valid N =4514

attaining persistence to the second year or a credential of any type was calculated in relation to dual enrollment status.

Dual Enrollment and the College Variables

In addition to considering the impact of dual enrollment participation as a predictor of college persistence or degree attainment, I investigated specific sociological and academic relationships between the college variables and DEPARTIC (dual enrollment participation) as depicted in the causal model (see Figure 3.1). The direct effects of dual enrollment program participation upon nine specific college variables allow the investigation of specific attributes that may form a bridge between high school experiences and post-secondary education. Each three-step logistic regression equation was built to explore the influence of dual enrollment participation, DEPARTIC, directly upon these college variables (step 1), then to introduce demographic descriptors (step 2), and high school variables (step 3) to conclude the equation. Following Tinto's model (see Figure 2.1), the college variables included attributes shown to affect college persistence in previous research (Adelman, 1999, 2004, 2006; Pascarella & Terenzini, 2005; Tinto, 1975, 1993; Venezia, Kirst & Antonio, 2003). The main focus of my research was to explore ways, if any, that participation in dual enrollment programs might influence student achievement on a path into post-secondary education. The unique quality of the dual enrollment experience often places the student in a limbo of sorts, between two worlds not necessarily joined by a smooth transition. Direct regression analysis may suggest whether dual enrollment provided an easier conveyance to success in post-secondary education, when considering the impact of specific college variables.

Tables 4.5 thru 4.13 display the logistic regression results on the direct effects of dual enrollment participation in relation to the college variables, now posing as dependent variables in each of nine equations. The variable DEPARTIC (dual enrollment participation), when regressed directly with each outcome variable in the college array (step 1), produced only two statistically significant parameter estimates. The first of these two significant estimates was found in the relations between NODELAY (no delay in entering post-secondary after high school) and DEPARTIC (see Table 4.7). The second statistically significant estimate in step 1 was generated in Model #8 (NONSELCT – first college was non-selective), which will be discussed in concert with other institutional selectivity variables (see Table 4.12). Not only was the estimate

Table 4.5. Model #1 - Direct Effects of Dual Enrollment Participation on APCLEP (Credits earned by examination)

	Step 1 Estimate	ExpB	Delta-*p*	Step 2 Estimate	ExpB	Delta-*p*	Step 3 Estimate	ExpB	Delta-*p*	Step 4 Estimate	ExpB	Delta-*p*	Step 5 Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Credits earned by examination	-2.266		-.083***	-2.557		-.086***	-3.906		-.091***						
(AP/CLEP)	(.091)			(.351)			(.593)								
Primary Independent Variable															
Dual Enrollment Participant	-.070		-.006	-.108		-.008	-.208		-.016						
	(.198)			(.211)			(.288)								
Demographics															
Male				-.346	.708	-0.026*	-.315		-.024						
				(.163)			(.195)								
Hispanic				-.439		-.031	-.112		-.009						
				(.203)			(.341)								
Asian Pacific Islander				.742	2.100	.085***	.712	2.038	.080**						
				(.203)			(.282)								
Black				-1.245	.288	-.065***	-.529		-.036						
				(.387)			(.432)								
English is First Language				-.273		-.021	.164		.015						
				(.263)			(.280)								
Urban High School				.325		.031	.492	1.636	.051*						
				(.200)			(.241)								
Rural High School				-.018		-.002	.121		.011						
				(.191)			(.223)								
First Generation Student				.082		.007	.036		.003						
				(.161)			(.196)								
Socioeconomic Quintile 1				-.775	.461	-.048**	-.019		-.002						
				(.301)			(.355)								
Socioeconomic Quintile 2				-.187		-.015	-.139		-.011						
				(.261)			(.333)								
Socioeconomic Quintile 4				.268		.253	-.101		-.008						
				(.234)			(.298)								
Socioeconomic Quintile 5				1.478	4.384	.218***	.858	2.358	.102***						
				(.204)			(.251)								
High School Variables															
Expectations are less than BA							.004		.0003						
							(.265)								
Expectations are raised to BA							-.268		-.020						
							(.255)								
AP Class/Test Participant							.227		.021						
							(.320)								
HS Rigor Quintile 1							.358		.035						
							(.321)								
HS Rigor Quintile 2							.117		.010						
							(.283)								
HS Rigor Quintile 4							.666	1.946	.034*						
							(.315)								

Table 4.5. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								.040		.003						
								(.344)								
Senior Test Quintile 1								-1.003		-.057						
								(.641)								
Senior Test Quintile 2								**-1.189**	**.305**	**-.063***						
								(.600)								
Senior Test Quintile 4								.490		.051						
								(.394)								
Senior Test Quintile 5								**2.148**	**8.568**	**.375*****						
								(.398)								
Class Rank/GPA Quintile 1								-.058		-.005						
								(.301)								
Class Rank/GPA Quintile 2								-.026		-.002						
								(.267)								
Class Rank/GPA Quintile 4								.168		.015						
								(.322)								
Class Rank/GPA Quintile 5								-.334		-.025						
								(.351)								
Model Statistics	**Step 0**															
Model N	4424	4424			3997			2938								
"-2 Log L"	1373.270	1373.190			1071.560			687.619								
R_L^2					0.219			0.499								
df		1			13			28								
Mean of DV	0.093															

***$p < .001$, **$p < .01$, *$p < .05$

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

Table 4.6. Model #2 - Direct Effects of Dual Enrollment Participation on CREDMOM (Earned 20 or more credits by the end of the first post-secondary year)

	Step 1 Estimate	ExpB	Delta-p	Step 2 Estimate	ExpB	Delta-p	Step 3 Estimate	ExpB	Delta-p	Step 4 Estimate	ExpB	Delta-p	Step 5 Estimate	ExpB	Delta-p
Constant - Dependent Variable															
Earned 20 or more credits by end of the first post-secondary year	.388		.089***	.282		.066	-.015		-.004						
	(.063)			(.247)			(.358)								
Primary Independent Variable															
Dual Enrollment Participant	.078		.019	.074		.018	.031		.007						
	(.223)			(.233)			(.260)								
Demographics															
Male				-.443	.642	-.110***	-.698	.498	-.173***						
				(.117)			(.134)								
Hispanic				-.475	.622	-.118**	-.288		-.071						
				(.186)			(.230)								
Asian Pacific Islander				-.060		-.015	-.073		-.018						
				(.227)			(.264)								
Black				-.363		-.090	.268		.062						
				(.203)			(.249)								
English is First Language				-.234		-.057	-.123		-.030						
				(.184)			(.207)								
Urban High School				.343	1.409	.079*	.347	1.415	.080*						
				(.163)			(.176)								
Rural High School				.433	1.542	.098**	.483	1.621	.109**						
				(.141)			(.160)								
First Generation Student				.199		.047	.262		.061						
				(.144)			(.164)								
Socioeconomic Quintile 1				-.577	.562	-.143**	-.341		-.040						
				(.200)			(.245)								
Socioeconomic Quintile 2				-.008		.002	-.175		-.043						
				(.176)			(.222)								
Socioeconomic Quintile 4				.360	1.433	.083*	.323		.075						
				(.171)			(.191)								
Socioeconomic Quintile 5				1.137	3.117	.225***	.739	2.094	.159***						
				(.182)			(.196)								
High School Variables															
Expectations are less than BA							.150		.036						
							(.206)								
Expectations are raised to BA							.136		.032						
							(.193)								
AP Class/Test Participant							-.034		-.008						
							(.234)								
HS Rigor Quintile 1							-.702	.496	-.174*						
							(.308)								
HS Rigor Quintile 2							-.183		-.045						
							(.196)								
HS Rigor Quintile 4							-.175		-.043						
							(.212)								

Table 4.6. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								-.317		-.078						
								(.222)								
Senior Test Quintile 1								**-1.469**	**.230**	**-.343*****						
								(.281)								
Senior Test Quintile 2								-.026		-.006						
								(.203)								
Senior Test Quintile 4								**.896**	**2.450**	**.187*****						
								(.186)								
Senior Test Quintile 5								**1.763**	**5.830**	**.299*****						
								(.227)								
Class Rank/GPA Quintile 1								-.070		-.017						
								(.292)								
Class Rank/GPA Quintile 2								.292		.068						
								(.245)								
Class Rank/GPA Quintile 4								.231		.054						
								(.217)								
Class Rank/GPA Quintile 5								.250		.058						
								(.235)								
Model Statistics	**Step 0**															
Model N	4053	4053			3665			2731								
"-2 Log L"	2689.820	2689.560			2229.700			1353.810								
R_L^2					.171			.497								
df		1			13			28								
Mean of DV	0.598															

****p* < .001, ***p* < .01, **p* < .05

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

Table 4.7. Model #3 - Direct Effects of Dual Enrollment Participation on NODELAY (No delay in entering post-secondary after high school)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
No delay in entering post-secondary after	**1.563**		.122***	**1.142**		.1032***	**1.132**		.1027**						
high school	(.080)			(.307)			(.472)								
Primary Independent Variable															
Dual Enrollment Participant	**1.438**	4.212	.117***	**1.519**	4.578	.121***	**1.663**	5.275	.126***						
	(.258)			(.284)			(.392)								
Demographics															
Male				-.099		.014	**-.448**	**.639**	**-.070****						
				(.148)			(.163)								
Hispanic				-.105		-.015	-.162		-.023						
				(.245)			(.279)								
Asian Pacific Islander				.660		.071	.542		.061						
				(.361)			(.434)								
Black				-.081		-.011	**.991**	**2.694**	**.095*****						
				(.291)			(.298)								
English is Student's First Language				-.021		-.003	-.072		-.010						
				(.235)			(.247)								
Urban High School				.225		.028	.078		.010						
				(.235)			(.239)								
Rural High School				.059		.008	.149		.019						
				(.175)			(.189)								
First Generation Student				.008		.001	-.026		-.004						
				(.185)			(.204)								
Socioeconomic Quintile 1				-.0433		-.006	-.272		-.040						
				(.257)			(.270)								
Socioeconomic Quintile 2				-.091		-.013	-.006		-.001						
				(.227)			(.217)								
Socioeconomic Quintile 4				**.714**	**2.042**	**.075****	**.604**	**1.829**	**.066***						
				(.257)			(.266)								
Socioeconomic Quintile 5				**1.505**	**4.504**	**.12*****	**1.694**	**5.441**	**.127*****						
				(.284)			(.383)								
High School Variables															
Expectations are less than BA							-.045		-.006						
							(.246)								
Expectations are raised to BA							.096		.013						
							(.237)								
AP Class/Test Participant							-.153		-.022						
							(.311)								
HS Rigor Quintile 1							-.163		-.023						
							(.326)								
HS Rigor Quintile 2							-.162		-.231						
							(.282)								
HS Rigor Quintile 4							.186		.024						
							(.334)								

Table 4.7. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								-.328		-.049						
								(.364)								
Senior Test Quintile 1								-.530		-.085						
								(.359)								
Senior Test Quintile 2								-.244		-.036						
								(.26)								
Senior Test Quintile 4								**.680**	**1.974**	**.072******						
								(.275)								
Senior Test Quintile 5								**1.375**	**3.955**	**.115*******						
								(.350)								
Class Rank/GPA Quintile 1								.508		.058						
								(.302)								
Class Rank/GPA Quintile 2								-.018		-.002						
								(.268)								
Class Rank/GPA Quintile 4								.094		.012						
								(.306)								
Class Rank/GPA Quintile 5								.252		.031						
								(.332)								
Model Statistics	**Step 0**															
Model N	4342	4342			3927			2898								
"-2 Log L"	1909.050	1880.380			1583.180			942.945								
R_L^2		0.015			.171			.506								
df		1			13			28								
Mean of DV	0.839															

***$p < .001$, **$p < .01$, *$p < .05$

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

Table 4.8. Model #4 - Direct Effects of Dual Enrollment Participation on GPA1YR (First year GPA is 2.88 or above)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
First year GPA is 2.88 or above	**-.489**		**-.1071*****	.034		.008	-.375		-.084						
	(.058)			(.237)			(.343)								
Primary Independent Variable															
Dual Enrollment Participant	.075		.018	-.063		-.015	-.09		-.021						
	(.183)			(.175)			(.220)								
Demographics															
Male				**-.376**	**.687**	**-.084*****	**-.336**	**.715**	**-.076****						
				(.117)			(.142)								
Hispanic				**-.82**	**.440**	**-.168*****	**-.726**	**.484**	**-.152*****						
				(.190)			(.211)								
Asian Pacific Islander				-.051		-.012	-.033		-.008						
				(.197)			(.195)								
Black				**-.791**	**.453**	**-.163****	**-.879**	**.415**	**-.178*****						
				(.255)			(.274)								
English is First Language				**-.346**	**.708**	**-.078***	**-.486**	**.615**	**-.101****						
				(.182)			(.206)								
Urban High School				**.300**	**1.350**	**.073***	.250		.0312						
				(.150)			(.188)								
Rural High School				**.276**	**1.318**	**.067***	.251		.061						
				(.126)			(.144)								
First Generation Student				.054		.013	.235		.057						
				(.125)			(.160)								
Socioeconomic Quintile 1				.036		.009	.383		.094						
				(.197)			(.230)								
Socioeconomic Quintile 2				-.0253		-.006	-.162		-.037						
				(197)			(.210)								
Socioeconomic Quintile 4				**-.358**	**.699**	**-.080***	-.209		-.048						
				(.183)			(.213)								
Socioeconomic Quintile 5				.264		.064	.216		.052						
				(.164)			(.192)								
High School Variables															
Expectations are less than BA							.157		.038						
							(.210)								
Expectations are raised to BA							-.370		-.083						
							(.199)								
AP Class/Test Participant							.077		.018						
							(.219)								
HS Rigor Quintile 1							-.338		-.076						
							(.270)								
HS Rigor Quintile 2							-.229		-.052						
							(.216)								
HS Rigor Quintile 4							.141		.034						
							(.222)								

Table 4.8. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								.003		.001						
								(.257)								
Senior Test Quintile 1								-.097		-.023						
								(.250)								
Senior Test Quintile 2								.203		.049						
								(.234)								
Senior Test Quintile 4								.342		.083						
								(.195)								
Senior Test Quintile 5								**1.186**	**3.274**	**.287*****						
								(.204)								
Class Rank/GPA Quintile 1								-.005		-.001						
								(.224)								
Class Rank/GPA Quintile 2								-.152		.035						
								(.199)								
Class Rank/GPA Quintile 4								.013		.003						
								(.204)								
Class Rank/GPA Quintile 5								.192		.046						
								(.213)								
Model Statistics	**Step 0**															
Model N	3950	3950			3568			2664								
"-2 Log L"	2577.060	2576.830			2215.59			1515.37								
R_L^2					.140			.412								
df		1			13			28								
Mean of DV	.382															

***$p < .001$, **$p < .01$, *$p < .05$

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

Table 4.9. Model #5 - Direct Effects of Dual Enrollment Participation on FOURYR (Ever attended a four-year college)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Ever attended a four-year college	.972		.153***	1.186		.175***	.990		.155**						
	(.067)			(.257)			(.402)								
Primary Independent Variable															
Dual Enrollment Participant	-.092		-.019	-.123		-.026	.102		.020						
	(.210)			(.200)			(.249)								
Demographics															
Male				-.016		-.003	.155		.030						
				(.121)			(.155)								
Hispanic				-.022		-.005	-.298		-.064						
				(.197)			(.276)								
Asian Pacific Islander				-.066		-.014	-.354		-.077						
				(.239)			(.255)								
Black				-.087		-.018	.886	2.425	.143**						
				(.268)			(.312)								
English is First Language				-.146		-.031	.414		.076						
				(.202)			(.247)								
Urban High School				.124		.024	-.073		-.015						
				(.149)			(.188)								
Rural High School				-.030		-.006	-.142		-.030						
				(.146			(.194)								
First Generation Student				-1.273	.280	-.302***	-.733	.480	-.168***						
				(.138)			(.174)								
Socioeconomic Quintile 1				.427		.078	.269		.051						
				(.239)			(.299)								
Socioeconomic Quintile 2				.182		.035	.068		.014						
				(.214)			(.288)								
Socioeconomic Quintile 4				.637	1.89	.110**	.774	2.168	.129**						
				(.203)			(.277)								
Socioeconomic Quintile 5				.441	1.554	.080**	.397		.0732						
				(.180)			(.231)								
High School Variables															
Expectations are less than BA							-1.906	.149	-.443***						
							(.187)								
Expectations are raised to BA							-.775	.460	-.178***						
							(.196)								
AP Class/Test Participant							1.556	4.740	.206*						
							(.810)								
HS Rigor Quintile 1							-.846	.429	-.196***						
							(.255)								
HS Rigor Quintile 2							-.414	.661	-.091*						
							(.191)								
HS Rigor Quintile 4							.669	1.952	.115**						
							(.247)								

Table 4.9. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								**1.568**	**4.797**	**.207*** **						
								(.283)								
Senior Test Quintile 1								.311		.059						
								(.336)								
Senior Test Quintile 2								.209		.040						
								(.300)								
Senior Test Quintile 4								-.056		-.012						
								(.207)								
Senior Test Quintile 5								-.049		-.01						
								(.217)								
Class Rank/GPA Quintile 1								-.271		-.058						
								(.233)								
Class Rank/GPA Quintile 2								-.066		-.014						
								(.235)								
Class Rank/GPA Quintile 4								.260		.050						
								(.291)								
Class Rank/GPA Quintile 5								**.585**	**1.795**	**.103***						
								(.252)								
Model Statistics	**Step 0**															
Model N	3759	35759			3414			2547								
"-2 Log L"	2227.370	2227.070			1827.950			886.288								
R_L^2					.179			.602								
df		1			13			28								
Mean of DV	.718															

***p < .001, **p < .01, *p < .05

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

Table 4.10. Model #6 - Direct Effects of Dual Enrollment Participation on FIRST4 (College of first attendance was a four-year school)

	Step 1 Estimate	ExpB	Delta-*p*	Step 2 Estimate	ExpB	Delta-*p*	Step 3 Estimate	ExpB	Delta-*p*	Step 4 Estimate	ExpB	Delta-*p*	Step 5 Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
College of first attendance was a	-.035		-.009	-.186		-.046	**-.765**		**-.180***						
four-year school	(.056)			(.213)			(.358)								
Primary Independent Variable															
Dual Enrollment Participant	-.224		-.056	-.359		-.088	**-.570**	**.565**	**-.138***						
	(.194)			(.199)			(.253)								
Demographics															
Male				**-.237**	**.789**	**-.059***	**-.387**	**.679**	**-.095****						
				(.115)			(.130)								
Hispanic				-.294		-.073	.081		.020						
				(.192)			(.236)								
Asian Pacific Islander				.110		.028	-.037		-.009						
				(.256)			(.315)								
Black				-.090		-.022	.455		.1125						
				(.228)			(.319)								
English is First Language				-.207		-.051	-.098		-.024						
				(.177)			(.209)								
Urban High School				**.333**	**1.395**	**.083***	.291		.073						
				(.156)			(.193)								
Rural High School				.149		.037	.179		.045						
				(.137)			(.170)								
First Generation Student				.143		.036	-.006		-.002						
				(.127)			(.167)								
Socioeconomic Quintile 1				**-.483**	**.617**	**-.118***	-.112		.028						
				(.203)			(.232)								
Socioeconomic Quintile 2				-.119		-.030	-.152		-.038						
				(.166)			(.186)								
Socioeconomic Quintile 4				.209		.052	.004		.001						
				(.158)			(.232)								
Socioeconomic Quintile 5				**1.202**	**3.327**	**.273*****	**.859**	**2.360**	**.205*****						
				(.161)			(.186)								
High School Variables															
Expectations are less than BA							.243		.061						
							(.211)								
Expectations are raised to BA							.306		.076						
							(.208)								
AP Class/Test Participant							.254		.063						
							(.227)								
HS Rigor Quintile 1							.118		.030						
							(.284)								
HS Rigor Quintile 2							.333		.083						
							(.260)								
HS Rigor Quintile 4							-.102		-.025						
							(.234)								

Table 4.10. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								-.160		-.040						
								(.264)								
Senior Test Quintile 1								**-1.265**	**.282**	**-.275*****						
								(.291)								
Senior Test Quintile 2								**-.449**	**.638**	**-.110***						
								(.216)								
Senior Test Quintile 4								**.818**	**2.266**	**.1956*****						
								(.192)								
Senior Test Quintile 5								**1.437**	**4.208**	**.313*****						
								(.218)								
Class Rank/GPA Quintile 1								.014		.035						
								(.248)								
Class Rank/GPA Quintile 2								.216		.054						
								(.256)								
Class Rank/GPA Quintile 4								.346		.086						
								(.225)								
Class Rank/GPA Quintile 5								.336		.084						
								(.228)								
Model Statistics	**Step 0**															
Model N	4328	4328			3906			2880								
"-2 Log L"	3002.520	3000.170			2494.550			1584.260								
R_L^2					.169			.472								
df		1			13			28								
Mean of DV	.486															

****p* < .001, ***p* < .01, **p* < .05
Standard errors in parenthesis below the Estimate
Only significant ExpB statistics shown
DV = Dependent Variable

Table 4.11. Model #7 - Direct Effects of Dual Enrollment Participation on SELCT (First college was selective)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
First college was selective	**-1.83**		**-.116*****	**-2.46**		**-.128*****	**-2.709**		**-.131*****						
	(.087)			(.371)			(.502)								
Primary Independent Variable															
Dual Enrollment Participant	.276		.037	.374		.052	.312		.042						
	(.224)			(.218)			(.301)								
Demographics															
Male				-.143		-.017	-.164		-.019						
				(.150)			(.170)								
Hispanic				-.059		-.007	.174		.023						
				(.308)			(.315)								
Asian Pacific Islander				**.793**	**2.210**	**.126****	**.896**	**2.450**	**.146****						
				(.256)			(.337)								
Black				.447		.064	**1.341**	**3.823**	**.245*****						
				(.351)			(.410)								
English is First Language				-.349		-.037	-.393		-.041						
				(.271)			(.283)								
Urban High School				.163		.021	.156		.020						
				(.188)			(.228)								
Rural High School				-.234		-.026	-.325		-.035						
				(.178)			(.206)								
First Generation Student				.262		.035	.111		.014						
				(.177)			(.227)								
Socioeconomic Quintile 1				-.249		-.028	.383		.053						
				(.426)			(.435)								
Socioeconomic Quintile 2				-.406		-.043	-.395		-.042						
				(.260)			(.302)								
Socioeconomic Quintile 4				**.487**	**1.627**	**.070***	.242		.032						
				(.256)			(.300)								
Socioeconomic Quintile 5				**1.741**	**5.703**	**.343*****	**1.181**	**3.258**	**.208*****						
				(.212)			(.243)								
High School Variables															
Expectations are less than BA							.013		.002						
							(.246)								
Expectations are raised to BA							.248		.033						
							(.271)								
AP Class/Test Participant							-.171		-.020						
							(.314)								
HS Rigor Quintile 1							.071		.009						
							(.290)								
HS Rigor Quintile 2							-.013		-.002						
							(.264)								
HS Rigor Quintile 4							**-.666**	**.514**	**-.064***						
							(.294)								

Table 4.11. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								-.494		-.050						
								(.328)								
Senior Test Quintile 1								**-3.316**	**.0326**	**-.136*****						
								(.724)								
Senior Test Quintile 2								-.504		-.051						
								(.574)								
Senior Test Quintile 4								**.591**	**1.806**	**.088***						
								(.295)								
Senior Test Quintile 5								**1.499**	**4.477**	**.283*****						
								(.262)								
Class Rank/GPA Quintile 1								.020		.002						
								(.268)								
Class Rank/GPA Quintile 2								-.126		-.015						
								(.261)								
Class Rank/GPA Quintile 4								.208		.027						
								(.314)								
Class Rank/GPA Quintile 5								**.581**	**1.788**	**.086****						
								(.243)								
Model Statistics	**Step 0**															
Model N	4326	4326			3913			2883								
"-2 Log L"	1763.140	1761.210			1324.150			900.078								
R_L^2					.249			.490								
df		1			13			28								
Mean of DV	.142															

****p* < .001, ***p* < .01, **p* < .05
Standard errors in parenthesis below the Estimate
Only significant ExpB statistics shown
DV = Dependent Variable

Table 4.12. Model #8 - Direct Effects of Dual Enrollment Participation on NONSELCT (First college was non-selective)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
First college was non-selective	-.471		-.102	-.487		-.106**	-.586		-.125						
	(.059)			(.192)			(.318)								
Primary Independent Variable															
Dual Enrollment Participant	-.485	.616	-.105**	-.690	.502	-.144***	-.873	.418	-.174***						
	(.198)			(.204)			(.223)								
Demographics															
Male				-.126		-.029	-.168		-.038						
				(.110)			(.120)								
Hispanic				-.311		-.070	-.070		-.016						
				(.186)			(.217)								
Asian Pacific Islander				-.514		-.111	-.829	.436	-.167**						
				(.281)			(.266)								
Black				-.157		-.036	.070		.017						
				(.214)			(.258)								
English is First Language				-.072		-.017	.024		.006						
				(.155)			(.180)								
Urban High School				.217		.052	.158		.038						
				(.147)			(.167)								
Rural High School				.196		.047	.189		.045						
				(.136)			(.159)								
First Generation Student				.071		.017	-.040		-.009						
				(.120)			(.152)								
Socioeconomic Quintile 1				-.380	.684	-.084*	-.301		-.067						
				(.201)			(.228)								
Socioeconomic Quintile 2				.051		.012	.021		.005						
				(.166)			(.180)								
Socioeconomic Quintile 4				.169		.040	.091		.022						
				(.163)			(.187)								
Socioeconomic Quintile 5				.338	1.402	.082**	.170		.041						
				(.140)			(.164)								
High School Variables															
Expectations are less than BA							.001		.001						
							(.182)								
Expectations are raised to BA							.038		.009						
							(.182)								
AP Class/Test Participant							.182		.044						
							(.189)								
HS Rigor Quintile 1							.322		.078						
							(.261)								
HS Rigor Quintile 2							.238		.057						
							(.236)								
HS Rigor Quintile 4							.079		.019						
							(.206)								

Table 4.12. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								-.023		-.005						
								(.229)								
Senior Test Quintile 1								**-1.007**	**.365**	**-.195*****						
								(.270)								
Senior Test Quintile 2								-.398		-.088						
								(.213)								
Senior Test Quintile 4								**.432**	**1.54**	**.105****						
								(.177)								
Senior Test Quintile 5								**.507**	**1.660**	**.124****						
								(.176)								
Class Rank/GPA Quintile 1								-.194		-.044						
								(.206)								
Class Rank/GPA Quintile 2								.092		.022						
								(.229)								
Class Rank/GPA Quintile 4								.180		.043						
								(.187)								
Class Rank/GPA Quintile 5								-.098		-.023						
								(207)								
Model Statistics	**Step 0**															
Model N	4326	4326			3913			2883								
"-2 Log L"	2856.450	2846.880			2501.310			1724.100								
R_L^2					.124			.396								
df		1			13			28								
Mean of DV	.374															

***$p < .001$, **$p < .01$, *$p < .05$

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

Table 4.13. Model #9 - Direct Effects of Dual Enrollment Participation on OPENDR (First college was an open door school)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
First college was an open door school	-.091		-.023	.093		.023	.317		.079						
	(.059)			(.216)			(.350)								
Primary Independent Variable															
Dual Enrollment Participant	.283		.071	**.437**	**1.548**	**.108***	**.731**	**2.077**	**.177****						
	(.196)			(.202)			(.263)								
Demographics															
Male				.199		.050	**.328**	**1.388**	**.082****						
				(.118)			(.129)								
Hispanic				.311		.077	-.051		-.013						
				(.187)			(.237)								
Asian Pacific Islander				.026		.007	.267		.067						
				(.262)			(.327)								
Black				-.034		-.009	**-.707**	**.493**	**-.168***						
				(.233)			(.327)								
English is First Language				.252		.063	.187		.047						
				(.175)			(.215)								
Urban High School				-.287		-.071	-.281		-.069						
				(.158)			(.195)								
Rural High School				-.108		-.027	-.08		-.020						
				(.143)			(.172)								
First Generation Student				-.189		-.047	-.017		-.004						
				(.124)			(.162)								
Socioeconomic Quintile 1				**.418**	**1.519**	**.104***	.166		.042						
				(.205)			(.238)								
Socioeconomic Quintile 2				.054		.014	.087		.022						
				(.166)			(.195)								
Socioeconomic Quintile 4				**-.317**	**.728**	**-.078***	-.155		-.039						
				(.162)			(.200)								
Socioeconomic Quintile 5				**-1.289**	**.276**	**-.279****	**-.978**	**.376**	**-.223*****						
				(.165)			(.186)								
High School Variables															
Expectations are less than BA							.003		.001						
							(.198)								
Expectations are raised to BA							-.173		-.043						
							(.208)								
AP Class/Test Participant							-.166		-.041						
							(.235)								
HS Rigor Quintile 1							-.420		-.103						
							(.244)								
HS Rigor Quintile 2							-.260		-.064						
							(.267)								
HS Rigor Quintile 4							.232		.058						
							(.231)								

Table 4.13. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								.344		.086						
								(.263)								
Senior Test Quintile 1								**1.322**	**3.751**	**.295*** **						
								(.294)								
Senior Test Quintile 2								.491	1.634	**.121** **						
								(.207)								
Senior Test Quintile 4								**-.683**	**.505**	**-.163*** **						
								(.191)								
Senior Test Quintile 5								**-1.53**	**.217**	**-.315*** **						
								(.214)								
Class Rank/GPA Quintile 1								.220		.055						
								(.226)								
Class Rank/GPA Quintile 2								-.020		-.005						
								(.250)								
Class Rank/GPA Quintile 4								-.347		-.085						
								(.202)								
Class Rank/GPA Quintile 5								-.222		-.055						
								(.232)								
Model Statistics	**Step 0**															
Model N	4326	4326			3913			2883								
"-2 Log L"	2992.650	2988.880			2485.510			1545.150								
R_L^2					.169			.484								
df		1			13			28								
Mean of DV	.484															

****p* < .001, ***p* < .01, **p* < .05
Standard errors in parenthesis below the Estimate
Only significant ExpB statistics shown
DV = Dependent Variable

of the first step of the equation (IV and DV only) in Model #3 (NODELAY – no delay in entering post-secondary after high school) positive and significant to $p < .001$, but the strength of the relations continued to increase positively as the demographic and high school variables were added to the stepwise regression (see Table 4.7). These results were amongst the strongest positive parameter estimates generated by DEPARTIC (dual enrollment participation). Odds ratios, detailed in Table 4.14, indicated increased odds of entering post-secondary education directly after high school after participation in dual enrollment programs. These particularly improved odds of not delaying college entrance for dual enrollment students were also the largest generated at the $p < .001$ level of statistical significance of the logistic regression outputs. The strength of NODELAY was also in evidence when cross tabulations of this variable and DEPARTIC were performed. Cross tabs with NODELAY produced the greatest proportional percentage of student cases meeting established research standards of any variable in this study. Chi-square statistics suggested that dual enrollment participating students entered college no more than seven months after high school at statistically greater rates than those who did not participate ($p < .001$) (see Table 4.1). Proportionally, 10% more dual enrollment students met the standard for NODELAY than did non-participants.

As noted previously, additional statistically significant effects resulted from regressing variables describing both type and selectivity of the college of first attendance. When considering sociological impacts of college attendance, the type of school (four-year or two-year) and selectivity levels tell much about the type of student and predicted post-secondary outcomes. Cross tabulations for dual enrollment participants and non-participants indicated that fewer participants attended four-year colleges as their first

Table 4.14. ExpB values of dual enrollment participants (DEPARTIC) for model dependent variables

Dependent Variable	ExpB value	Step of Logistic Regression Model	Interpretation
NODELAY	**4.212*** **	#1 - IV & DV	Increased odds by 4.212 of a dual enrollment participant not delaying entry into post-secondary education as compared to a non-dual enrollment participant.
NODELAY	**4.578*** **	#2 - IV & Demographic variables	Increased odds by 4.578 of a dual enrollment participant not delaying entry into post-secondary education as compared to a non-dual enrollment participant, controlling for demographic variables.
NODELAY	**5.275*** **	#3 - IV, Demographic, High School variables	Increased odds by 5.275 of a dual enrollment participant not delaying entry into post-secondary education as compared to a non-dual enrollment participant, controlling for demographic and high school variables.
FIRST4	**0.565* **	#3 - IV, Demographic, High School variables	Odds of a four year college as the first post-secondary school are 43.5% lower for dual enrollment students as compared to a non-dual enrollment participant, controlling for demographic and high school variables.
NONSELCT	**0.616** **	#1 - IV & DV	Odds of a non-selective college as the first post-secondary school are 38.4% lower for dual enrollment students as compared to a non-dual enrollment participant.
NONSELCT	**0.502*** **	#2 - IV & Demographic variables	Odds of a non-selective college as the first post-secondary school are 49.8% lower for dual enrollment students as compared to a non-dual enrollment participant, controlling for demographic variables.
NONSELCT	**0.418*** **	#3 - IV, Demographic, High School variables	Odds of a non-selective college as the first post-secondary school are 58.2% lower for dual enrollment students as compared to a non-dual enrollment participant, controlling for demographic and high school variables.
OPENDR	**1.548* **	#1 - IV & DV	Increased odds by 1.548 of a dual enrollment participant attending an open door college upon first entry to post-secondary education as compared to a non-dual enrollment participant.
OPENDR	**2.077** **	#3 - IV, Demographic, High School variables	Increased odds by 2.077 of a dual enrollment participant attending an open door college upon first entry to post-secondary education as compared to a non-dual enrollment participant.

Table 4.14. Continued

Dependent Variable	ExpB value	Step of Logistic Regression Model	Interpretation
CUMCRED - TOTAL	0.961	#1 - IV & DV	Odds of a dual enrollment participant meeting the 50+ credit hour threshold for the 2nd year in post-secondary education are 3.9% less than a non-dual enrollment participant.
CUMCRED - DIRECT	0.960	#1 - IV & DV	Odds of a dual enrollment participant meeting the 50+ credit hour threshold for the 2nd year in post-secondary education are 4.02% less than a non-dual enrollment participant.
NOSTOP - DIRECT	**1.67****	#1 - IV & DV	Increased odds by 1.67 of a dual enrollment participant continuously enrolling in post-secondary education with no more than a one semester break as compared to a non-dual enrollment participant.
NOSTOP - DIRECT	**1.682****	#2 - IV & Demographic variables	Increased odds by 1.682 of a dual enrollment participant continuously enrolling in post-secondary education with no more than a one semester break as compared to a non-dual enrollment participant.
NOSTOP- DIRECT	**1.605***	#3 - IV, Demographic, High School variables	Increased odds by 1.605of a dual enrollment participant continuously enrolling in post-secondary education with no more than a one semester break as compared to a non-dual enrollment participant.
NOSTOP - TOTAL	**1.645****	#1 - IV & DV	Increased odds by 1.645 of a dual enrollment participant continuously enrolling in post-secondary education with no more than a one semester break as compared to a non-dual enrollment participant.
NOSTOP - TOTAL	**1.659****	#2 - IV & Demographic variables	Increased odds by 1.659 of a dual enrollment participant continuously enrolling in post-secondary education with no more than a one semester break as compared to a non-dual enrollment participant.
NOSTOP - TOTAL	**1.605***	#3 - IV, Demographic, High School variables	Increased odds by 1.605 of a dual enrollment participant continuously enrolling in post-secondary education with no more than a one semester break as compared to a non-dual enrollment participant.
BATIME - TOTAL	1.114	#1 - IV & DV	Increased odds by 1.114 of a dual enrollment participant earning a bachelor's degree in 4.56 years or less as compared to a non-dual enrollment participant.
BATIME - DIRECT	1.148	#1 - IV & DV	Increased odds by 1.148 of a dual enrollment participant earning a bachelor's degree in 4.56 years or less as compared to a non-dual enrollment participant.

Table 4.14. Continued

Dependent Variable	ExpB value	Step of Logistic Regression Model	Interpretation
BATIME - DIRECT	**0.515***	#4 - IV, Demographic, High School, and College variables	Odds of a dual enrollment participant earning a bachelor's degree in 4.56 years or less are 48.5% less than a non-dual enrollment participant.
CERTAA- TOTAL	1.470	#1 - IV & DV	Increased odds by 1.470 of a dual enrollment participant earning a certificate or associate in arts degree as compared to a non-dual enrollment participant.
CERTAA - DIRECT	1.533	#1 - IV & DV	Increased odds by 1.533 of a dual enrollment participant earning a certificate or associate in arts degree as compared to a non-dual enrollment participant.
CERTAA - DIRECT	**1.898***	#2 - IV & Demographic variables	Increased odds by 1.898 of a dual enrollment participant earning a certificate or associate in arts degree as compared to a non-dual enrollment participant.
BADEG - TOTAL	0.691	#1 - IV & DV	Odds of a dual enrollment participant earning a bachelor's degree are 30.85% less than for a non-dual enrollment participant.
BADEG - DIRECT	**0.664***	#1 - IV & DV	Odds of a dual enrollment participant earning a bachelor's degree are 33.60 % less than for a non-dual enrollment participant.
GRAD - TOTAL	1.082	#1 - IV & DV	Increased odds by 1.082 of a dual enrollment participant earning graduate credits or an advanced degree as compared to a non-dual enrollment participant.
GRAD - DIRECT	1.089	#1 - IV & DV	Increased odds by 1.089 of a dual enrollment participant earning graduate credits or an advanced degree as compared to a non-dual enrollment participant.

Bolded values are statistically significant to the $p < .05$*, $p < .01$**, or $p < .001$*** levels post-secondary experience than did dual enrollment students, whereas nearly six percent more participating students enrolled in two-year colleges after high school. Since the onset of the NELS survey, more dual enrollment than non-participants attended four-year colleges at some time during their educational careers (see Table 4.1). However, negative parameter estimates were generated by the relationship between FIRST4 (college of first attendance was a four-year school), the variable that defined the first college of attendance as a four-year school, and DEPARTIC. Estimates for all three steps of logistic model #5 (see Table 4.9) were negative and statistical significance was only achieved in the last step ($p < .05$), when high school variables were added into the equation. Delta-*p* statistics showed that students participating in dual enrollment programs were 13.8% less likely to enter a four-year college as their first post-secondary institution than non-participants. When regressed against FIRST4 without any control variables (step 1), the estimate for DEPARTIC was negative, but non-significant, with delta-*p* statistics suggesting a 5.6% less likelihood of entering a four-year college. Although not utilized as a separate variable in the logistic equation, FIRST2 (college of first attendance was a two-year school) was created to specifically evaluate student enrollment in two-year colleges. Cross tabs suggest that statistically significant differences exist between rates of two-year college attendance and participation in dual enrollment programs. Dual enrollment students entered both selective colleges and community colleges at rates higher than non-participants.

Selectivity levels of colleges imply at least two attributes of exclusivity: high SAT or ACT scores and high familial socioeconomic standing. REFSELCT, the original variable, was a categorical variable with five values, “highly selective”, “selective”, “non-selective”, “open door” and “non-ratable”. This variable was collapsed into three categories, with non-ratable removed to system missing. “Highly selective” and “selective were combined into one variable, SELCT (first college was selective), due to low numbers of cases meeting the criteria of “highly selective” school attendance. Cross tabulations for these variables show that while proportionally fewer dual enrollment students entered four-year colleges as their first college of enrollment, 6.3% more participating students entered selective colleges, and 4.8% more dual enrollment participants entered open door (community) colleges than did non-participants (see Table 4.1). Chi-square statistics indicated statistically significance differences in the percent of the sample that entered selective colleges. Dual enrollment participants entered selective colleges at statistically significant greater rates than those who did not participate ($p < .01$).

Parameter estimates for three college selectivity variables (SELCT – first college was selective), NONSELCT – first college was non-selective, OPENDR – first college was an open door type) mirrored percentage participation rates between dual enrollment participants and non-participants. For each of the three steps of the regression model, DEPARTIC (dual enrollment participant) estimates in relation to SELCT were positive, although not significant. Estimates for OPENDR are positive for all three steps of the equation, and reached the level of significance when demographic variables were entered, generating very strong positive and significant results when high school variables were added. These findings are confirmed by strong model probabilities, which also show that as variables are added to the 9th logistic regression model, OPENDR, the strength of the model improved (see Table 4.15). Conversely, nearly 10% fewer dual enrollment

Table 4.15. Model probabilities of dual enrollment participants (DEPARTIC) and the dependent variables

	Step 1	Step 2	Step 3	Step 4	Step 5
Log Model 1					
b_0 = APCLEP	-2.266	-2.577	-3.906		
b_1X_1 = DEPARTIC	-0.07	-0.108	-0.201		
$L_1 = b_0 + b_1 X_1$	-2.336	-2.685	-4.114		
$P_1 = 1/(1 + e^{-(L1)})$	0.088	0.064	0.016		
Change		-0.024	-0.048		
Log Model 2					
b_0 = CREDMOM	0.388	0.282	-0.015		
b_1X_1 = DEPARTIC	0.078	0.074	0.031		
$L_1 = b_0 + b_1 X_1$	0.466	0.356	0.016		
$P_1 = 1/(1 + \mathrm{e}^{-(L1)})$	0.614	0.588	0.504		
Change		-0.026	-0.084		
Log Model 3					
b_0 = NODELAY	1.563	1.142	1.132		
b_1X_1 = DEPARTIC	1.438	1.519	1.663		
$L_1 = b_0 + b_1 X_1$	3.001	2.661	2.795		
$P_1 = 1/(1 + e^{-(L1)})$	0.952	0.934	0.942		
Change		-0.018	**0.008**		
Log Model 4					
b_0 = GPA1YR	-0.489	-0.034	-0.375		
b_1X_1 = DEPARTIC	0.075	-0.063	-0.09		
$L_1 = b_0 + b_1 X_1$	0.414	-0.029	-0.465		
$P_1 = 1/(1 + e^{-(L1)})$	0.398	0.493	0.385		
Change		**0.095**	-0.108		
Log Model 5					
b_0 = FOURYR	0.972	1.186	0.99		
b_1X_1 = DEPARTIC	-0.092	-0.123	0.102		
$L_1 = b_0 + b_1 X_1$	0.88	1.063	1.092		
$P_1 = 1/(1 + e^{-(L1)})$	0.707	0.743	0.749		
Change		**0.036**	**0.006**		

Table 4.15. Continued

	Step 1	Step 2	Step 3	Step 4	Step 5
Log Model 6					
b_0 = FIRST4	-0.035	-0.186	-0.765		
b_1X_1 = DEPARTIC	-0.224	-0.359	-0.57		
$L_1 = b_0 + b_1 X_1$	-0.259	-0.545	-1.335		
$P_1 = 1/(1 + e^{-(L1)})$	0.436	0.367	0.208		
Change		-0.069	-0.159		
Log Model 7					
b_0 = SELCT	-1.83	-2.46	-2.709		
b_1X_1 = DEPARTIC	0.276	0.374	0.312		
$L_1 = b_0 + b_1 X_1$	-1.554	-2.086	-2.379		
$P_1 = 1/(1 + e^{-(L1)})$	0.175	0.11	0.085		
Change		-0.065	-0.025		
Log Model 8					
b_0 =NONSELCT	-0.471	-0.485	-0.586		
b_1X_1 = DEPARTIC	-0.485	-0.69	-0.873		
$L_1 = b_0 + b_1 X_1$	-0.956	-1.177	-1.459		
$P_1 = 1/(1 + e^{-(L1)})$	0.278	0.236	0.189		
Change		-0.042	-0.047		
Log Model 9					
b_0 = OPENDR	-0.091	0.093	0.317		
b_1X_1 = DEPARTIC	0.283	0.437	0.731		
$L_1 = b_0 + b_1 X_1$	0.192	0.53	1.048		
$P_1 = 1/(1 + e^{-(L1)})$	0.548	0.629	0.74		
Change		**0.081**	**0.111**		
Log Model 10					
b_0 = CUMCRED TOTAL	0.237	0.076	-0.408		
b_1X_1 = DEPARTIC	-0.039	-0.016	-0.045		
$L_1 = b_0 + b_1 X_1$	0.198	0.06	-0.453		
$P_1 = 1/(1 + e^{-(L1)})$	0.549	0.515	0.389		
Change		-0.034	-0.126		

Table 4.15. Continued

	Step 1	Step 2	Step 3	Step 4	Step 5
Log Model 11					
b_0 = CUMCRED DIRECT	0.23	0.058	-0.408	-1.905	
b_1X_1 = DEPARTIC	-0.041	-0.02	-0.045	-0.108	
$L_1 = b_0 + b_1 X_1$	0.189	0.038	-0.453	-2.013	
$P_1 = 1/(1 + e^{-(L1)})$	0.547	0.509	0.389	0.118	
Change		-0.039	-0.12	-0.271	
Log Model 12					
b_0 = NOSTOP TOTAL	0.379	0.131	-0.548		
b_1X_1 = DEPARTIC	0.498	0.506	0.473		
$L_1 = b_0 + b_1 X_1$	0.879	0.637	-0.075		
$P_1 = 1/(1 + e^{-(L1)})$	0.706	0.654	0.481		
Change		-0.052	-0.173		
Log Model 13					
b_0 = NOSTOP DIRECT	0.378	0.059	-0.548	-2.647	
b_1X_1 = DEPARTIC	0.512	0.52	0.473	0.229	
$L_1 = b_0 + b_1 X_1$	0.89	0.579	-0.075	-2.418	
$P_1 = 1/(1 + e^{-(L1)})$	0.709	0.641	0.481	0.082	
Change		-0.068	-0.16	-0.399	
Log Model 14					
b_0 = BATIME TOTAL	0.018	-0.145	-0.302		
b_1X_1 = DEPARTIC	0.108	-0.197	-0.328		
$L_1 = b_0 + b_1 X_1$	0.126	-0.342	-0.63		
$P_1 = 1/(1 + e^{-(L1)})$	0.531	0.415	0.347		
Change		-0.116	-0.068		
Log Model 15					
b_0 = BATIME DIRECT	0.007	-0.142	-0.302	-2.677	-5.097
b_1X_1 = DEPARTIC	0.138	-0.184	-0.328	-0.664	-0.596
$L_1 = b_0 + b_1 X_1$	0.145	-0.326	-0.63	-3.341	-5.693
$P_1 = 1/(1 + e^{-(L1)})$	0.536	0.419	0.347	0.034	0.003
Change		-0.117	-0.027	-0.313	-0.031

Table 4.15. Continued

	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**
Log Model 16					
b_0 = CERTAA TOTAL	-0.146	-0.755	-0.215		
b_1X_1 = DEPARTIC	0.385	0.567	0.615		
$L_1 = b_0 + b_1 X_1$	-0.761	-0.188	0.4		
$P_1 = 1/(1 + e^{-(L1)})$	0.318	0.453	0.599		
Change		**0.135**	**0.146**		
Log Model 17					
b_0 =CERTAA DIRECT	-1.151	-0.778	-0.215	3.921	5.08
b_1X_1 = DEPARTIC	0.427	0.641	0.614	0.488	0.4
$L_1 = b_0 + b_1 X_1$	-0.724	-0.137	0.399	4.409	5.48
$P_1 = 1/(1 + e^{-(L1)})$	0.326	0.466	0.598	0.988	0.996
Change			**0.132**	**0.39**	**0.008**
Log Model 18					
b_0 = BADEG TOTAL	0.101	-0.39	-0.688		
b_1X_1 = DEPARTIC	-0.369	-0.375	-0.368		
$L_1 = b_0 + b_1 X_1$	-0.268	-0.765	-1.056		
$P_1 = 1/(1 + e^{-(L1)})$	0.433	0.317	0.258		
Change		-0.116	-0.059		
Log Model 19					
b_0 = BADEG DIRECT	0.007	-0.142	-0.302	-2.677	-5.097
b_1X_1 = DEPARTIC	0.138	-0.184	-0.328	-0.664	-0.596
$L_1 = b_0 + b_1 X_1$	0.145	-0.326	-0.63	-3.341	-5.693
$P_1 = 1/(1 + e^{-(L1)})$	0.536	0.419	0.347	0.034	0.003
Change		-0.117	-0.027	-0.313	-0.031
Log Model 20					
b_0 = GRAD TOTAL	-1.188	-1.017	-1.254		
b_1X_1 = DEPARTIC	0.079	-0.069	-0.038		
$L_1 = b_0 + b_1 X_1$	-1.109	-1.086	-1.292		
$P_1 = 1/(1 + e^{-(L1)})$	0.248	0.252	0.216		
Change		**0.004**	-0.036		

Table 4.15. Continued

	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**
Log Model 21					
b_0 = GRAD DIRECT	-1.187	-1.52	-1.254	-4.581	-5.537
b_1X_1 = DEPARTIC	0.085	-0.076	-0.038	0.214	0.257
$L_1 = b_0 + b_1 X_1$	-1.102	-1.596	-1.292	-4.367	-5.28
$P_1 = 1/(1 + e^{-(L1)})$	0.249	0.169	0.216	0.013	0.005
Change		-0.08	**0.047**	-0.203	-0.008

Bolded values indicate improvements in the model when control variables added
P_1 = probability of the DV (b_0) if student is a dual enrollment participant
Step 1 = IV/DV only
Step 2 = IV and Demographic
Variables
Step 3 = IV and Demographic and High School Variables
Step 4 = IV and Demographic, High School and College
Variables
Step 5= IV and Demographic, High School, College and Post-secondary Persistence

students entered non-selective colleges, as compared to percentages of non-participants. Chi-square statistics suggested a statistically significant difference in the percentage of students entering non-selective colleges. Students who did not participate in dual enrollment programs enrolled in non-selective colleges at significantly greater rates than dual enrollment students ($p < .001$). Parameter estimates for the variable, NONSELCT, when regressed directly with DEPARTIC in step 1 of the equation, were negative and significant ($b = -.485$, $p < .01$). The delta-p statistic implied that students who participated in dual enrollment programs were 10.5% less likely to enter a non-selective college than non-participants. This negative relationship grew and strengthened in significance through the next two steps of the model. When high school variables were added, the odds of attending a non-select college for dual enrollment students were 58.2% less than non-participants (see Table 4.14).

While students' odds of attending a four-year school right out of high school were not positive, dual enrollment students still posted higher percentages of students attending four-year schools during their post-secondary school years. Perhaps dual enrollment students were more successful after transferring from the two-year colleges (open door), which they first attended after high school, and completed their academic careers at four-year schools in larger numbers than non-participants. When directly regressed on the dependent variable, OPENDR (first college was an open door type), and again with demographic and high school variables, the odds of attending a community college increased by 1.548 and 2.077 respectively for dual enrollment students (see Table 4.13). In order to progress towards advanced degrees or graduate credits, dual enrollment students must transfer from a two-year to a four-year school. Surprisingly, cross tabs for the transfer variables, not utilized during regression analysis due to high missing values, indicated a higher proportion of reverse transfers (from four-year to two-year colleges) among dual enrollment students. These data seem contradictory, and may be a symptom of high percentages of missing data. When evaluating the percent of missing cases connecting DEPARTIC (dual enrollment participant) and ATRANSFR (transfers between two and four-year colleges), the results showed 55.1% of cases who were identified as dual enrollment participants were missing information about transferring between different types of colleges; 66.9% of non-participants were missing data for this same construct. Although the relationship between the transfer variable and dual enrollment participation was significant, ATRANSFR, if included in regression analysis, it most likely would have produced misrepresentative results (see Tables 3.5 and 4.2).

Attending a four-year school is a necessary condition for acquiring a bachelor or advanced degree. The reported statistical results showed that dual enrollment students attended selective universities in larger proportions to the sample and to non-participants, although coordinating positive parameter estimates failed to meet the level of statistical significance. Aside from NODELAY (no delay in entering post-secondary after high school), FIRST4 (college of first attendance was a four-year school), NON-SELCT (first college was non-selective) and OPENDR (first college was an open door), college variables in this analytic sample generated non-significant results when regressed directly with DEPARTIC (dual enrollment participant).

Answer to Research Question #1

Do students who have participated in dual enrollment programs have higher rates of second year college persistence than those who were not dual enrollment participants?

Two variables, CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year) and NOSTOP (continuous enrollment with no more than one semester break) were utilized to generate statistics concerning any possible statistical significance found in the relations between post-secondary persistence and dual enrollment course participation. CUMCRED was a contrived variable, created by adding earned college credits from the years 1992-93 and 1993-94 (the first two years of post-secondary attendance for students who entered directly after high school). Students who had earned at least 50 hours of post-secondary credit by the end of 1994 met the threshold mark for this variable. Four logistic regression equations were developed from the causal model (see Figure 3.1). Two equations evaluated the total effect of these post-secondary persistence variables upon dual enrollment participation, controlling for demographic and high school variables (parts 1 and 2 of the causal model). The other two equations evaluated the direct effect of post-secondary persistence variables upon dual enrollment participation, controlling for demographic, high school and college variables (parts 1, 2 and 3 of the causal model). The results of logistic equations #10 thru #13 are found in Tables 4.16 thru 4.19.

Neither of the equations using CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year) as a dependent variable produced statistically significant logistic regression estimates for the main independent variable DEPARTIC (dual enrollment participant) (see Tables 4.16 and 4.17a). In all cases, estimates registered negative values and were small in size. From these results, it appears that participation in dual enrollment programs, without consideration of control variables, exerts little statistically significant impact on students earning the threshold level of 50 credits during their initial two post-secondary years.

Several control variables, however, produced statistically significant estimates for the dependent variable, CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year). Especially notable were the large negative estimates, significant at the $p < .001$ level, for first generation students. Delta-p statistics indicated that first generation students were 23.2% and 13.5% less likely than non-first generation students to earn 50 or more post-secondary credits by the end of 1993, as noted in steps 2 and 3 of the logistic regression model (see Table 4.16). Step 3 of the model (high school

Table 4.16. Model #10 - Total Effects of Dual Enrollment Participation on CUMCRED (Cumulative credits of 50 or more by the end of the second post-secondary year)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Cumulative credits of 50 or more	.237		.057***	.076		.019	-.408		-.102						
by the end of the second year	(.066)			(.240)			(.388)								
Primary Independent Variable															
Dual Enrollment Participant	-.039		-.010	-.016		.004	-.045		-.011						
	(.220)			(.223)			(.311)								
Demographics															
Male				.164		.040	.083		.020						
				(.131)			(.158)								
Hispanic				-.085		-.021	-.214		-.053						
				(.170)			(.217)								
Asian Pacific Islander				.510	1.665	.120*	.514		.120						
				(.2220			(.378)								
Black				.134		.033	.726		.165						
				(.260)			(.411)								
English is First Language				.053		.013	.357		.085						
				(.185)			(.259)								
Urban High School				.220		.053	-.075		-.019						
				(.161)			(.207)								
Rural High School				.097		.024	-.042		-.010						
				(.153)			(.182)								
First Generation Student				-.960	.383	-.232***	-.625	.535	-.155***						
				(.142)			(.171)								
Socioeconomic Quintile 1				-.424	.654	.101*	.080		.020						
				(.213)			(.268)								
Socioeconomic Quintile 2				.308		.074	.040		.010						
				(.188)			(.250)								
Socioeconomic Quintile 4				.262		.063	.317		.076						
				(.202)			(.237)								
Socioeconomic Quintile 5				.137		.034	.174		.042						
				(.169)			(.2110								
High School Variables															
Expectations are less than BA							-1.052	.349	-.252***						
							(.233)								
Expectations are raised to BA							-.0587	.556	-.015**						
							(.205)								
AP Class/Test Participant							.738	2.091	.167**						
							(.294)								
HS Rigor Quintile 1							-.817	.442	-.20*						
							(.402)								
HS Rigor Quintile 2							-.153		-.038						
							(.258)								
HS Rigor Quintile 4							.485	1.624	.114*						
							(.234)								

Table 4.16. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								**.987**	**2.683**	**.214*****						
								(.228)								
Senior Test Quintile 1								.221		.054						
								(.311)								
Senior Test Quintile 2								.093		.023						
								(.238)								
Senior Test Quintile 4								.209		.051						
								(.214)								
Senior Test Quintile 5								-.100		-.025						
								(.214)								
Class Rank/GPA Quintile 1								**-.778**	**.459**	**-.191****						
								(.264)								
Class Rank/GPA Quintile 2								-.071		-.018						
								(.257)								
Class Rank/GPA Quintile 4								**.500**	**1.649**	**.118****						
								(.202)								
Class Rank/GPA Quintile 5								**1.321**	**3.747**	**.268*****						
								(.207)								
Model Statistics	**Step 0**															
Model N	3564	3564			3250			2450								
"-2 Log L"	2451.290	2451.230			2113.870			1156.620								
R_L^2					.138			.528								
df		1			13			28								
Mean of DV	.558															

****p* < .001, ***p* < .01, **p* < .05

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

Table 4.17. Model #11 - Direct Effects of Dual Enrollment Participation on CUMCRED (Cumulative credits of 50 or more by the end of the second post-secondary year)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Cumulative credits of 50 or more	**.230**		**.056*****	.058		.014	-.408		-.102	**-1.905**		**-.400****			
by the end of the second year	(.065)			(.236)			(.388)			(.789)					
Primary Independent Variable															
Dual Enrollment Participant	-.041		-.010	-.020		-.005	-.045		-.011	-.108		-.027			
	(.217)			(.218)			(.311)			(.315)					
Demographics															
Male				.143		.035	.083		.020	.066		.0162			
				(.129)			(.158)			(.164)					
Hispanic				-.100		-.025	-.214		-.053	-.345		-.086			
				(.167)			(.217)			(.233)					
Asian Pacific Islander				**.515**	**1.674**	**.121***	.514		.121	.504		.1186			
				(.221)			(.378)			(.480)					
Black				.132		.032	.726		.165	.712		.163			
				(.260)			(.411)			(.431)					
English is First Language				.085		.021	.357		.085	.442		.105			
				(.182)			(.259)			(.309)					
Urban High School				.232		.056	-.075		-.019	-.067		-.012			
				(.160)			(.207)			(.230)					
Rural High School				.110		.027	-.042		-.010	-.136		-.034			
				(.151)			(.182)			(.182)					
First Generation Student				**-.975**	**.377**	**-.235*****	**-.625**	**.535**	**-.155*****	**-.374**	**.688**	**-.093***			
				(.141)			(.171)			(.177)					
Socioeconomic Quintile 1				**-.433**	**.649**	**-.108***	.080		.020	-.147		-.037			
				(.212)		-.053	(.268)			(.266)					
Socioeconomic Quintile 2				(.185)			.04		.099	-.190		-.047			
				.233		.057	(.250)			(.281)					
Socioeconomic Quintile 4				(.198)			.317		.076	.054		.0133			
				.134		.033	(.237)			(.232)					
Socioeconomic Quintile 5				(.167)			.174		.042	.072		.018			
							(.211)			(.230)					
High School Variables															
Expectations are less than BA							**-1.052**	**.349**	**-.252*****	**-.655**	**.519**	**-.162****			
							(.233)			(.260)					
Expectations are raised to BA							**-.587**	**.556**	**-.146****	**-.462**	**.630**	**-.115***			
							(.205)			(.214)					
AP Class/Test Participant							**.738**	**2.091**	**.168****	**.851**	**2.342**	**.190****			
							(.294)			(.339)					
HS Rigor Quintile 1							**-.817**	**.442**	**-.200***	-.439		-.109			
							(.402)			(.406)					
HS Rigor Quintile 2							-.153		-.038	.099		.024			
							(.258)			(.262)					
HS Rigor Quintile 4							**.485**	**1.624**	**.114***	**.553**	**1.738**	**.129****			
							(.234)			(.231)					

Table 4.17. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								**.987**	**2.683**	**.215*****	**1.068**	**2.910**	**.229*****			
								(.228)			(.230)					
Senior Test Quintile 1								.221		.054	.047		.012			
								(.311)			(.361)					
Senior Test Quintile 2								.093		.023	.075		.018			
								(.238)			(.252)					
Senior Test Quintile 4								.209		.051	.125		.031			
								(.214)			(.214)					
Senior Test Quintile 5								-.100		-.025	-.092		-.023			
								(.214)			(.259)					
Class Rank/GPA Quintile 1								**-.778**	**.459**	**-.191****	**-.694**	**.500**	**-.171****			
								(.264)			(.295)					
Class Rank/GPA Quintile 2								-.071		-.018	-.183		-.046			
								(.257)			(.273)					
Class Rank/GPA Quintile 4								**.500**	**1.649**	**.120****	**.492**	**1.636**	**.116***			
								(.202)			(.211)					
Class Rank/GPA Quintile 5								**1.321**	**3.747**	**.268*****	**1.316**	**3.728**	**.268*****			
								(.207)			(.211)					
College Variables																
Credits Earned by Examination											-.168		-.042			
											(.270)					
Earned 20 or more credits by end of year 1											.214		.052			
											(.202)					
No Delay in entering post-secondary after high school											-.073		-.018			
											(.273)					
1st year GPA of 2.88 or above											-.019		-.005			
											(.167)					
Ever attended a four-year college											**1.107**	**3.025**	**.235*****			
											(.192)					
College of first attendance was a four-year school											.281		.068			
											(.587)					
First college was selective											.256		.062			
											(.256)					
First college was an open door school											.530		.124			
											(.605)					
Model Statistics	**Step 0**															
Model N	3614	3614			3284			2450			2170					
"-2 Log L"	2489.350	2489.280			2139.510			1157.470			966.682					
R_L^2					.141			.535			.612					
df		1			13			28			36					
Mean of DV	.556															

Table 4.17. Continued

***$p < .001$, **$p < .01$, *$p < .05$		
Standard errors in parenthesis below the Estimate		
Only significant ExpB statistics shown		
DV = Dependent Variable		

Table 4.18. Model #12 - Total Effects of Dual Enrollment Participation on NOSTOP (Continuous enrollment with no more than one semester break)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable	.379		.086***	.131		.031	-.548		-.135						
Continuous enrollment with no more	(.057)			(.222)			(.352)								
than one semester break															
Primary Independent Variable	.498	1.645	.111**	.506	1.659	.113**	.473	1.605	.106*						
Dual Enrollment Participant	(.173)			(.197)			(.218)								
Demographics				-.148		-.036	-.362	.696	-.089**						
Male				(.118)			(.123)								
				-.503	.605	-.124**	-.527	.590	-.130*						
Hispanic				(.179)			(.237)								
				.123		.029	.466		.105						
Asian Pacific Islander				(.270)			(.301)								
				-.521	.594	-.129**	-.188		-.046						
Black				(.196)			(.230)								
				.133		.031	.267		.062						
English is First Language				(.181)			(.212)								
				.202		.047	.154		.036						
Urban High School				(.148)			(.160)								
				.073		.017	.056		.013						
Rural High School				(.149)			(.170)								
				.171		.040	.218		.051						
First Generation Student				(.125)			(.153)								
				-.493	.611	-.122**	-.254		-.062						
Socioeconomic Quintile 1				(.197)			(.222)								
				-.180		-.044	-.087		-.021						
Socioeconomic Quintile 2				(.170)			(.182)								
				.145		.034	.286		.066						
Socioeconomic Quintile 4				(.178)			(.190)								
				.962	1.196	.196***	.907	2.477	.187***						
Socioeconomic Quintile 5				(.179)			(.188)								
High School Variables							.315		.072						
Expectations are less than BA							(.197)								
							.132		.031						
Expectations are raised to BA							(.191)								
							-.031		-.007						
AP Class/Test Participant							(.200)								
							.061		.015						
HS Rigor Quintile 1							(.289)								
							.586	1.797	.129**						
HS Rigor Quintile 2							(.213)								
							.198		.046						
HS Rigor Quintile 4							(.223)								

Table 4.18. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								.081		.019						
								(.239)								
Senior Test Quintile 1								**-.989**	**.372**	**-.242*** **						
								(.255)								
Senior Test Quintile 2								-.165		-.040						
								(.191)								
Senior Test Quintile 4								.196		.046						
								(.192)								
Senior Test Quintile 5								**.694**	**2.00**	**.149*** **						
								(.208)								
Class Rank/GPA Quintile 1								.194		.045						
								(.239)								
Class Rank/GPA Quintile 2								.265		.061						
								(.251)								
Class Rank/GPA Quintile 4								**.670**	**1.954**	**.145** **						
								(.222)								
Class Rank/GPA Quintile 5								**.566**	**1.761**	**.125** **						
								(.216)								
Model Statistics	**Step 0**															
Model N	4424	4424			3997			2938								
"-2 Log L"	2969.340	2958.760			2489.080			1607.420								
R_L^2					.162			.459								
df		1			13			28								
Mean of DV	.604															

****p* < .001, ***p* < .01, **p* < .05	
Standard errors in parenthesis below the Estimate	
Only significant ExpB statistics shown	
DV = Dependent Variable	

Table 4.19. Model #13 - Direct Effects of Dual Enrollment Participation on NOSTOP (Continuous enrollment with no more than one semester break)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Continuous enrollment with no more	**.378**		**.086*****	.059		.014	-.548		-.135	-2.647		-.5069			
than one semester break	(.057)			(.218)			(.352)			(.750)					
Primary Independent Variable															
Dual Enrollment Participant	**.512**	**1.67**	**.114****	**.520**	**1.682**	**.115****	**.473**	**1.605**	**.106***	.229		.053			
	(.170)			(.195)			(.218)			(.299)					
Demographics															
Male				-.152		-.037	**-.362**	**.696**	**-.089****	-.265		-.065			
				(.117)			(.123)			(.148)					
Hispanic				**-.458**	**.633**	**-.113****	**-.527**	**.590**	**-.130***	-.448		-.110			
				(.176)			(.237)			(.265)					
Asian Pacific Islander				.139		.033	.466		.104	.279		.064			
				(.269)			(.301)			(.353)					
Black				**-.517**	**.596**	**-.128****	-.188		-.046	-.433		-.107			
				(.196)			(.230)			(.286)					
English is First Language				.193		.045	.267		.062	.384		.087			
				(.179)			(.212)			(.236)					
Urban High School				.202		.047	.154		.036	-.119		-.029			
				(.146)			(.160)			(.205)					
Rural High School				.084		.020	.056		.013	-.186		-.045			
				(.148)			(.170)			(.182)					
First Generation Student				.192		.045	.218		.051	.068		.016			
				(.124)			(.153)			(.185)					
Socioeconomic Quintile 1				**-.486**	**.615**	**-.120****	-.254		-.062	-.166		-.040			
				(.194)			(.222)			(.265)					
Socioeconomic Quintile 2				-.177		-.043	-.087		-.021	.077		.018			
				(.167)			(.182)			(.250)					
Socioeconomic Quintile 4				.143		.034	.286		.066	.119		.028			
				(.176)			(.190)			(.204)					
Socioeconomic Quintile 5				**.978**	**2.659**	**.198*****	**.907**	**2.477**	**.187*****	.357		.081			
				(.178)			(.188)			(.241)					
High School Variables															
Expectations are less than BA							.315		.072	.244		.057			
							(.197)			(.222)					
Expectations are raised to BA							.132		.031	.018		.004			
							(.191)			(.227)					
AP Class/Test Participant							-.031		-.007	-.108		-.026			
							(.200)			(.234)					
HS Rigor Quintile 1							.061		.015	.401		.091			
							(.289)			(.320)					
HS Rigor Quintile 2							**.586**	**2.797**	**.129****	**.789**	**2.201**	**.166*****			
							(.213)			(.243)					
HS Rigor Quintile 4							.198		.046	.200		.0467			
							(.223)			(.247)					

Table 4.19. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								.081		.019	.025		.006			
								(.239)			(.259)					
Senior Test Quintile 1								-.989	.372	-.242***	-.218		-.053			
								(.255)			(.340)					
Senior Test Quintile 2								-.165		.040	-.147		-.036			
								(.191)			(.229)					
Senior Test Quintile 4								.196		.046	-.217		-.053			
								(.192)			(.226)					
Senior Test Quintile 5								.694	2.00	.149***	-.285		-.070			
								(.208)			(.293)					
Class Rank/GPA Quintile 1								.194		.045	-.004		-.001			
								(.239)			(.316)					
Class Rank/GPA Quintile 2								.265		.061	.241		.056			
								(.251)			(.259)					
Class Rank/GPA Quintile 4								.670	1.954	.145**	.646	1.908	.140**			
								(.222)			(.259)					
Class Rank/GPA Quintile 5								.566	1.761	.125**	.472	1.603	.106*			
								(.216)			(.246)					
College Variables																
Credits Earned by Examination											.097		.023			
											(.382)					
Earned 20 or more credits by end of first year											1.648	5.197	.284***			
											(.167)					
No Delay in entering post-secondary after high school											.787	2.197	.166***			
											(.223)					
First year GPA of 2.88 or above											.388	1.474	.088*			
											(.174)					
Ever attended a four-year college											.193		.045			
											(.207)					
College of first attendance was a four-year school											1.17		.227			
											(.603)					
First college was selective											.451		.101			
											(.298)					
First college was an open door school											.805		.169			
											(.629)					
Model Statistics	Step 0															
Model N	4490	4490			4041			2938			2258					
"-2 Log L"	3013.060	3001.690			2520.900			1607.490			1020.380					
R_L^2					.163			.466			.661					
df		1			13			28			36					
Mean of DV	.605															

Table 4.19. Continued

*** $p < .001$, ** $p < .01$, * $p < .05$		
Standard errors in parenthesis below the Estimate		
Only significant ExpB statistics shown		
DV = Dependent Variable		

variables) produced far more statistically significant results than did the demographic variables. When compared to students who had consistently aspired to earn a bachelor's degree, negative estimates were produced for students whose hopes for a BA either were raised from a lesser outcome or were lowered from a BA. Students whose aspirations were lower than a bachelor's degree were 25.2% less likely to earn the threshold level of cumulative credits than students who consistently desired such a degree. Even more dramatic, the log odds of a student with aspirations of less than a BA earning 50 or more post-secondary credits by the end of the second year of education were 65.1% lower than students whose goal included earning a bachelor's degree.

High school course loads and resultant class rank/GPA scores indicated positive and statistically significant relationships to earning 50 or more credits by the end of the second post-secondary year for students who ranked in the top two quintiles of both HSRIGOR (high school academic rigor quintiles) and RANK (class rank and GPA quintiles). As compared with students in the third quintile of both variables, students in the top quintile were at least 20% more likely to achieve the threshold 50 credit level. Students at the lowest end of the quintile ranking were 20% less likely to meet the same threshold. Advanced placement students also showed significant results, which suggested that participation in AP classes or taking AP tests may result in increasing the odds of meeting the 50 credit standard by 2.091 fold.

The fourth step (college control variables) in the CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year) direct effects model (see Table 4.17) showed that first generation students continued to significantly fail to meet the post-secondary credits standard, although the level of significance and the estimates decreased. Educational expectations continued to register significant and negative results for students with aspirations less than a bachelor's degree, compared to the reference group of students who consistently aspired to a bachelor's degree. Advanced placement class participation produced a delta-*p* statistic showing 19.0% greater likelihood of meeting the 50 credit standard in the fourth step of the model. High quintiles of high school rigor and class rank continued to be statistically significance at nearly the same level as found in step 3. The only college variable in step four to show significance was FOURYR (ever attended a four-year college), with a high estimate statistic of 1.107 and delta-*p* result showing 23.5% increased likelihood of earning 50 or more credits ($p < .001$).

The dependent variable NOSTOP (continuous enrollment with no more than one semester break) generated positive estimates for dual enrollment participants in both the total and direct effects models (see Tables 4.18 and 4.19). Additionally, Chi-square statistics generated through cross tabulations indicated a statistically significance difference in the percent of the sample that continually enrolled in post-secondary education. Dual enrollment students met the standard for NOSTOP at statistically significant greater rates than those who were not participants ($p < .05$). All parameter estimates for DEPARTIC were statistically significant, except step four in model #13. Considering first the total effect model for NOSTOP, several demographic variables introduced in step 2 produced statistically significant results. Compared to White students, both Black and Hispanic students yielded negative estimates and delta-*p* statistics in step 2 of the model. Statistics indicated that students in these racial groups were at least 12% less likely to continuously enroll in post-secondary education.

Hispanic students' results continued to show significantly decreased odds at persistence in this 3rd step of the equation. In the fourth step, Hispanic students estimates remained negative, but failed to reach the threshold of statistical significance. Socioeconomic status seemed to play a significant role in continuous enrollment. In the first step, students in SES quintile 1 demonstrated decreased likelihoods of continuous enrollment at levels very nearly the same as Black and Hispanic students. However, students whose economic status ranked in the 5th quintile produced strong positive log odds and strong delta-*p* statistics in steps 2 and 3 of the model equation when compared to students in the third SES quintile. Students in SES5 were nearly 20% more likely to enroll continuously than were students in the 3rd quintile. Significant negative results were generated by students in the first quintile of high school academic rigor, when compared to those in the third quintile. The HSRIGOR1 (high school academic rigor quintile 1) students were 24.2% less likely to continuously enroll in post-secondary school. Not unlike the results for CUMCRED (cumulative credits of 50 or more by the end of the second year of post-secondary education), the highest two levels of RANK (class rank/GPA quintiles) produced positive and statistically significant results, as did the highest quintile of the SATACT (senior test score quintiles) variable.

Adding the college variables in step 4 of the direct effects model (see Table 4.19) for NOSTOP (continuous enrollment with no more than one semester break) impacted the demographic variables in a way that removed all statistical significance from their contributions to the model. High school variables, RANK4 (class rank/GPA quintile 4) and RANK5 (class rank/GPA quintile 5), continued their positive and statistically significant influence into the last step of the model. Interestingly, HSRIGOR2 (high school academic rigor quintile 2) also yielded positive and statistically significant estimates to the third and fourth models, compared to students in the 3rd quintile of this variable. Earning at least 20 credits by the end of the first post-secondary year suggests no statistically significant estimates with CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year), but shows significance with NOSTOP. For students who earned twenty credits by the end of 1992-93 (CREDMOM – earned 20 or more credits by the end of the first post-secondary year), the odds of continual enrollment were 5.197 times higher than for those who did not earn the credits. Similarly, students who did not delay entry to post-secondary school (NODELAY) were 16.6% more likely to be continuously enrolled than those who waited beyond 7 months after high school graduation to enter college. Estimates generated by these two college variables, CREDMOM and NODELAY, were significant to the $p < .001$ level. First year grade point average (GPA1YR) also generated positive and significant results, but to a greatly reduced degree of power.

The first research question asked if participation in dual enrollment programs affects students' persistence in post-secondary education. The variable, DEPARTIC (dual enrollment participation) generated small and negative estimates for the dependent variable CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year) (see Tables 4.16 and 4.17). Cross-tabulations of the variable DEPARTIC for participants and non-participants showed a greater percentage of the sample population of dual enrollment participants than non-participants who had earned the threshold level of 50 credits by the end of the second year (58.5% versus 54.4%). However, the logistic regression results failed to show that this difference was statistically significant, as participation in dual enrollment seems to fall short as a contributing factor in earning those 50 or more credits by the end of the second year. The variable NOSTOP (continuous enrollment with no more than one semester break), however, demonstrated a statistically significant connection to DEPARTIC. Cross-tabulations revealed that 69.9% of all sampled dual enrollment participants met the standard for continual enrollment, against 64.1% of non-participants. DE students continually enrolled at statistically significant greater rates than non-participants ($p < .05$). Additionally, in all but the fourth step of the direct effects model for the variable NOSTOP (log model #13), dual enrollment participation yielded positive estimates at the $p < .01$ and $p < .05$ levels of significance (see Tables 4.18 and 4.19). Odds ratios for the independent variables are explained in Table 4.14 and demonstrated consistently increased odds of continual enrollment for students participating in dual enrollment programs against those who do not participate. The loss of statistical significance with the addition of college variables in the final step of the direct effects model for NOSTOP (continuous enrollment with no more than one semester break) suggests that dual enrollment participation contributed significantly to continual enrollment in college at the time just before official college enrollment begins - the high school years. Therefore, dual enrollment participation may lay the groundwork for students to persist into the second year in college. And, while not always statistically significant, the effects of dual enrollment participation were evident in the percentage of participants who persisted to the second year through credit momentum.

Answer to Research Question #2

Do students who have participated in dual enrollment programs have shorter time to degree periods than those who are not dual enrollment participants?

The variable BACHTME (elapsed time from post-secondary entry to bachelor's degree) was utilized to evaluate the relations between dual enrollment participation and time to degree. Originally a continuous variable, BACHTME was recoded into BATIME (elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less) as 1, for cases whose transcripts indicated a degree was awarded 4.56 years or less from first enrollment in post-secondary education, and as 0 for all others whose degree was granted after 4.56 years. By its very nature, missing cases for this variable reflect not only missing information from transcripts, but participants who did not complete a degree. Missing data for this particular variable represented 54.2% of the 4514 cases in this research. Of the number of possible cases available, 24.6% met the standard and 21.2% required more time to complete their programs. Students whose degree was not a BA, such as those who earned associate in arts degrees or certificates, were also excluded from BACHTME (elapsed time from post-secondary entry to bachelor's degree). According to the frequencies for the variable HDEG (highest degree earned), 564 students had earned a certificate or an AA degree in the analytic sample.

Two logistic regression equations were developed from the original causal model (see Figure 3.1). One equation evaluated the total effects of BATIME (elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less) on the primary independent variable, DEPARTIC (dual enrollment participant), and the demographic and high school control variables, entered in steps 2 and 3 of the stepwise logistic model (see Table 4.20). The second equation evaluated the direct effects of BATIME and utilized a five-step logistic regression process (see Table 4.21). As has been noted previously, regression equations with BATIME utilized the smallest number of cases of any of the twenty-one models in this research. However, the amount of cases analyzed fell only slightly below the minimum recommended amount only within step 5 of the direct effects model equation. Standard errors increased as more variables entered the equations, but are in the range comparable to or smaller than those produced in "The Toolbox Revisited" (Adelman, 2006). These effects were most notably in evidence in the direct effects model (see Table 4.21). As more variables entered the equation, the negative estimates for BATIME intensified from -.302 in step 3 to -2.677 in step 4. Standard errors increased accordingly from .421 in step 3 to 1.315 in step 4. Several control variables in these last two steps also registered large standard errors. However, these errors were proportionally similar to those produced in the direct effects models for GRAD (earned graduate credits or advanced degree) and CERTAA (earned certificate or AA degree).

Considering both the direct and total effects models, step 1 of each equation produced positive estimates for the primary independent variable, DEPARTIC (dual enrollment participation) and the dependent variable, BATIME (elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less). However, this direct relationship was not statistically significant. In each of the subsequent steps of the two logistic models, parameter estimates were not significant and negative, with one exception, step 4 of the direct effects model, which yielded significant results to the $p < .05$ level. For this analytic sample, participation in dual enrollment programs exerted

Table 4.20. Model #14 - Total Effects of Dual Enrollment Participation on BATIME (Elapsed time to bachelor's degree is 4.56 years or less)

	Step 1 Estimate	ExpB	Delta-*p*	**Step 2** Estimate	ExpB	Delta-*p*	**Step 3** Estimate	ExpB	Delta-*p*	**Step 4** Estimate	ExpB	Delta-*p*	**Step 5** Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Elapsed time to BA is 4.56 years or less	.018		.005	-.145		.036	-.302		-.075						
	(.075)			(.315)			(.421)								
Primary Independent Variable															
Dual Enrollment Participant	.108		.027	-.197		-.049	-.328		-.081						
	(.231)			(.251)			(.261)								
Demographics															
Male				**-.403**	**.668**	**-.100****	**-.601**	**.548**	**-.147*****						
				(.145)			(.176)								
Hispanic				**-.963**	**.382**	**-.225*****	**-1.071**	**.343**	**-.247****						
				(.271)			(.337)								
Asian Pacific Islander				.140		.035	.203		.051						
				(.209)			(.250)								
Black				-.537		-.132	.175		.044						
				(.379)			(.386)								
English is First Language				.105		.026	.112		.028						
				(.242)			(.266)								
Urban High School				.186		.046	.160		.040						
				(.190)			(.191)								
Rural High School				-.087		-.022	-.118		-.030						
				(.166)			(.187)								
First Generation Student				.189		.047	.012		.003						
				(.162)			(.186)								
Socioeconomic Quintile 1				-.507		-.125	-.600		-.146						
				(.379)			(.478)								
Socioeconomic Quintile 2				.049		.012	.061		.015						
				(.305)			(.324)								
Socioeconomic Quintile 4				.178		.044	.266		.066						
				(.238)			(.258)								
Socioeconomic Quintile 5				**.494**	**1.639**	**.121****	**.466**	**1.594**	**.114***						
				(.190)			(.199)								
High School Variables															
Expectations are less than BA							-.219		-.055						
							(.233)								
Expectations are raised to BA							-.161		-.040						
							(.254)								
AP Class/Test Participant							-.155		-.039						
							(.290)								
HS Rigor Quintile 1							-.027		-.007						
							(.272)								
HS Rigor Quintile 2							-.007		-.002						
							(.256)								
HS Rigor Quintile 4							-.231		-.058						
							(.269)								

Table 4.20. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								**-.675**	**.509**	**-.163***						
								(.307)								
Senior Test Quintile 1								**-1.426**	**.240**	**-.309****						
								(.565)								
Senior Test Quintile 2								**-1.646**	**.193**	**-.342****						
								(.533)								
Senior Test Quintile 4								.344		.085						
								(.252)								
Senior Test Quintile 5								.997	2.710	**.229*****						
								(.242)								
Class Rank/GPA Quintile 1								-.212		-.053						
								(.271)								
Class Rank/GPA Quintile 2								.449		.110						
								(.253)								
Class Rank/GPA Quintile 4								.198		.049						
								(.287)								
Class Rank/GPA Quintile 5								**.530**	**1.700**	**.129***						
								(.241)								
Model Statistics	**Step 0**															
Model N	2037	2037			1843			1429								
"-2 Log L"	1244.100	1243.860			1062.630			732.533								
R_L^2					.146			.411								
df		1			13			28								
Mean of DV	.507															

***$p < .001$, **$p < .01$, *$p < .05$

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

Table 4.21. Model #15 - Direct Effects of Dual Enrollment Participation on BATIME (Elapsed time to bachelor's degree is 4.56 years or less)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Elapsed time to BA is 4.56 years	.007		.002	-.142		-.036	-.302		-.075	**-2.677**		**-.440***	**-5.097**		**-.499*****
or less	(.075)			(.312)			(.421)			(1.315)			(1.477)		
Primary Independent Variable															
Dual Enrollment Participant	.138		.034	-.184		-.046	-.328		-.081	**-.664**	**.515**	**-.161***	-.596		-.145
	(.229)			(.251)			(.261)			(.310)			(.331)		
Demographics															
Male				**-.427**	**.652**	**-.105****	**-.601**	**.548**	**-.146*****	**-.437**	**.646**	**-.108***	**-.464**	**.629**	**-.114***
				(.145)			(.176)			(.199)			(.214)		
Hispanic				**-.981**	**.375**	**-.228*****	**-1.071**	**.343**	**-.246****	**-1.11**	**.330**	**-.254*****	**-.840**	**.432**	**-.199***
				(.266)			(.337)			(.314)			(.382)		
Asian Pacific Islander				.133		.033	.203		.051	-.075		-.19	-.101		-.025
				(.208)			(.250)			(.331)			(.344)		
Black				-.540		-.132	.175		.044	-.317		-.079	-.231		-.058
				(.381)			(.386)			(.383)			(.391)		
English is First Language				.140		.035	.112		.028	.098		.025	.220		.055
				(.240)			(.266)			(.274)			(.274)		
Urban High School				.192		.048	.160		.040	.213		.053	.132		.033
				(.189)			(.191)			(.220)			(.236)		
Rural High School				-.085		-.021	-.118		-.030	-.281		-.070	-.153		-.038
				(.166)			(.187)			(.236)			(.243)		
First Generation Student				.155		.0386	.012		.003	.288		.071	.345		.085
				(.162)			(.186)			(.219)			(.229)		
Socioeconomic Quintile 1				-.522		-.128	-.600		-.146	-.023		-.006	-.082		-.021
				(.377)			(.478)			(.478)			(.466)		
Socioeconomic Quintile 2				.052		.013	.061		.015	.329		.081	.127		.032
				(.300)			(.324)			(.362)			(.382)		
Socioeconomic Quintile 4				.137		.034	.266		.066	.416		.102	.360		.089
				(.238)			(.258)			(.289)			(.300)		
Socioeconomic Quintile 5				**.478**	**1.613**	**.117****	**.466**	**1.594**	**.114****	**.432**	**1.540**	**.106***	.387		.095
				(.189)			(.199)			(.218)			(.228)		
High School Variables															
Expectations are less than BA							-.219		-.055	.008		.002	.221		.055
							(.233)			(.276)			(.289)		
Expectations are raised to BA							-.161		-.040	-.326		-.091	-.269		-.067
							(.254)			(.275)			(.290)		
AP Class/Test Participant							-.155		-.039	-.423		-.104	-.451		-.111
							(.290)			(.303)			(.312)		
HS Rigor Quintile 1							-.027		-.007	-.209		-.052	-.249		-.062
							(.272)			(.327)			(.349)		
HS Rigor Quintile 2							-.007		-.002	.176		.044	.037		.009
							(.256)			(.289)			(.307)		
HS Rigor Quintile 4							-.231		-.058	-.191		-.048	-.223		-.056
							(.269)			(.332)			(.354)		

Table 4.21. Continued

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5							-.675	.509	-.163*	-.508		-.125	-.558		-.136
							(.307)			(.348)			(.365)		
Senior Test Quintile 1							-1.426	.240	-.308**	-1.763	.172	-.356**	-1.734	.177	-.353**
							(.565)			(.713)			(.697)		
Senior Test Quintile 2							-1.646	.193	-.341**	-1.74		-.353	-1.79	.167	-.360**
							(.533)			(.576)			(.598)		
Senior Test Quintile 4							.344		-.085	-.161		-.040	-.190		-.047
							(.252)			(.287)			(.291)		
Senior Test Quintile 5							.997	2.710	.229***	.124		.031	.193		.490
							(.242)			(.272)			(.277)		
Class Rank/GPA Quintile 1							-.212		-.053	-.053		-.013	-.040		-.010
							(.271)			(.324)			(.345)		
Class Rank/GPA Quintile 2							.449		.110	.479		.117	.353		.087
							(.253)			(.298)			(.309)		
Class Rank/GPA Quintile 4							.198		.049	.046		.012	-.020		-.005
							(.287)			(.293)			(.306)		
Class Rank/GPA Quintile 5							.530	1.699	.129*	.426		.105	.363		.090
							(.241)			(.251)			(.265)		
College Variables															
Credits Earned by Examination										.106		.027	.028		.007
										(.278)			(.284)		
Earned 20 or more credits by end of first year										2.042	7.706	.382***	1.801	6.056	.356***
										(.446)			(.460)		
No Delay in entering post-secondary after high school										.243		.060	.218		.054
										(.693)			(.718)		
First year GPA of 2.88 or above										1.074	2.927	.244***	1.086	2.962	.246***
										(.183)			(.192)		
Ever attended a four-year college										.337		.083	.406		.100
										(.242)			(.264)		
College of first attendance was four-year school										-.037		-.009	.077		.019
										(1.03)			(1.046)		
First college was selective										.370		.091	.422		.104
										(.247)			(.255)		
First college was an open door school										-1.352		-.296	-1.178		-.266
										(1.07)			(1.084)		
Post-secondary Variables															
Cumulative credits of 50 or more by the end of the second year													.200		.050
													(.218)		
Continuous enrollment with no more than one semester break													2.395	10.968	.413**
													(.774)		

Table 4.21. Continued

Model Statistics	Step 0	Step 1	Step 2	Step 3	Step 4	Step 5
Model N	2066	2066	1858	1429	1157	1102
"-2 Log L"	1263.900	1263.500	1073.740	731.725	520.357	486.182
R_L^2			.150	.421	.588	.615
df		1	13	28	36	38
Mean of DV	.505					

***$p < .001$, **$p < .01$, *$p < .05$

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

little positive and more negative impact on time to degree for those students who received bachelor's degrees.

When compared to their reference groups (female and White students), the direct and total logistic models for BATIME (elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less) produced significantly negative estimates for male and Hispanic students. Decreased likelihoods of Hispanic students graduate with a BA in 4.56 years compared to White students – between 25.4% and 19.9%. Male students demonstrated lower likelihoods of earning a BA in 4.56 years or less as compared to female students – between 14.6% and 10.5%. Including high school, college and post-secondary control variables resulted in changes to the negative estimates produced by these two demographic variables, but not in any way that was consistent with the steps of the two models. Another demographic variable, which produced statistically significant results for time to degree, was membership in the highest socioeconomic quintile. As compared to students in the third quintile, students in the fifth quintile showed positive and strong relationships to meeting the BATIME threshold through step 4 of the direct model #15 (see Table 4.21) and in steps 2 and 3 of the total effects model #14 (see Table 4.20). Only when post-secondary persistence variables were added to the model, did the statistical significance of the SES5 (socioeconomic quintile 5) variable decrease, but parameter estimates remained positive and showed a 9.5% greater likelihood of meeting the standard through delta-*p* statistics (see Table 4.21).

Step three of each model, the high school variables, yielded both positive and negative significant estimates. Students whose high school SAT or ACT scores were in the highest quintile and, to a lesser degree, students whose class rank or GPA also fell within the highest quintile, showed a greater likelihood of graduating with a BA in 4.56 years or less after high school. Particularly strong were the high school test estimates (SATACT5 – senior test quintile 5), generating a 22.9% greater likelihood than students in the third quintile SATACT of meeting the standard for time to degree (*p* < .001). On the other end of the test score spectrum, however, students whose scores fell within the lowest two quintiles registered negative estimates (in the 30-36% range) having a lower likelihood of meeting the BA elapsed time standard. More importantly, the statistically significant and positive parameters registered by class rank and SAT/ACT test scores were only evident in step 3 of the models, and lost their statistical power when college and post-secondary variables were added to the direct effects equation for BATIME (elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less). However, negative estimates produced by the lowest two quintiles of the senior test variable remained negative and statistically significant through the 4^{th} and 5^{th} steps of the direct model (see Table 4.21). One exception to this was the negative but not significant result in step 4 for cases in SATACT2 (senior test quintile 2).

When college variables were added to the direct effects BATIME (elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less) model in step 4 (see Table 4.21), two variables showed very strong estimates and statistical significance. CREDMOM (earned 20 or more credits by the end of the first year in post-secondary education) and GPA1YR (first year GPA of 2.88 or above) registered these positive results, which remained strong and equally as significant through step 5 of the model. Earning at least 20 credits by the end of the first calendar year of post-secondary school improved the odds of achieving a BA in 4.56 years or less by 7.706 and 6.056 times.

Likewise, earning a GPA of at least 2.88 increased the likelihood of achieving a BA in 4.56 years or less by more than 24%. Only NOSTOP (continuous enrollment with no more than one semester break), functioning in the direct effects model of BATIME as a post-secondary control variable, registered a larger ExpB ratio than GPA1YR. Although caution must be raised at the size of the standard error noted for NOSTOP in this model, the delta-*p* statistic shows that continual enrollment in college improves the likelihood of earning a BA by 41.3%.

The second research question inquired as to whether dual enrollment participation affects students time to degree. Cross tabulations showed that a slightly higher percentage of non-dual enrollment participants in the sample had met the threshold of 4.56 years to the BA degree than dual enrollment participants (see Table 3.7). Logistic regression within the two models created to evaluate BATIME (elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less) primarily indicated negative relations between DEPARTIC and BATIME, with very little statistical significance in evidence. Odds ratios for these two variables suggested a decrease in odds for a dual enrollment student to achieve a BA in the allotted time for BATIME, compared to non-participants (see Table 4.14). Describing students who participated in dual enrollment programs in relationship to attributes which produced positive and statistically significant estimates may improve our understanding of how to improve dual enrollment students' odds of meeting the BATIME standard. However, for students without these particular attributes, the data for this analytic sample suggested that dual enrollment participation on its own did not improve the statistical probability of earning a BA in less than an average time to degree.

Answer to Research Question #3

Do students who have participated in dual enrollment programs experience higher levels of college degree attainment than those who are not dual enrollment participants?

The variable, HDEG (highest degree earned) was recoded into four categories and then recoded again to the following types of degrees: certificate or associate in arts degree (CERTAA), bachelor's degree (BADEG), and graduate credits or advanced degree (GRAD). Not unlike BACHTIME (elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less), HDEG contained large numbers of missing cases, due to the fact that transcripts don't always show degree completion. The reality is that the percentage of the population that has completed a bachelor's degree continues to hover around 30% (Bergman, 2007, p. 1). Of the 4514 cases in the analytic sample, 1877 or 41.6% of the cases did not contain data for the HDEG variable. Frequencies revealed that 697 cases had received an advanced degree or earned graduate credits; 1376 had earned a bachelor's degree, and 564 had earned a certificate or associate in arts degree. Therefore, 2,637 cases were available for evaluation from the original 4514 in the analytic sample.

Two logistic model equations were developed for each of the degree attainment variables; one for total effects of each variable upon dual enrollment participation and another for direct effects of the same. As with BATIME (elapsed time from post-secondary entry to bachelor's degree is 4.56 years or less), the total effects models were developed using a three-step formula, while the direct effects models utilized a five-step sequential logistic regression approach.

Students whose highest academic achievement were associate in arts degrees or training certificates may possess different demographic attributes, and high school and college attributes from students whose aspirations were to achieve a bachelor's degree or beyond. This premise was evident in the parameter estimates generated by students who answered questions concerning the variable EDUANNEW (educational expectations), converted in this study to EDURBA (educational expectations are raised to a BA), EDULBA (educational expectations are lowered from a BA), and EDUBA (educational expectations are consistently to earn a BA). Therefore, the CERTAA (earned a certificate or associate in arts degree) regression models generated results of a different nature from those analyzed in the previous two research questions (see Tables 4.22 and 4.23). The dependent variable, CERTAA, when regressed with DEPARTIC (dual enrollment participant), yielded parameter estimates which were positive in all cases in both the direct and total effects models, but significant only in step 2 of the direct effects model (see Table 4.23). Dual enrollment participation increased the likelihood of earning an AA or a certificate by 13.8% ($p < .05$) over non-participants, when demographic variables were controlled. However, in step 2 of the total effects model, DEPARTIC was not statistically significant, and parameter estimates were slightly smaller yet continued positive (see Table 4.22). Another comparison of step 2 in the total and direct effects models demonstrates that in the total effects model, first generation students (NOCOLEX) generated a negative and statistically significant parameter estimate (b = -.416, $p < .05$), while in the direct effects model, the estimate remained negative, but not as strongly negative and not statistically significant (b = -.381). Demographic variables, entering at step 2, produced several noteworthy statistics for the CERTAA (earned a

Table 4.22. Model #16 - Total Effects of Dual Enrollment Participation on CERTAA (Received a certificate or associate in arts degree)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Received a certificate or	**-1.146**		-.1542***	-.755		-.1146*	-.215		-.038						
associate in arts degree	(.090)			(.392)			(.502)								
Primary Independent Variable															
Dual Enrollment Participant	.385		.0788	.567		.120	.614		.131						
	(.303)			(.324)			(.388)								
Demographics															
Male				.044		.008	.116		.022						
				(.185)			(.219)								
Hispanic				-.132		-.024	-.512		-.084						
				(.299)			(.372)								
Asian Pacific Islander				.349		.071	-.273		-.048						
				(.432)			(.561)								
Black				.032		.006	-.286		-.050						
				(.280)			(.350)								
English is First Language				.326		.066	.243		.048						
				(.372)			(.372)								
Urban High School				-.282		-.049	**-.541**	**.582**	**-.088***						
				(.226)			(.267)								
Rural High School				.074		.014	-.178		-.032						
				(.216)			(.231)								
First Generation Student				**-.416**	**.660**	**.070***	-.215		-.038						
				(.203)			(.223)								
Socioeconomic Quintile 1				**1.156**	**3.177**	**.264*****	**.853**	**2.347**	**.189****						
				(.281)			(.333)								
Socioeconomic Quintile 2				.204		.040	.088		.017						
				(.269)			(.272)								
Socioeconomic Quintile 4				**-.708**	**.493**	**-.109****	**-.871**	**.419**	**-.128****						
				(.238)			(.296)								
Socioeconomic Quintile 5				**-1.867**	**.155**	**-.201*****	**-1.789**	**.167**	**-.197*****						
				(.286)			(.311)								
High School Variables															
Expectations are less than BA							-.458		-.076						
							(.245)								
Expectations are raised to BA							.408		.084						
							(.334)								
AP Class/Test Participant							.432		.089						
							(.373)								
HS Rigor Quintile 1							**.683**	**1.980**	**.148***						
							(.351)								
HS Rigor Quintile 2							.436		.090						
							(.289)								

Table 4.22. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								**.796**	**2.217**	**.175****						
								(.325)								
Senior Test Quintile 1								**1.01**	**2.746**	**.228****						
								(.364)								
Senior Test Quintile 2								.134		.026						
								(.296)								
Senior Test Quintile 4								**-1.87**	**.154**	**-.201*****						
								(.297)								
Senior Test Quintile 5								**-1.993**	**.136**	**-.207*****						
								(.309)								
Class Rank/GPA Quintile 1								.514		.108						
								(.332)								
Class Rank/GPA Quintile 2								-.101		-.019						
								(.354)								
Class Rank/GPA Quintile 4								-.237		-.042						
								(.363)								
Class Rank/GPA Quintile 5								**-.894**	**.490**	**-.130****						
								(.367)								
Model Statistics	**Step 0**															
Model N	2595	2595			2351			1789								
"-2 Log L"	1349.810	1346.130			1024.720			638.498								
R_L^2					.241			.527								
df		1			13			28								
Mean of DV	.250															

***p < .001, **p < .01, *p < .05

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

Table 4.23. Model #17 - Direct Effects of Dual Enrollment Participation on CERTAA (Received certificate or associate in arts degree)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Received certificate or associate in	**-1.151**		**-.155*****	**-.778**		**-.117***	-.215		-.038	3.921		.694	5.08		**.732*****
arts degree	(.090)			(.383)			(.502)			(1.069)			(1.087)		
Primary Independent Variable															
Dual Enrollment Participant	.427		.088	**.641**	**1.898**	**.138***	.614		.131	.488		.102	.400		.082
	(.294)			(.319)			(.388)			(.346)			(.369)		
Demographics															
Male				.085		.016	.116		.022	.145		.028	.125		.024
				(.183)			(.219)			(.236)			(.260)		
Hispanic				-.055		-.010	-.512		-.084	-.647		-.102	**-1.007**	**.365**	**-.142****
				(.310)			(.372)			(.363)			(.383)		
Asian Pacific Islander				.333		.068	-.273		-.048	.209		.041	-.134		-.024
				(.432)			(.561)			(.510)			(.455)		
Black				.016		.003	.286		.057	-.011		-.002	.205		.040
				(.279)			(.350)			(.574)			(.639)		
English is First Language				.289		.058	.243		.048	-.011		-.002	.359		.073
				(.357)			(.372)			(.395)			(.377)		
Urban High School				-.223		-.040	**-.541**	**.582**	**-.088***	-.311		-.054	-.337		-.058
				(.225)			(.267)			(.305)			(.328)		
Rural High School				.081		.016	-.178		-.032	-.138		-.025	-.235		-.042
				(.217)			(.231)			(.277)			(.308)		
First Generation Student				-.381		-.065	-.215		-.038	-.162		-.029	-.105		-.019
				(.203)			(.223)			(.277)			(.304)		
Socioeconomic Quintile 1				**1.151**	**3.161**	**.263*****	**.853**	**2.347**	**.189****	.707		.153	.802		.176
				(.280)			(.333)			(.403)			(.446)		
Socioeconomic Quintile 2				.203		.040	.088		.017	.040		.008	.101		.019
				(.265)			(.272)			(.330)			(.372)		
Socioeconomic Quintile 4				**-.683**	**.505**	**-.106****	**-.871**	**.419**	**-.128****	**-.593**	**.880**	**-.095***	-.600		-.095
				(.235)			(.296)			(.297)			(.321)		
Socioeconomic Quintile 5				**-1.878**	**.153**	**-.202*****	**-1.789**	**.167**	**-.197*****	**-1.244**	**.288**	**-.163*****	**-1.273**	**.280**	**-.165*****
				(.284)			(.311)			(.388)			(.358)		
High School Variables															
Expectations are less than BA							-.458		-.076	**-.829**	**.436**	**-.124****	**-.915**	**.401**	**-.132****
							(.245)			(.332)			(.379)		
Expectations are raised to BA							.408		.084	.296		.060	.374		.076
							(.334)			(.338)			(.364)		
AP Class/Test Participant							.432		.089	**1.01**	**2.746**	**.228***	**1.171**	**3.225**	**.268***
							(.373)			(.501)			(.546)		
HS Rigor Quintile 1							**.683**	**1.980**	**.148***	**1.098**	**2.998**	**.250****	.864		.192
							(.361)			(.447)			(.527)		
HS Rigor Quintile 2							.436		.090	.650		.140	**.858**	**2.358**	**.190***
							(.289)			(.367)			(.437)		
HS Rigor Quintile 4							**1.247**	**3.480**	**.287*****	**1.33**	**3.781**	**.308*****	**1.543**	**4.679**	**.359*****
							(.353)			(.408)			(.434)		

Table 4.23. Continued

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5							**.796**	**2.217**	**.175****	**.933**	**2.542**	**.209****	**1.174**	**2.235**	**.269****
							(.325)			(.369)			(.430)		
Senior Test Quintile 1							**1.101**	**3.007**	**.251****	.786		.173	.683		.148
							(.364)			(.438)			(.610)		
Senior Test Quintile 2							.134		.026	-.301		-.052	-.503		-.082
							(.296)			(.399)			(.457)		
Senior Test Quintile 4							**-1.187**	**.305**	**-.158*****	-.479		-.079	-.446		-.074
							(.297)			(.337)			(.353)		
Senior Test Quintile 5							**-1.993**	**.136**	**-.207*****	-.659		-.103	-.392		-.066
							(.309)			(.417)			(.367)		
Class Rank/GPA Quintile 1							.514		.108	.345		.070	.150		.029
							(.332)			(.392)			(.433)		
Class Rank/GPA Quintile 2							-.101		-.019	.121		.023	-.039		-.007
							(.354)			(.406)			(.411)		
Class Rank/GPA Quintile 4							-.237		-.042	-.200		-.036	-.075		-.014
							(.363)			(.385)			(.369)		
Class Rank/GPA Quintile 5							**-.894**	**.409**	**-.130****	**-1.211**	**.298**	**-.160****	**-1.293**	**.274**	**-.166****
							(.367)			(.411)			(.451)		
College Variables															
Credits Earned by Examination										-.413		-.069	**-.915**	**.401**	**-.132***
										(.488)			(.435)		
Earned 20 or more credits by end of first year										**-1.419**	**.242**	**-.176*****	**-1.256**	**.285**	**-.163*****
										(.271)			(.298)		
No Delay in entering post-secondary after high school										**-2.094**	**.123**	**-.211*****	**-1.966**	**.140**	**-.206*****
										(.418)			(.451)		
First year GPA of 2.88 or above										-.257		-.045	-.417		-.070
										(.256)			(.283)		
Ever attended a four-year college										-.276		-.048	-.489		-.080
										(.265)			(.307)		
College of first attendance was four-year school										**-2.476**	**.084**	**-.223****	**-1.895**	**.150**	**-.202****
										(.782)			(.667)		
First college was selective										-.950		-.136	-.858		-.126
										(.607)			(.550)		
First college was an open door school										-.137		-.025	.663		.143
										(.800)			(.682)		
Post-secondary Variables															
Cumulative credits 50+ or more by the end of the second year													-.225		-.040
													(.319)		
Continuous enrollment with no more than one semester break													**-2.494**	**.083**	**-.223*****
													(.372)		

Table 4.23. Continued

Model Statistics	Step 0	Step 1	Step 2	Step 3	Step 4	Step 5
Model N	2632	2632	2373	1789	1440	1381
"-2 Log L"	1373.240	1368.570	1041.500	638.589	375.535	323.270
R_L^2						
df		1	13	28	36	38
Mean of DV	.250					

***p < .001, **p < .01, *p < .05

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

certificate or AA degree) models. The demographic variables SES4 (socioeconomic quintile 4) and SES5 (socioeconomic quintile 5) yielded significant negative estimates starting in step 2 and continuing through step 4. SES5 continued to show negative and significant estimate statistics through the final step of the direct model. URBANHS (urban high school) consistently generated negative estimates, which rose to statistical significance at step 3 of the total and direct effects CERTAA models. Hispanic students, in contrast to Whites, produced consistent negative estimates in both models of CERTAA. However, only at the final step of the direct model did the HISPANIC estimate rise to the level of significance ($b = -1.007$, $p < .01$) with a delta-p statistic indicating Hispanic students are less likely to earn an AA or Certificate than White students (see Table 4.23). Black students and males generated positive estimates, although neither rose to the level of statistical significance. In a very interesting contrast to variables yielding significant results in the BATIME (elapsed time to bachelor's degree is 4.56 years or less) models, SES4 and SES5 estimates were negative, while SES1 (socioeconomic quintile 1) estimates were statistically significant and strongly positive in steps 2 and 3 of the model. SES1 estimates remained positive through the 5th step of the direct model, although not statistically significant. The inclusion of college and post-secondary variables diminished the power of SES1. The juxtaposition of positive and negative estimate statistics for socioeconomic status shows that dual enrollment participants who are also low-income students are more likely than affluent students to earn AA or certificates in this analytic sample.

Several of the high school variables produced statistically significant estimates for the dependent variable CERTAA (earned a certificate or AA degree) in the direct effects model #17 (see Table 2.23). Compared to students who consistently wanted to earn a bachelor's degree, students whose expectations fell short of obtaining a BA were also less likely to earn an AA or a certificate. At steps 4 and 5, this EDULBA (educational expectations lowered from a BA) increased in intensity to an estimate of $b = -.915$. Delta-*p* statistics indicated that students with lower educational expectations were 13.2% less likely to earn a certificate than those students who aspired to earn a bachelor's degree. Students who may have raised their educational aspirations toward a BA (EDURBA) registered weaker positive estimates for CERTAA. Advanced Placement course or test participants posted strong positive and significant estimates in steps 4 and 5 of the direct effects model compared to students without AP experience.

Posting what might be seen as contradictory results, all HSRIGOR (high school academic rigor quintiles) variables registered positive estimate results, in comparison to quintile 3. Quintile 1 cases showed significance for steps 3 and 4, while quintile 2 was significant only in step 5, and quintiles 4 and 5 were significant from steps 3 through 5. The highest level of significance, $p < .001$, was produced by cases in HSRIGOR4 (high school academic rigor quintile 4), along with the strongest delta-*p* indicating that students at this level of high school academic rigor were nearly 36% more likely to earn an AA or a certificate than students in quintile 3. These statistics suggest that aspirations for educational success and academic rigor were strongly related to earning a certificate or associate in arts degree.

Senior test scores and class rank/GPA levels, however, told a very different story. Students scoring at the lowest quintile for senior tests produced positive (steps 3 through 5) and statistically significant results (step 3 only) (See Table 4.23). Results for SATACT (senior test ACT/SAT) quintiles 4 and 5 of the direct effects CERTAA model produced overwhelmingly negative estimates results in step 2 thru 5, but significance only in step 3. GPA/class rank nearly mirrored the SATACT results, with students in the lowest quintile producing positive estimates, and those in quintiles 2, 4, and 5 producing negative results. Only RANK5 showed negative and consistently statistically significant results ($p < .01$) for steps 3 through 5 of the CERTAA direct effects model. These data imply that regardless of test scores or GPA/class rankings, all levels of high school curriculum completed influenced the likelihood of achieving a certificate or associate in arts degree. While high school course selection suggested a positive impact on earning an AA degree, high school test scores and GPA's above the lowest quintile do not seem to improve the likelihood of the same.

Nearly all of the college variables and both post-secondary persistence variables, like many high school variables, produced negative estimates in the CERTAA direct effects model ($p < .01$ or $p < .001$). Of particular interest were estimates posted by the variable FIRST4 (college of first attendance was a four-year school). According to these results, students who entered four-year colleges as their first post-secondary experiences were 20.2% less likely to earn an AA or a certificate than students whose first post-secondary experience involved a two-year experience or trade school. Entering any type of college immediately after high school, enrolling in a four-year school, earning more than 20 credits the first year in college, and continuous enrollment with less than one semester break are all behaviors that are less likely to describe students who acquire a training certificate or an associate in arts degree.

While the overwhelming majority of estimates produced by the control variables in the CERTAA total and direct effects models were negative, estimates generated by the variable DEPARTIC were positive in every step of both models. Although statistical significance was achieved only with demographic variables in step 2 of the direct effects model, logistic regression statistics associated with dual enrollment participation yielded positive delta-*p* probabilities and ExpB odds ratios. Cross tabulations for CERTAA and DEPARTIC showed that 22.3% of the participants in dual enrollment programs in the analytic sample earned a certificate or an associate in arts degree, compared to 21.3% of students who did not participate in dual enrollment courses in high school (see Table 4.1). While not statistically significant, the logistic models using CERTAA as the dependent variable suggest positive interactions between DEPARTIC and CERTAA. These logistic model statistical results support findings in the cross tabulation data, which indicated that students who participate in dual enrollment programs achieve certificates and/or associate in arts degrees in larger proportions than non-participants.

Scanning the logistic model results for the dependent variable, BADEG (earned bachelor's degree), reveals a near mirror image of the finding generated for CERTAA (earned a certificate or AA degree) (See Tables 4.24 and 4.25). Regarding the relations between DEPARTIC (dual enrollment participation) and BADEG, negative estimates and delta-*p* statistics replace positive estimates found within the CERTAA model results. The only estimates for DEPARTIC reaching statistical significance are found in the direct effects model # 19, step 1, where the only variables in the regression equation are the main IV – DEPARTIC (dual enrollment participation) and the dependent variable BADEG (earned a bachelor's degree) (b = -.410, $p < .05$). This whole scale reversal of

Table 4.24. Model #18 - Total Effects of Dual Enrollment Participation on BADEG (Received bachelor's degree)

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable																
Received bachelor's degree		.101		.0252	-.390		.097	-.688		-.167						
		(.070)			(.265)			(.386)								
Primary Independent Variable																
Dual Enrollment Participant		-.369		-.092	-.375		-.093	-.368		-.091						
		(.229)			(.242)			(.246)								
Demographics																
Male					.107		.027	.267		.066						
					(.134)			(.158)								
Hispanic					-.071		-.018	.146		.036						
					(.225)			(.279)								
Asian Pacific Islander					-.353		-.088	.051		.013						
					(.271)			(.256)								
Black					.078		.020	.356		.088						
					(.250)			(.274)								
English is First Language					.041		.010	.165		.041						
					(.215)			(.230)								
Urban High School					.235		.058	.290		.072						
					(.163)			(.181)								
Rural High School					.115		.029	.322		.079						
					(.163)			(.179)								
First Generation Student					.250		.062	.120		.030						
					(.144)			(.159)								
Socioeconomic Quintile 1					**-.865**	**.421**	**-.206*** **	**-.853**	**.426**	**-.203** **						
					(.257)			(.307)								
Socioeconomic Quintile 2					-.225		-.056	-.328		-.082						
					(.254)			(.250)								
Socioeconomic Quintile 4					**.604**	**1.829**	**.145** **	**.703**	**2.020**	**.167** **						
					(.195)			(.224)								
Socioeconomic Quintile 5					**.579**	**1.784**	**.140*** **	**.551**	**1.735**	**.133** **						
					(.172)			(.200)								
High School Variables								**.497**	**1.644**	**.121** **						
Expectations are less than BA								(.197)								
								.075		.0109						
Expectations are raised to BA								(.248)								
								-.188		-.047						
AP Class/Test Participant								(.261)								
								-.335		-.083						
HS Rigor Quintile 1								(.262)								
								-.298		-.074						
HS Rigor Quintile 2								(.212)								
								-.311		-.077						
HS Rigor Quintile 4								(.237)								

Table 4.24. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								-.234		-.058						
								(.256)								
Senior Test Quintile 1								**-1.049**	**.350**	**-.244****						
								(.376)								
Senior Test Quintile 2								.114		.028						
								(.286)								
Senior Test Quintile 4								.305		.075						
								(.237)								
Senior Test Quintile 5								.183		.046						
								(.218)								
Class Rank/GPA Quintile 1								-.262		-.065						
								(.250)								
Class Rank/GPA Quintile 2								-.182		-.046						
								(.243)								
Class Rank/GPA Quintile 4								.163		.041						
								(.262)								
Class Rank/GPA Quintile 5								.141		.035						
								(.246)								
Model Statistics	**Step 0**															
Model N	2595	2595			2351			1789								
"-2 Log L"	1662.560	1658.480			1409.170			1016.650								
R_L^2					.153			.389								
df		1			13			28								
Mean of DV	.515															

****p* < .001, ***p* < .01, **p* < .05	
Standard errors in parenthesis below the Estimate	
Only significant ExpB statistics shown	
DV = Dependent Variable	

Table 4.25. Model #19 - Direct Effects of Dual Enrollment Participation on BADEG (Received bachelor's degree)

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Received bachelor's degree	.104		.026	-.382		-.095	-.688		-.167	-1.507		-.324	**-1.977**		**-.386***
	(.069)			(.263)			(.386)			(.856)			(.849)		
Primary Independent Variable															
Dual Enrollment Participant	**-.410**	**.664**	**-.102***	-.426		-.106	-.368		-.091	-.419		-.104	-.364		-.090
	(.226)			(.241)			(.246)			(.260)			(.279)		
Demographics															
Male				.111		.028	.267		.066	.298		.074	.317		.078
				(.134)			(.158)			(.177)			(.185)		
Hispanic				-.144		-.036	.146		.036	.271		.067	.321		.079
				(.231)			(.279)			(.281)			(.290)		
Asian Pacific Islander				-.350		-.087	.051		.013	.186		.046	.185		.046
				(.272)			(.256)			(.290)			(.254)		
Black				.081		.020	.356		.088	.468		.114	.458		.117
				(.250)			(.274)			(.325)			(.344)		
English is First Language				.035		.009	.165		.041	-.102		-.026	-.137		-.034
				(.212)			(.230)			(.233)			(.223)		
Urban High School				.209		.052	.290		.072	.094		.023	.167		.042
				(.162)			(.181)			(.196)			(.203)		
Rural High School				.095		.024	.322		.079	**.428**	**1.534**	**.105***	**.409**	**1.505**	**.100***
				(.162)			(.179)			(.204)			(.204)		
First Generation Student				.257		.064	.120		.030	.201		.050	.326		.080
				(.144)			(.159)			(.189)			(.193)		
Socioeconomic Quintile 1				**-.840**	**.431**	**-.201*****	**-.853**	**.426**	**-.203****	-.541		-.133	-.451		-.112
				(.257)			(.307)			(.313)			(.317)		
Socioeconomic Quintile 2				-.202		-.050	-.328		-.082	-.262		-.065	-.041		-.010
				(.251)			(.250)			(.282)			(.258)		
Socioeconomic Quintile 4				**.615**	**1.850**	**.148****	**.703**	**2.020**	**.167****	.289		.071	.334		.082
				(.193)			(.224)			(.237)			(.238)		
Socioeconomic Quintile 5				**.587**	**1.799**	**.141*****	**.551**	**1.734**	**.133****	.118		.029	.117		.029
				(.171)			(.200)			(.212)			(.210)		
High School Variables															
Expectations are less than BA							**.497**	**1.644**	**.121****	**.496**	**1.642**	**.121***	.230		.057
							(.197)			(.247)			(.244)		
Expectations are raised to BA							.075		.019	.242		.060	.122		.030
							(.248)			(.254)			(.256)		
AP Class/Test Participant							-.188		-.047	-.421		-.104	-.418		-.104
							(.261)			(.287)			(.296)		
HS Rigor Quintile 1							-.335		-.083	-.537		-.132	-.460		-.114
							(.262)			(.299)			(.312)		
HS Rigor Quintile 2							-.298		-.074	-.390		-.097	-.165		-.041
							(.212)			(.241)			(.244)		
HS Rigor Quintile 4							-.311		-.077	-.139		-.035	-.039		-.010
							(.237)			(.245)			(.242)		

Table 4.25. Continued

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5							-.234		-.058	.003		.001	.096		.024
							(.256)			(.253)			(.261)		
Senior Test Quintile 1							**-1.049**	**.350**	**-.244****	-.589		-.144	-.687		-.167
							(.376)			(.361)			(.388)		
Senior Test Quintile 2							.114		.028	.446		.1089	.515		.125
							(.286)			(.303			(.322)		
Senior Test Quintile 4							.305		.075	.059		.015	.076		.019
							(.237)			(.245)			(.246)		
Senior Test Quintile 5							.183		.046	.006		.002	-.077		-.019
							(.218)			(.265)			(.257)		
Class Rank/GPA Quintile 1							-.262		-.065	-.052		-.013	-.093		-.023
							(.250)			(.265)			(.275)		
Class Rank/GPA Quintile 2							-.182		-.046	-.095		-.024	.038		.010
							(.243)			(.284)			(.281)		
Class Rank/GPA Quintile 4							.163		.041	.249		.062	.267		.066
							(.262)			(.266)			(.263)		
Class Rank/GPA Quintile 5							.141		.035	.221		.055	.265		.066
							(.246)			(.256)			(.266)		
College Variables															
Credits Earned by Examination										-.318		-.079	-.277		-.069
										(.239)			(.237)		
Earned 20 or more credits by end of the first year										**.872**	**2.392**	**.203*****	**.827**	**2.286**	**.193*****
										(.236)			(.246)		
No Delay in entering post-secondary after high school										**1.275**	**3.579**	**.277*****	**1.169**	**3.219**	**.259*****
										(.349)			(.337)		
First year GPA of 2.88 or above										**-.436**	**.647**	**-.108****	**-.487**	**.614**	**-.120****
										(.177)			(.178)		
Ever attended a four-year college										-.045		-.011	-.033		-.008
										(.211)			(.216)		
College of first attendance was a four-year school										-.193		-.048	-.452		-.112
										(.642)			(.589)		
First college was selective										.126		.031	.066		.017
										(.236)			(.232)		
First college was an open door school										-1.03		-.240	**-1.299**	**.273**	**-.290***
										(.665)			(.604)		
Post-secondary Variables															
Cumulative credits 50+ or more by the end of the second year													-.214		-.053
													(.190)		
Continuous enrollment with no more than one semester break													**.989**	**2.689**	**.226*****
													(.285)		

Table 4.25. Continued

Model Statistics	Step 0	Step 1	Step 2	Step 3	Step 4	Step 5
Model N	2632	2632	2373	1789	1440	1381
"-2 Log L"	1691.160	1686.010	1427.590	1016.640	772.075	732.122
R_L^2			.156	.399	.543	.567
df		1	13	28	36	38
Mean of DV	.514					

***$p < .001$, **$p < .01$, *$p < .05$

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

estimates from positive to negative shows a trend not only for DEPARTIC, but also for SES1, SES4 and SES5 within the demographic variables entered in step 2, and continuing through step 3 of the stepwise logistic models. The direct effects model for BADEG, featuring the addition of college and post-secondary variables, suggests that the positive and statistical strength of the SES variables diminishes in step three. Attending a rural high school, versus a suburban school is a significant variable in steps four and five of the model. Positive estimates were generated for RURALHS (rural high school) throughout the logistic regression analysis of BADEG.

High school variables exerted significantly less influence as control variables in the BADEG models than in CERTAA (earned certificate or AA degree). Only those students whose expectations for post-secondary education were less than a BA (EDULBA) and membership in the lowest quintile of the SATACT (senior test score quintile 1) variable were statistically significant – the first with a positive result showing greater likelihood of achieving a BA, the latter yielding a negative estimate and 24.4% less likelihood of the desired result (see Table 4.24).

College and post-secondary persistence variables produced additional statistically significant relations with BADEG (earned a bachelor's degree) – some positive to earning the BA, and others negatively associated. Several variables (CREDMOM – earned 20 or more credits by the end of the first post-secondary year, NODELAY – no delay in entering post-secondary after high school, and NOSTOP – continuous enrollment with no more than one semester break) were directly opposite of those generated by the CERTAA (earned a certificate or AA degree) variable. Others were statistically significant for the first time in the HDEG (highest degree earned) variable group. First year GPA produced negative estimates, thereby indicating that for the analytic sample, grade point averages above 2.88 were not a necessary condition for achieving a bachelor's degree. Another control variable to reach statistical significance was enrollment in an open door college (OPENDR), which in the last step suggested that students who go to this type of easily accessed college were 29% less likely to earn a bachelor's degree than those who attended a non-selective institution (see Table 4.25). Open door colleges usually identify with community colleges, requiring transfer to a four-year college in order to earn a BA degree. Continuous enrollment in post-secondary education (NOSTOP) makes a very strong statement as a control variable ($b = .989$, $p < .001$). ExpB statistics show that the odds of students who continuously enroll are 2.689 more likely to earn a bachelor's degree than students who have longer breaks in their post-secondary education.

The contrasts between the results of models #16 and #17 for CERTAA (earned certificate or AA degree) and models #18 and #19 for BADEG (earned bachelor's degree) imply significant differences in the profiles of dual enrollment students. Estimates generated for DEPARTIC (dual enrollment participant) in the regression models of the dependent variable CERTAA (earned a certificate or AA degree) were positive, while the majority of the control variables produced negative estimates. The opposite was true for BADEG, as DEPARTIC generated negative estimates and many control variables produced positive estimates, although few were statistically significant results. Cross tabulations of this analytical sample show that 49.3% of dual enrollment students earned bachelors' degrees, while 52.5% of non-participants earned a BA as their highest degree (see Table 4.1). These statistics seem to lend statistical credence to the negative statistical interactions between DEPARTIC and BADEG. Not only did fewer dual enrollment participating students earn bachelor's degrees, the results point against dual enrollment participation playing any role in achieving a BA over the life of the students' academic careers. However, the variables NODELAY (no delay in entering post-secondary after high school) and NOSTOP (continuous enrollment with no more than one semester break) posted strongly positive estimates and statistically significant values in the fourth and fifth steps of the direct effects model for BADEG (earned a bachelor's degree). Dual enrollment participation (DEPARTIC) registered the highest positive and statistically significant results with these two variables. These data suggest positive outcomes for earning a BA for dual enrollment students who do not delay entry to college and continue through the second year without stopping more than one semester out of school.

The last category in the variable HDEG (highest degree earned) to receive specific attention in the logistic models of this research was GRAD, a new variable created from two categories of HDEG: 1) earned bachelor's degree and graduate credits and 2) earned advanced degree. Two models, one for direct effects and the other for total effects, were developed from the causal model (see Figure 3.1). Results of these two logistic regression models are found in Tables 4.26 and 4.27. Particularly striking in the two sets of results was the minimal number of variables in each of the steps that produced statistically significant estimates. As was the case for all but one step in the logistic models for CERTAA (earned certificate or AA degree) and BADEG (earned a bachelor's degree), parameter estimates produced for the variable DEPARTIC (dual enrollment participation) were not statistically significant in either of the models of GRAD (earned

Table 4.26. Model #20 - Total Effects of Dual Enrollment Participation on GRAD (Received graduate credits or advanced degree)

	Step 1 Estimate	ExpB	Delta-*p*	Step 2 Estimate	ExpB	Delta-*p*	Step 3 Estimate	ExpB	Delta-*p*	Step 4 Estimate	ExpB	Delta-*p*	Step 5 Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Received graduate credits or	**-1.188**		-.150***	-1.07		-.140***	-1.254		-.155**						
advanced degree	(.078)			(.319)			(.416)								
Primary Independent Variable															
Dual Enrollment Participant	.079		.015	-.069		-.012	-.038		-.007						
	(.242)			(.216)			(.234)								
Demographics															
Male				-.204		-.035	**-.486**	**.615**	**-.076****						
				(.157)			(.175)								
Hispanic				.300		.058	.313		.061						
				(.299)			(.290)								
Asian Pacific Islander				.159		.030	.043		.008						
				(.223)			(.272)								
Black				-.138		-.024	-.247		-.042						
				(.295)			(.327)								
English is First Language				-.343		-.056	-.459		-.073						
				(.276)			(.258)								
Urban High School				-.054		-.010	0		.999						
				(.181)			(.188)								
Rural High School				-.241		-.041	-.355		-.058						
				(.196)			(.216)								
First Generation Student				.059		.011	.005		.0009						
				(.157)			(.182)								
Socioeconomic Quintile 1				-.668		-.100	-.067		-.012						
				(.447)			(.380)								
Socioeconomic Quintile 2				.052		.010	.263		.051						
				(.335)			(.328)								
Socioeconomic Quintile 4				-.055		-.010	-.192		-.033						
				(.233)			(.278)								
Socioeconomic Quintile 5				**.766**	**2.151**	**.163*****	**.558**	**1.747**	**.114****						
				(.192)			(.223)								
High School Variables															
Expectations are less than BA							-.263		-.044						
							(.226)								
Expectations are raised to BA							-.373		-.060						
							(.259)								
AP Class/Test Participant							-.062		-.011						
							(.281)								
HS Rigor Quintile 1							-.011		-.002						
							(.287)								
HS Rigor Quintile 2							.193		.037						
							(.254)								
HS Rigor Quintile 4							**-.656**	**.519**	**-.100****						
							(.262)								

Table 4.26. Continued

		Step 1			Step 2			Step 3			Step 4			Step 5		
		Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5								-.185		-.032						
								(.282)								
Senior Test Quintile 1								-.674		-.100						
								(.461)								
Senior Test Quintile 2								**-.844**	**.430**	**-.235***						
								(.396)								
Senior Test Quintile 4								**.705**	**2.024**	**.148****						
								(.237)								
Senior Test Quintile 5								**1.18**	**3.254**	**.265*****						
								(.224)								
Class Rank/GPA Quintile 1								-.128		-.022						
								(.276)								
Class Rank/GPA Quintile 2								.357		.070						
								(.255)								
Class Rank/GPA Quintile 4								-.010		-.002						
								(.269)								
Class Rank/GPA Quintile 5								**.533**	**1.704**	**.109***						
								(.241)								
Model Statistics	**Step 0**															
Model N	2595	2595			2351			1789								
"-2 Log L"	1309.230	1309.090			1100.570			773.269								
R_L^2					.159			.409								
df																
Mean of DV	.235															

***p < .001, **p < .01, *p < .05

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

Table 4.27. Model #21 - Direct Effects of Dual Enrollment Participation on GRAD (Received graduate credits or advanced degree)

	Step 1 Estimate	ExpB	Delta-*p*	Step 2 Estimate	ExpB	Delta-*p*	Step 3 Estimate	ExpB	Delta-*p*	Step 4 Estimate	ExpB	Delta-*p*	Step 5 Estimate	ExpB	Delta-*p*
Constant - Dependent Variable															
Received graduate credits or	**-1.187**		**-.150*****	**-1.52**		**-.172*****	**-1.254**		**-.155****	**-4.581**		**-.232*****	**-5.537**		**-.234*****
advanced degree	(.077)			(.316)			(.416)			(.1.092)			(.1.107)		
Primary Independent Variable															
Dual Enrollment Participant	.085		.016	-.076		-.013	-.038		-.007	.214		.041	.257		.049
	(.237)			(.214)			(.234)			(.264)			(.301)		
Demographics															
Male				-.247		-.042	**-.486**	**.615**	**-.076****	-.339		-.056	-.345		-.056
				(.156)			(.175)			(.200)			(.210)		
Hispanic				.308		.060	.313		.061	.177		.033	.521		.106
				(.299)			(.290)			(.311)			(.332)		
Asian Pacific Islander				.166		.031	.043		.008	-.227		-.038	-.045		-.008
				(.222)			(.272)			(.315)			(.292)		
Black				-.130		-.023	-.247		-.042	-.482		-.076	-.423		-.068
				(.296)			(.327)			(.331)			(.349)		
English is First Language				-.312		-.052	-.459		-.073	.114		.021	.088		.016
				(.275)			(.258)			(.248)			(.255)		
Urban High School				-.065		-.012	0		0	-.004		-.001	-.063		-.011
				(.180)			(.188)			(.201)			(.210)		
Rural High School				-.213		-.036	-.355		-.058	-.544		-.084	-.456		-.072
				(.195)			(.216)			(.257)			(.254)		
First Generation Student				.019		.003	.005		.001	-.091		-.016	-.238		-.040
				(.158)			(.182)			(.218)			(.220)		
Socioeconomic Quintile 1				-.708		-.104	-.067		-.012	-.266		-.045	-.367		-.060
				(.448)			(.380)			(.435)			(.449)		
Socioeconomic Quintile 2				.019		.003	.263		.051	.273		.053	-.127		-.022
				(.332)			(.328)			(.386)			(.371)		
Socioeconomic Quintile 4				-.098		-.017	-.192		-.033	-.051		-.009	-.095		-.017
				(.230)			(.278)			(.281)			(.287)		
Socioeconomic Quintile 5				**.758**	**2.134**	**.161*****	**.558**	**1.747**	**.114****	**.501**	**1.650**	**.102***	**.496**	**1.642**	**.100***
				(.188)			(.223)			(.239)			(.245)		
High School Variables															
Expectations are less than BA							-.263		-.044	-.148		-.026	.170		.032
							(.226)			(.281)			(.265)		
Expectations are raised to BA							-.373		-.061	**-.643**	**.525**	**-.096***	-.502		-.078
							(.259)			(.285)			(.287)		
AP Class/Test Participant							-.062		-.011	.024		.004	-.020		-.004
							(.281)			(.303)			(.309)		
HS Rigor Quintile 1							-.011		-.002	.074		.014	.236		.045
							(.287)			(.346)			(.353)		
HS Rigor Quintile 2							.193		.037	.212		.040	-.074		-.013
							(.254)			(.285)			(.294)		
HS Rigor Quintile 4							**-.656**	**.519**	**-.098****	**-.637**	**.529**	**-.095***	**-.772**	**.462**	**-.111****
							(.262)			(.279)			(.293)		

Table 4.27. Continued

	Step 1			Step 2			Step 3			Step 4			Step 5		
	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*	Estimate	ExpB	Delta-*p*
HS Rigor Quintile 5							-.185		-.032	-.397		-.236	-.551		-.085
							(.282)			(.297)			(.319)		
Senior Test Quintile 1							-.674		-.100	-.303		-.050	-.222		-.038
							(.461)			(.467)			(.472)		
Senior Test Quintile 2							**-.844**	**.430**	**-.119***	-.832		-.117	-.844		-.119
							(.396)			(.488)			(.535)		
Senior Test Quintile 4							**.705**	**2.024**	**.149****	.243		.047	.212		.040
							(.237)			(.258)			(.264)		
Senior Test Quintile 5							**1.180**	**3.254**	**.265*****	.155		.029	.153		.0286
							(.224)			(.252)			(.265)		
Class Rank/GPA Quintile 1							-.128		-.022	-.221		-.037	-.141		-.024
							(.276)			(.293)			(.302)		
Class Rank/GPA Quintile 2							.357		.070	.152		.029	.058		.011
							(.255)			(.299)			(.291)		
Class Rank/GPA Quintile 4							-.01		-.002	-.152		-.026	-.214		-.036
							(.269)			(.276)			(.285)		
Class Rank/GPA Quintile 5							**.533**	1.704	**.109***	.337		.066	.278		.054
							(.241)			(.257)			(.275)		
College Variables															
Credits Earned by Examination										**.480**	**1.616**	**.097***	**.485**	**1.624**	**.098***
										(.235)			(.245)		
Earned 20 or more credits by end of the first year										**.677**	**1.968**	**.142***	.372		.0733
										(.306)			(.324)		
No Delay in entering post-secondary after high school										.808		.173	.694		.146
										(.529)			(.518)		
First year GPA of 2.88 or above										**.635**	**1.887**	**.132*****	**.739**	**2.094**	**.157*****
										(.185)			(.194)		
Ever attended a four-year college										.154		.029	.145		.027
										(.240)			(.245)		
College of first attendance was a four-year school										**1.974**	**7.199**	**.454****	**1.717**	**5.568**	**.396***
										(.784)			(.801)		
First college was selective										-.118		-.021	-.108		-.019
										(.226)			(.230)		
First college was an open door school										.657		.137	.471		.095
										(.815)			(.832)		
Post-secondary Variables															
Cumulative credits of 50 or more by the end of the second year													.371		.073
													(.209)		
Continuous enrollment with no more than one semester break													**1.537**	**4.651**	**.343*****
													(.404)		

Table 4.27. Continued

Model Statistics	Step 0	Step 1	Step 2	Step 3	Step 4	Step 5
Model N	2632	2632	2373	1789	1440	1381
"-2 Log L"	1332.570	1332.400	1114.830	773.379	574.602	533.028
R_L^2			.163	.420	.569	.600
df		1	13	28	36	38
Mean of DV	.236					

***$p < .001$, **$p < .01$, *$p < .05$

Standard errors in parenthesis below the Estimate

Only significant ExpB statistics shown

DV = Dependent Variable

graduate credits or an advanced degree). Regressed without controls, estimates for DEPARTIC in both the total and direct effects models of GRAD were positive, but small in size. In both models, step 1 (IV/DV only) produced positive estimates. In the direct model, DEPARTIC produced positive estimates, when regressed together with college and post-secondary control variables. Delta-*p* statistics were small in size, with the largest at step 5 (.049) (see Table 4.27).

After one adds the demographic variables in step 2, both total and direct effects models show only one variable that has statistically significant parameter estimates. This variable, SES5 (socioeconomic quintile 5), produced a strong positive estimate ($b = .766$, $p < .001$). Delta-*p* statistics indicated that a student whose family's socioeconomic status falls within the highest quintile had a 16.3% greater likelihood of earning an advanced degree or graduate credits than students whose family's affluence aligned with the third quintile level. SES5 continued to demonstrate statistical significance in step 3 of the total effect model and throughout all five steps of the direct effects model. The power of its statistical influence diminished to $p < .05$ in steps 4 and 5 of the direct effects model, however, SES5 was the only demographic variable to produce consistently positive, significant estimates.

The third step of the logistic regression equation added only one more demographic variable to the list of significant influences upon GRAD (earned graduate credits or an advanced degree). Males had generated negative estimates for GRAD in the second step of the equation. In the third step, the continuing negative estimates for gender gained significance at $p < .01$ levels. This trend for males, however, faltered when adding college and post-secondary control variables. While remaining negative, the statistics fell short of retaining their significance. Nevertheless, these statistics suggest that males were less likely than females to earn credentials or credit hours past the bachelor's degree level.

Considering the high school variables and their impact upon graduate level work, two variables produced estimates at acceptable levels of statistical significance: SATACT (senior test ACT/SAT quintiles) and RANK (class rank/GPA quintiles). The senior test variable provided estimates that made the most logical sense of all of the high school variables. While estimates for quintiles 1 and 2 were negative, those for SATACT quintiles 4 and 5 were positive. Statistical significance increased in power as test scores by quintile increased, from $p < .05$ to $p < .001$. Log odds indicated that students whose test scores ranked into quintile 5 increased their odds of achieving an advanced degree or graduate hours by 3.254 over students in the SATACT 3rd quintile (see Table 4.27). Students with scores in the 1st quintile reduced their odds of the same achievement by 57% when compared to students scoring in the 3rd quintile. Parameter estimates for class rank also suggested that students in the highest quintile increased their likelihood of participating in advanced college coursework by 10.9% over students in RANK3 (class rank/GPA quintile 3).

Adding college variables to the model, HSRIGOR4 (high school academic rigor quintile 4) continues as a negative and statistically significant variable. In most other logistic regression models in this research, HSRIGOR has functioned in a way that mirrors SATACT (senior test ACT/SAT quintiles) and RANK (class rank/GPA quintiles). When previous log models produced negative estimates in the lower quintiles, for instance, each of these high school quintile control variables saw negatives estimates.

In the case of GRAD (earned graduate hours or an advanced degree), however, this trend was set aside by HSRIGOR4, which produced consistent negative and statistically significant results for the direct effects model across steps 3, 4, and 5. The parameter estimate reached its strongest negative estimate in step 5 (b = -772, $p < .01$). Standard errors for this variable were not unusually large, and therefore the results for HSRIGOR were unexpected.

Several college variables showed statistical significance with GRAD. For the first time in the logistic equations evaluated thus far, the college control variable APCLEP (credits earned by examination – AP or CLEP and without any dual enrollment credits) presented estimates meeting the minimum level of statistical significance, even if the delta-p statistics were smaller than most. Other variables of note in the last two steps of the direct effects GRAD (earned graduate credits or advanced degree) model were GPA1YR (first year GPA of 2.88 or above) and FIRST4 (college of first attendance was a four-year school). Both of these variables produced positive and statistically significant estimates across the 4^{th} and 5^{th} steps of the model. GPA1YR was particularly strong – $p < .001$. The odds that students with GPA's of 2.88 or above will acquire graduate credits or an advanced degree were 1.877 times higher than those with lower GPA's. Chi-square statistics suggested a statistically significant difference in the percent of the overall analytic sample whose GPA's met the 2.88 or above standard. Dual enrollment students met the threshold for first year GPA at statistically higher rates than did non-participants ($p < .05$) (see Table 4.1). However, attending a four-year school as the first institution of the post-secondary experience may prove the greatest indicator of success for experiencing an advanced academic experience. When controlling for variables in the

4th step of the direct effects model, students who attended a four-year college right after high school were 45.4 times more likely to achieve graduate level work than those who entered post-secondary education at a two-year school or trade school. Introducing post-secondary persistence variables into the logistic equation only lowered the likelihood for four-year school attendees by 5.8%. Continuous enrollment in post-secondary education nearly equaled the strength of FIRST4 (college of first attendance was a four-year school), by registering a positive parameter estimate of 1.537 at $p < .001$. Delta-p statistics indicated a 34.3% greater likelihood of achieving graduate levels of education, when compared to students who began post-secondary in colleges that award credentials for less than four-year programs.

While all parameter estimates for DEPARTIC (dual enrollment participant), when regressed alone or in concert with the control variables, lacked statistical significance, three out of five DEPARTIC estimates for the dependent variable GRAD (earned graduate credits or an advanced degree) were positive. Cross tabulations indicated that while a smaller percentage of dual enrollment participants in the analytic sample achieved both a bachelor's degree and graduate credits than did non-participants, a larger percentage of dual enrollment students earned advanced degrees. When combining two categories into a new variable GRAD, the cross tabs showed that 28.4% of dual enrollment participants against 26.2% of non-participants earned graduate credits or an advanced degree (see Table 4.1). Similar to the results for CERTAA (earned certificate or AA degree), statistically significant estimates for the variable DEPARTIC were not generated by logistic regression with the dependent variable GRAD. However, neither

Chi-square nor logistic analysis suggested any statistical significance in the relationship between dual enrollment participation and graduate school attendance.

Research question #3 inquired into whether dual enrollment participation affected degree attainment. Three levels of credentials, CERTAA (earned a certificate or AA degree), BADEG (earned a bachelor's degree), and GRAD (earned graduate credits or advanced degree), were considered for evaluation. Dual enrollment participation (DEPARTIC) failed to generate statistically significant parameter estimates within the logistic models of dependent variables CERTAA, BADEG or GRAD, with only two exceptions. If students had participated in dual enrollment programs, attributes of these same students must be considered as mediating conditions contributing to the likelihood of completing a credential.

Answer to Research Question #4

Do students who have participated in dual enrollment programs experience positive affects upon college persistence and degree attainment after accounting for specific demographic attributes, when compared to those who are not dual enrollment participants after accounting for these same attributes?

Isolating the strength of the independent variable for dual enrollment (DEPARTIC) from all control variables in the log equations was necessary to answer research question #4. As evident in the logistic models #10 and #11 (see Tables 4.16 and 4.17), dual enrollment participation did not positively contribute to students' persistence in college by way of accumulating at least 50 credits by the end of the second post-secondary year (CUMCRED). Parameter estimates for DEPARTIC in the first step of each equation were negative and non-significant. Model probabilities lost strength as control variables were added to the equations (see Table 4.15). Finally, probabilities indicated that, when assessed only with the dependent variable CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year), dual enrollment participants were 1% less likely to earn the threshold number of credits than were non-participants. Controlling for high school and college variables further decreased participants probability of meeting the 50-credit standard up to 3% with college variables included in the equation. Although cross tabs indicated that proportionally 4% more DE students earned 50 or more college credits by the end of the second post-secondary year, I concluded that dual enrollment did not contribute to students' propensity to acquire credit momentum by the end of the second year of college. However, the small negative probability statistic may suggest that there were few negative consequences for dual enrollment participants in the area of credit momentum and persistence.

Continual enrollment (NOSTOP), the second descriptor of post-secondary persistence in my research, produced quite different statistics for dual enrollment participants than did the variable CUMCRED (cumulative credits of 50 or more by the end of the second post-secondary year). Two models, shown in Tables 4.18 and 4.19, produced strongly positive and statistically significant parameter estimates in the first step of the log equations. When regressed alone with DEPARTIC (dual enrollment participation), the model probabilities suggested that step 1 created the strongest relationship. Each subsequent infusion of control variables showed model probabilities declining in strength (see Table 4.15). When considering the difference in probabilities between dual enrollment participants and non-participants, dual enrollment students were 11% more likely to remain continually enrolled in college through the second year of attendance than non-participants. The probability statistic remained essentially unchanged when demographic and high school variables were included in the logistic equations. However, when college variables were added, probabilities decreased by nearly 50%. Therefore, dual enrollment as an activity created positive effects on students' persistence in college, but even more so when taking into account pre-college factors. Nevertheless, controlling for the college factors, 5% more dual enrollment students than non-participants persisted. Only one other dependent variable construct in the research produced higher probabilities of success – the variable CERTAA (earned certification or AA degree).

Time to degree has been suggested as a primary factor in the attraction of dual enrollment class participation (Menzel, 2006). However, the analytic sample used here produced statistics that suggested dual enrollment participation played only a partial role in predicting whether students will graduate in 4.56 years or less with a bachelor's degree. As shown in Tables 4.20 and 4.21, parameter estimates for step 1 produced positive values, although failing to meet the level of statistical significance. Log model probabilities indicated that the first step of the logistic equation produced the strongest result, with each subsequent entry of control variables decreasing the strength of the model in relation to DEPARTIC. Considering the difference in probabilities of students graduating in 4.56 years, the models suggest that dual enrollment students were more likely to graduate within the parameter by approximately 3% over non-participants (see Table 4.28). However, when high school variables were included in the model, the impact of dual enrollment participation fell into negative territory and indicated a reduced probability (-8%) of graduating in the time frame of the variable. Furthermore, the

Table 4.28. Probability Differences of Dual Enrollment versus Non-Dual Enrollment Participants

Variable	Difference in Probabilities
CUMCRED (Cumulative credits of 50 or more by the end of the second post-secondary year)	
Total Effects Model #10 DEPARTIC – Step 1	-.0096
Direct Effects Model #12 DEPARTIC – Step 1	-.0102
DEPARTIC – Step 3 (High School Variables Controlled)	-.0012
DEPARTIC –Step 4 (College Variables Controlled)	-.0268
NOSTOP (Continuous enrollment with no more than one semester break)	
Total Effects Model #11 DEPARTIC – Step 1	.1111
Direct Effects Model #13 DEPARTIC – Step 1	.1071
DEPARTIC – Step 3 (High School Variables Controlled)	.1056
DEPARTIC – Step 4 (College Variables Controlled)	.0530
BATIME (Elapsed time to bachelor's degree is 4.56 years or less)	
Total Effects Model #14 DEPARTIC – Step 1	.0269
Direct Effects Model #18 DEPARTIC – Step 1	.0344

Table 4.28. Continued

Variable	**Difference in Probabilities**
DEPARTIC – Step 3 (High School Variables Controlled)	-.0814
DEPARTIC – Step 4 (College Variables Controlled)	-.1607
CERTAA (Earned a certificate or associate in arts degree)	
Total Effects Model#15	
DEPARTIC – Step 1	.0788
Direct Effects Model #19	
DEPARTIC – Step 1	.0881
DEPARTIC – Step 3 (High School Variables Controlled)	.1310
DEPARTIC – Step 4 (College Variables Controlled)	.1019
BADEG (Earned bachelor's degree)	
Total Effects Model #16	
DEPARTIC – Step 1	-.0915
Direct Effects Model #20	
DEPARTIC – Step 1	-.1016
DEPARTIC – Step 3 (High School Variables Controlled)	-.0914
DEPARTIC – Step 4 (College Variables Controlled)	-.1038

Table 4.28. Continued

Variable	**Difference in Probabilities**
GRAD (Received graduate credits or advanced degree)	
Total Effects Model #17 DEPARTIC – Step 1	.0144
Direct Effects Model #21 DEPARTIC – Step 1	.0156
DEPARTIC – Step 3 (High School Variables Controlled)	-.0068
DEPARTIC – Step 4 (College Variables Controlled)	.0406

decrease in probability doubled when college variables were added to the logistic equation. Dual enrollment course participation may well be helpful to students as they pursue their bachelor's degrees. However, depending on specific attributes of students, DEPARTIC loses strength and importance as a factor in advancing students' graduation within the allotted time frame.

Proportionally only one percent more dual enrollment participants in the analytic sample earned certificates or associate in arts degrees than did non-participants. Parameter estimates for DEPARTIC (dual enrollment participation), produced as a result of the first step of the logistic regression equations utilizing CERTAA (earned certificate or AA degree) as the dependent variable, suggested that the relationship between these two variables was not significant but positive. Considering the strength of the log model probabilities, CERTAA regressed alone with DEPARTIC yielded the smallest parameter estimates found in both the total and direct effects models. As demographic, high school, college and then post-secondary persistence variables entered into the model, the estimates grew, as did the model probabilities statistics and the strength of predictability of the models themselves (see Tables 4.15). With minimal statistical significance produced by the estimates, probability differences were computed to determine whether dual enrollment participation against non-participation would increase the likelihood of earning an AA degree or certificate. Regressing DEPARTIC alone with CERTAA, participants were 8% more likely in the total effects model (see Table 4.22) and 9% more likely in the direct effects model to earn a credential (see Table 4.23). Controlling for attributes of high school level accomplishments, the estimates indicated that dual enrollment students were 13% more likely to earn a certificate or AA degree. This statistic decreased slightly to 10% when college variables entered the logistic model. These data mirror closely and therefore affirm the delta-*p* statistics generated by Model #17 (see Table 4.23) – direct effects of CERTAA (earned certificate or AA degree). Even though the models gained strength as control variables are added, DEPARTIC (dual enrollment participation) lost some of its influence toward likelihood of earning a credential, as college variables came into play in the regression analysis. Dual enrollment, when controlling for both high school and college variables, demonstrated positive effects upon gaining an AA degree or a certificate.

A primary goal of attending a four-year college arguably is to complete a bachelor's degree. Does dual enrollment participation enhance a students' probability of earning this credential? The total effects model for BADEG (earned bachelor's degree) produced negative estimates for the first step of the logistic equation; the direct effects model confirmed this at an added statistically significant level ($p < .05$) (see Tables 4.24 and 4.25). In fact, only in step 1 of the direct effects model did estimates of DEPARTIC (dual enrollment participation), regressed with BADEG (earned bachelor's degree), rise to the level of significance, and the estimates were negative. In every subsequent step of the logistic model, parameters were also negative. Model statistics suggested that the strongest step of the BADEG model #19 was the first regression between the IV and the DV (see Table 4.15). Adding control variables did not improve the relationship between dual enrollment participation and achieving a bachelor's degree. Probabilities indicated that dual enrollment participants were between 9 and 10% less likely to gain a bachelor's degree than were non-participants, whether considering the regression only between the primary variables (see Table 4.28). With no real variation in the outcomes of statistical analysis, I postulate that, for this particular analytical sample and regardless of a wide range of control variables, dual enrollment participation, as a single factor, did not improve students' chances of achieving the bachelor's degree.

The analytic sample of students in the NELS: 88/2000 who participated in dual enrollment programs also earned proportionally more advanced degrees or graduate credits than students who did not take dual enrollment classes in high school. Logistic regression produced positive estimates for step 1 in both the total and direct effects models of GRAD (earned graduate credits or an advanced degree). The difference in probability of a dual enrollment student versus a non-participant gaining an advanced degree or earning graduate credits was about 1.5% greater probability for the total effects and the direct effects model (see Table 4.28). Considering model probabilities, these statistics were also the largest at step 1 (see Table 4.15). Model probabilities for steps 2 through 5 remained in the predominantly in the negative range. One exception to this trend was in step 3 of the direct model. When high school variables entered the model, the strength of the equation pushed the change in model probabilities from step 2 to step 3 into positive territory, thereby indicating that when high school variables were controlled, DEPARTIC (dual enrollment participation) displayed a more positive relationship with GRAD (earned graduate credits or an advanced degree). However, the model probabilities in step 4 decreased dramatically, as the standard errors for the dependent variable increased. These statistics may have resulted from decreasing cases and increasing variables in the model equation, or may have suggested a very strong effect of college and post-secondary persistence variables on the primary variables in the model. When regressed alone with the dependent variable GRAD, dual enrollment participation produced statistics that implied positive effects on the acquisition of advanced credentials. Although not statistically significant, positive parameter estimates and probabilities produced in steps 4 and 5 of the direct effects model of GRAD suggested that dual enrollment positively affected the success of students who attained advanced degrees.

These results aligned with Adelman (2004), who found that NELS: 88/2000 students graduating with advanced degrees had earned credits through AP, CLEP or dual enrollment programs. Additional investigation of the APPART variable (Advanced Placement course and/or test participation) yielded cross tabs for Advanced Placement participants in relationship to degree attainment (see Table 4.29). In comparison to Advanced Placement participants, more dual enrollment students earned bachelor’s

Table 4.29. Advanced Placement Participation and Highest Degree Attainment

Variables	Advanced Placement	Non-Advanced Placement
Earned certificate or AA degree	23.1%	20.8%
Earned bachelor's degree	49.0%	52.7%
Earned bachelor's degree plus graduate hours*	18.2%	16.1%
Earned advanced degree*	9.7%	10.4%
Earned graduate credits or advanced degree	27.9%	26.5%

degrees and advanced degrees (see Table 4.1), while greater percentages of Advanced Placement participating students earned certificates or AA degrees and graduate credits than dual enrollment participants. In summary, 2.9% more dual enrollment participants in this analytic sample earned degrees of any type than did students who participated in Advanced Placement courses.

No singular set of statistics definitively answers the question of whether participation in a particular event will positively or negatively impact participation in another particular event. Rather a combination of statistics may lead research to stronger inferences regarding the relationship of variables. In the case of dual enrollment and its possible influences upon post-secondary persistence, the evidence collected through cross tabs, parameter estimates, odds ratios, and probabilities positively points to statistically significant effects. When considering degree attainment, the results of inferential statistical methods suggested less than definitive conclusions about the impact of dual enrollment participation. Cross tabs demonstrated that dual enrollment students, proportionally, earned more certificates or associate in arts degrees and more advanced degrees than non-participants. However, inconsistent and non-significant parameter estimates fail to build a case for statistically significant relationships between degree attainment and dual enrollment participation. Positive and statistically significant attributes, in the form of control variables, must be considered as descriptors of students who, having engaged in dual enrollment activities as high school students, progress over the years towards degree attainment.

CHAPTER V
DISCUSSION

Introduction

This research study on dual enrollment participation and the implications for student persistence and degree attainment in post-secondary education utilized data collected from American children at the end of their 8th grade education in 1988 to their adulthood in 2000. Four research questions were posed and a causal model developed by which to analyze the impacts of dual enrollment course participation on student achievement in post-secondary education. The NELS: 88/2000 data provided variables by which to control a wide range of demographic and academic characteristics linked to outcomes of higher education. Inferential statistical methods formed the basis for the inquiry and analysis of the variables. The findings of this research are described for each of the research questions. In subsequent sections of this final chapter, I discuss findings most pertinent to the primary intent of dual enrollment course offerings – persistence and subsequent degree attainment in the post-secondary setting. Limitations of the NELS: 88/2000 data are outlined, as well as ideas for future research utilizing a new longitudinal study – ELS: 2002. Because the proliferation and sustainability of dual enrollment programming is heavily dependent on state government funding and regulation, I offer recommendations for policy makers which encourages closer oversight of DE programs, and the development of data collection and student identification systems. These systems will enable schools and states to longitudinally follow students' academic progress from PreK-16 and beyond. Finally, I offer implications for the future of dual enrollment programming in light of the results suggested by the data analysis undertaken for this study.

Summary of Results

<u>Research Question #1</u>

Do students who have participated in dual enrollment programs have higher rates of second year college persistence than those who were not dual enrollment participants?

Two dependent variables, one representing cumulative credits of 50 or more by the end of the second post-secondary year (CUMCRED) and the other continuous enrollment with no more than one semester break (NOSTOP), were evaluated directly with dual enrollment participation (DEPARTIC) to assist in identifying clues to answering research question #1. Cross tabs revealed that larger percentages of dual enrollment students had acquired 50 or more college credits by the end of the second year and had also continued in college to the second year without stopping out for more than one semester than non-participants in the analytic sample. In fact, dual enrollment students continued in college at statistically significant different rates than did non-participants ($p < .05$) (see Table 4.1). Results of logistic regression analysis indicated that dual enrollment participation did not enhance students' ability to gain 50 or more credits by the end of the second year of post-secondary education (CUMCRED). However, DEPARTIC produced strong, positive and statistically significant parameter estimates with the dependent variable NOSTOP. Students who participated in dual enrollment programs were more likely than non-participants to stay in college and continue on without stopping for more than one semester through the end of the second academic year in college. Earning a bachelor's degree (BADEG) and earning graduate credits or an advanced degree (GRAD) each produced strong, positive and statistically significant estimates with NOSTOP (continuous enrollment with no more than one semester break). When CUMCRED was regressed as a control variable in the same log equations for degree attainment, it showed non-significant estimates in every case and negative estimates for earning a bachelor's degree. It is increasingly clear that continuing in college was more likely to positively influence degree attainment than acquiring a particular level of college credits by the second year. The statistics that indicated a positive relationship between NOSTOP and DEPARTIC also signaled a greater likelihood that, when compared to non-participants, dual enrollment students who continue in college without stopping were also more likely to complete their bachelor's or post-graduate degrees.

Research Question #2

Do students who have participated in dual enrollment programs have shorter time to degree periods than those who are not dual enrollment participants?

The analytic sample indicated that proportionately fewer dual enrollment participants earned a bachelor's degree within the time frame of 4.56 years or less (BATIME) than did non-participants. Logistic regression equations, directly regressing DEPARTIC with the dependent variable BATIME (log models #14 and #15) generated positive but statistically non-significant parameter estimates (see Tables 4.20 and 4.21). However, when control variables were added to the equations all subsequent estimates were negative. When college variables were added to the direct effects model #15, negative estimates became significant to $p <.05$. These statistical results suggest that dual enrollment participation alone failed to aid students' odds of earning a bachelor's degree in 4.56 years or less time from first entry into post-secondary education.

Research Question #3

Do students who have participated in dual enrollment programs experience higher levels of college degree attainment than those who are not dual enrollment participants?

Three levels of college credentials, CERTAA (certificate or associate in arts degree), BADEG (bachelor's degree) and GRAD (graduate credit or advanced degree) were utilized to evaluate dual enrollment's impact upon degree attainment. The analytic sample indicated that a greater proportion of dual enrollment participants had earned certificates or associate in arts degrees than had non-participants. Logistic regression equations for CERTAA as the dependent variable (see Tables 4.22 and 4.23) produced exclusively positive parameter estimates for the independent variable DEPARTIC. In only one case, however, were these results statistically significant (step 2 of model #17). The data suggest that when demographic variables were controlled, dual enrollment participants' likelihood of acquiring an AA or a certificate were 13.8% greater than non-participants. Dual enrollment as an activity seemed to enhance students' chances at achieving a two-year degree or technical training certification.

When weighing the likelihood that dual enrollment students would achieve a bachelor's degree, the analytic sample showed that a smaller percentage of DE participants completed BA's than did non-participants. In stark contrast with statistics found in the CERTAA equations, regression equations for BADEG (see Tables 4.24 and 4.25) produced exclusively negative but non-significant parameter estimates. One estimate in particular, step 1 of the direct effects model #20, rose to the level of significance ($p < .05$). When regressed alone with the dependent variable, BADEG, these data suggested a 10.2% less likelihood of dual enrollment students earning a bachelor's degree as compared to non-participants. No block of control variables moved DEPARTIC's parameter estimates to the level of statistical significance. Therefore, when considering dual enrollment participation as a contributing activity toward degree attainment, participation did not improve students' chances of completing a bachelor's degree.

Two categories of the original variable for highest degree earned (HDEG) were collapsed to create a new dependent variable, GRAD. This new variable allowed the identification of students who earned bachelor's degrees and subsequent graduate level credits as well as advanced degrees, such as master's degrees, Ph.D., M.D., or J.D. credentials. The analytic sample demonstrated that dual enrollment students in this study earned smaller percentages of BA and graduate credits, but higher percentages of advanced degrees when compared to non-participants. Collapsing these two categories into GRAD produced data indicating a greater proportion of DE students completing advanced degrees or graduate level work than non-participants. Logistic regression analysis of the variable GRAD with DEPARTIC (see Tables 4.26 and 4.27) indicated that parameter estimates for DEPARTIC were split between positive and negative values, and consistently failed to achieve the level of statistical significance for either log model. Estimates were positive when the independent and dependent variable were regressed alone without control variables, and when college and post-secondary persistence variables were added to log model #21. Parameters were negative when demographic and high school variables were entered as controls to the equation. Dual enrollment participation, when controlling for demographic and high school, decreased the likelihood of students completing advanced degrees. However, when treated as a unique activity or when regressed with college and post-secondary control variables, dual enrollment participation improved the likelihood of earning graduate level degrees or completing graduate level coursework, although these statistics failed to reach the level of statistical significance.

Research Question #4

Do students who have participated in dual enrollment programs experience positive affects upon college persistence and degree attainment after accounting for specific demographic attributes, when compared to those who are not dual enrollment participants after accounting for these same attributes?

Guided by the causal model, parameter estimates were produced through logistic regression equations to suggest effects of dual enrollment participation on college persistence and degree attainment. Devoid of control variables, the first step of each of the total and direct effects models of the dependent variables (CUMCRED – earned 50 or more credits by the end of the second post-secondary year, NOSTOP – continuous enrollment with no more than one semester break, BATIME – elapsed time to a bachelor's degree of 4.56 years or less, CERTAA – earned a certificate or AA degree, BADEG – earned a bachelor's degree and GRAD – earned graduate credits or advanced degree) produced parameter estimates necessary to investigate the fourth research equation. DEPARTIC regressed with CUMCRED yielded negative estimates indicating dual enrollment participation did not aid in acquiring 50 or more credits by the end of the second post-secondary year. Continuous enrollment through the same amount of post-secondary education (NOSTOP) however, was greatly enhanced by dual enrollment. Students who aspired to earning less than two-year credentials (CERTAA) were more likely to do so if they had participated in a dual enrollment program in high school. BATIME and BADEG, characterizing an amount of time to earn the BA degree and completion of a bachelor's degree program, were not improved by student participation in dual enrollment programs in high school. DEPARTIC regressed directly with GRAD indicated a positive association between dual enrollment participation and earning graduate level credits and degrees. Of these direct relationships, only NOSTOP and BADEG generated estimates that rose to the level of statistical significance. Estimates suggest that the odds of completing a BA were decreased by one-third for dual enrollment students as compared to non-participants, whereas dual enrollment students increased their odds of continuously enrolling in post-secondary schooling through the end of the second year by1.67 times when compared to non-dual enrollment participants.

Key Findings

Demographic Control Variables

Demographic control variables produced some interesting results for race and gender, but the resultant statistics in the area of socioeconomic status were especially intriguing. Racial and gender designations for the demographic variables generally lacked results which carried over beyond one singular step of the regression equations. An exception to this trend was found, however, in the BATIME (elapsed time to a bachelor's degree is 4.56 year or less) direct effects log model #15 (see Table 4.21). Estimates for males, when compared to female students, and the estimates for Hispanics, when compared to White students, were consistently negative and statistically significant across all steps of the logistic model. These results indicated that male and Hispanic students were less likely to achieve a BA in 4.56 years or less than were female or White students. Conversely, students whose family SES status was at the quintile 5 level posted positive and statistically significant estimates for steps 3 thru 4 of BATIME. Another noteworthy result, when considering demography of the analytic sample, was suggested by negative and statistically significant results for first generation students. Students whose parents had no prior college experience were 23.5% less likely to earn 50 or more credits by the end of the second year when the model controlled for demographic variables in step 2 than non-first generation students. The parameter estimates decreased for each subsequent equation in the direct model for CUMCRED until in the last step. First generation students' likelihood of achieving the standard for CUMCRED was only 9% less than students' whose parents had attended college. Strongly negative and statistically significant parameter estimates were produced by students in SES (socioeconomic status) quintiles 4 and 5 in the direct effect model of CERTAA (see Table 4.23). Statistical significance to $p < .001$ suggested a strongly negative relationship between high socioeconomic status and students earning associate in arts degrees. However, students in the lowest SES level produced very strong positive estimates of statistical significance as a control variable for CERTAA ($p < .001$). Dual enrollment participants who are economically disadvantaged were up to 26% more likely to earn an AA or a certificate than students from families in the SES3 level (see Table 4.23). While the results for the higher quintiles of SES were not unexpected, the fact that dual enrollment participation made a positive impact on acquiring a credential for low SES families is a very important finding of this dissertation. Finishing a program matters more, economically speaking, than attending school without earning a credential. If dual enrollment participation increases the chances that low-income students will complete an associate in arts degree or a training certificate, rather than no credential at all, then participation in dual enrollment programs will have a proven benefit to these students.

High School Control Variables

The high school control variable APPART identified students who participated in AP classes and/or AP tests. Of the students who were dual enrollment participants, 12.7% had also taken an AP class or a test. I had hypothesized a greater overlap of students taking AP and dual enrollment courses, although a greater proportion of dual enrollment students did enter AP programs than non-dual enrollment participants (11.1%) (see Table. 4.1). As a whole, a higher percentage of students in the analytic sample completed an AP course or test than had participated in dual enrollment programs (11.3% for AP versus 9.8% for dual enrollment) (see Tables 3.4 and 3.6). APPART produced positive and statistically significant estimates for dual enrollment students who earned AA degrees or certificates, as shown in Model #17, steps 4 and 5 of the log equation. These data reinforced cross tabs indicating that 23.1% of AP participants earned AA degrees as opposed to 20.8% of non-participants (see Table 4.29). Parameter estimates for APPART in log model #19 (BADEG) and #21 (GRAD) produced negative and non-statistically significant estimates across steps 3 thru 5 of the equation (see Tables 4.25 and 4.27). These results suggested that AP participation for dual enrollment students did not improve the likelihood of earning a bachelor's degree, or graduate credits and/or an advanced degree. Parameter estimates for DEPARTIC in log model #19 (BADEG) were also negative and non-significant. However, estimates for DEPARTIC in model #21 for GRAD produced positive, but non-significant parameter estimates in steps 1, 4 and 5. Dual enrollment participation, while failing to improve students' likelihoods of earning bachelors' degrees, added more positive effects toward earning advanced degrees than did the control variable APPART.

The theory of anticipatory socialization, as described by Merton (1957), was included in this research as a means to explain attitudinal changes that may occur for students experiencing college classes in high school. In order to assess the impact of this unique experience, EDUANNEW, a high school variable that controlled for students' anticipations toward a bachelor's degree was utilized in the causal model (Figure 3.1). Were dual enrollment students more likely to acclimate to college and develop habits of mind or attitudes to create opportunities for success, in the way of persistence and degree attainment than their non-participating counterparts? Tinto's longitudinal model of institutional departure also utilized goals and intentions as sectors in the "Goals and Commitments" portion of the model (Figure 2.1). Evaluating the role of EDUANNEW as a control variable for dual enrollment students enabled an appraisal of the power of college entry goals and intentions in Tinto's model. Cross tabulation results indicated that greater proportions of dual enrollment students consistently desired to earn a bachelor's degree than did non-participants (see Table. 4.1). Likewise, more non-participants who had not planned to earn a BA, reconsidered working towards a bachelor's degree by spring of their senior year (1992) than did dual enrollment participants. Chi-square statistics indicated significant differences in the rate of dual enrollment students' aspirations for bachelor's degree than for non-participants ($p < .05$).

Students who did not expect to earn a bachelor's degree were 15% to 25% less likely to have earned 50 or more credits by the end of the second year in college (CUMCRED) than those who did expect to earn a degree (see Table 4.17). For students whose aspiration was less than a BA (EDULBA), negative and statistically significant parameter estimates suggested a 12-13% reduction in the likelihood of earning a certificate or associate in arts degree compared to students who wanted a BA (see Table 4.23). When considering the possibility of earning graduate level credentials or credits, students with aspirations lower than a BA decreased their odds of success when compared to students who aspired for a BA. Dual enrollment students whose expectations were less than a BA demonstrated a 12% greater likelihood of actually earning a bachelor's degree than students who had consistently desired such a credential (see Table 4.25).

Anticipating and consistently aspiring to achieve a goal, in this case the bachelor's degree produced strong and positive relationships toward achieving AA or graduate level credentials. In the case of students whose aspiration was less than a BA, dual enrollment students were more likely than their counterparts to achieve that level of college degree. For some dual enrollment students, and let us not forget that 30% of the analytic sample represented first generation students who also participated in DE programs, aspiring to obtain a bachelor's degree is an ambitious and bold idea. Expectations for college success among first generation students might be associated with experiencing some success in college courses and gaining enough courage and confidence to complete the task. This research did not delve into the minds of the students, but it did look for trends and suggestions to identify some of the controlling factors that set the stage for success in college persistence and degree attainment. Dual enrollment course experiences, in this case, suggested a positive impact on the anticipatory socialization of students as they move from high school to college.

College Control Variables

When students delayed entry to post-secondary school, by definition, their intentions to commit to a college experience diminished in strength. NODELAY (no delay in entering post-secondary after high school), in this causal model, was aligned with the college variables; the construct for NODELAY creates a link between the commitments and experiences of high school and the new academic experience in college. I placed the idea of NODELAY within Tinto's model at the point of the "Goals/ Commitments" sector, subsection "Intentions"' – in the same location as best describes the effects of educational anticipations (EDUANNEW). Adelman (2006) found that the variable NODELAY was statistically significant when entered as a control variable in step 2 of his logistic model that utilizes earning the bachelor's degree as the dependent variable. However, in the final step of Adelman's model, as more control variables were added to the equation, NODELAY lost statistical significance.

In my research, dual enrollment participation was directly regressed with NODELAY in log model #3 (see Table 4.7). In all three steps of this direct effects model, DEPARTIC produced positive and statistically significant estimates ranging from $b = 1.438$ $p < .001$ in the first step with no controls to $b = 1.663$, $p < .001$ in the final step with high school control variables. According to these statistics, dual enrollment students were 12% more likely to enter college within 7 months after graduation than non-participant students. As a college control variable (step 4) in the direct effects model of NOSTOP (see Table 4.19), NODELAY produced positive and statistically significant results. Dual enrollment students were nearly 17% more likely to continue their education with no stop-outs if they had also entered college directly after high school. In the direct effects log model for CERTAA, NODELAY produced negative and statistically significant estimates suggesting that dual enrollment students who do not delay college entry were 21% less likely to earn a certificate or an AA degree (see Table 4.23). NODELAY, as a control variable in the direct effects model for BADEG, generated positive and statistically significant results in steps 4 and 5. Dual enrollment students who entered college immediately after high school increased their odds of earning a bachelor's degree by between 3.2 and 3.6 times as compared to those dual enrollment students who did not enter immediately after high school (see Table 4.25). NODELAY also produced positive estimates, but not to the level of statistical significance, as a control variable in the direct models for BATIME and GRAD (see Tables 4.32 and 4.27). NODELAY was a negative, but non-statistically significant factor in acquiring 50 or more credits by the end of the second post-secondary year (CUMCRED) (see Table 4.17).

These statistics suggested that dual enrollment students who entered college within seven months after high school graduation increased their odds and likelihoods of earning a bachelor's degree and of persisting to the second year in college, but were far less likely to earn a certificate or AA degree. Rather than losing significance, as Adelman found in his research in 2006, in my research NODELAY maintained positive strength and significance when regressed as a control variable with BADEG (earned a bachelor's degree). The dual enrollment variable, DEPARTIC, produced consistent negative parameters with BADEG. However, with NODELAY, students increased their likelihood of degree attainment. Therefore, NODELAY may have created a bridge effect for dual enrollment students who attained a bachelor's degree.

APCLEP was utilized as a college variable to identify the significance of earning college credits through AP or CLEP tests during the initial year of college. Colleges and universities generally award AP credits during the first semester of college. For dual enrollment students, this college variable produced few statistically significant results. APCLEP generated negative and statistically significant estimates when entered with the post-secondary variables in log model #17 (CERTAA), suggesting that earning AP or CLEP credits was negatively associated with earning certificates or AA degrees. Negative estimates were also produced by APCLEP in steps 4 and 5 of log model #19 (BADEG), however, the variable failed to meet the level of significance. These data suggest that for dual enrollment students, earning AP or CLEP credits in addition to DE college credits in high school added no positive value toward attaining a bachelor's degree. Only when considering log model #20 (see Table 4.26), for the dependent variable GRAD, did APCLEP generate positive and statistically significant results. Parameter estimates were moderately strong (b=.480 to .485) with significance at $p < .05$ across both steps 4 and 5 of the logistic regression equation. Noting that students who earned AP credits (APPART) produced negative and statistically significant parameters in model #21 (GRAD), it may be inferred that dual enrollment students who earned CLEP hours may benefit more from those credits toward accomplishments in graduate school than the same students who participated in AP classes (see Table 4.27).

These data reinforced the cross tabulation results comparing the percentage of the sampled population who participated in dual enrollment to those who participated in AP (12.7% of which enrolled in both programs). As a percentage of whole, more students who participated in dual enrollment programs earned bachelor's degrees, advanced degrees and graduate credits than did the students who were enrolled in AP programs (see Tables 4.1 and 4.29). The corresponding Chi-square and the inferential statistics from the logistic regression equations, however, produced minimal evidence of statistically significant results. Not unlike, NODELAY and EDUANNEW, which revealed students' attitudes toward college attendance, APCLEP defined the educational intentions of students who wish to earn college credits. Statistical results produced by this college control variable suggested positive impacts for students who eventually earned graduate level credits or credentials. APCLEP, which was a variable signaling potential for dual enrollment students to progress toward a bachelor's degree, fell short of significance. , According to these statistical results, earning AP or CLEP credits did not enhance a students' likelihood of earning an AA degree or certificate.

The college control variables FIRST4 (college of first attendance was a four-year school), SELCT (first college was selective), NONSELCT (first college was non-selective), and OPENDR (first college was an open door school) all align with the "Institutional Commitments" section of Tinto's theoretical model (see Figure 2.1). In this research, determining the impact of type and selectivity of post-secondary institution of first attendance mattered in at least two different ways. First, the type of school into which a student initially matriculated correlated with students' socioeconomic backgrounds and academic achievements prior to entering college. Enrollment decisions in this context formed a bridge between the high school and the college experience. Second, students who attended two-year or open door schools have historically experienced higher college drop out rates and lower completion rates than students attending four-year colleges (Hoachlander, Sikora & Horn, 2003). The reasons for dropping out of two-year schools are many and varied. First and foremost, students attending two-year schools do not always intend to finish a program there, and may instead enroll with the specific desire to transfer to another institution. Therefore, the student may drop out of one school so that they could drop into another. Under this scenario, records at the initial school identified the departed student as a drop out, when in actuality the student was an enrollee elsewhere. Next, two-year schools offer tuition at much more economical rates than four-year colleges, and therefore appeal financially to students whose families and assets prohibit entrance into more expensive and/or more selective institutions. Investigating whether dual enrollment students enter two-year colleges at higher rates than non-participants and also noting the first school of enrollment rates for dual enrollment students at selective institutions may suggest whether DE students were, by their participation in these programs, stratified into certain types of post-secondary placements.

When regressed with directly DEPARTIC, two of the four variables defining type of first college and selectivity of college produced positive estimates, while two others produced negative estimates. Estimates from the variable FIRST4 (log model #5 – Table 4.9) suggested a 13.8% decrease in the likelihood of dual enrollment students attending a four-year school, when controlling for high school variables, ($p < .05$). Even stronger negative estimates were generated by NONSELCT (log model #8 – Table 4.12). Estimates for this variable, when regressed as the dependent with DEPARTIC and controlling for the high school variables, showed that it was 17.4% less likely that a dual enrollment student would enter a non-selective school directly from high school ($p < .001$). Non-selective colleges include Division II or III colleges of state university systems or smaller liberal arts colleges. A greater likelihood of post-secondary school attendance for dual enrollment participants exists on dichotomous ends of the college spectrum. Controlling for the high school variables again, log model #9 estimates show a 17.7% greater likelihood that DE students will attend an open door or community college in their first year of post-secondary school ($p < .01$). Estimates produced by logistic regression for DEPARTIC with SELCT (log model #7 – Table 4.11) were positive, but not statistically significant. Delta-*p* probabilities indicated at most a 4% increase in likelihood of attending a selective or highly selective college after high school, controlling for the college variables. Cross tabulations produced statistically significant differences in the rates of entry to selective or highly selective colleges among dual enrollment students against the rates of non-participants (see Table 4.1).

In logistic regression model #9, measuring the direct effects of OPENDR on dual enrollment participation (DEPARTIC), statistically significant and positive parameter estimates were generated when controlling for demographic and high school variables. Dual enrollment students were between 11% and 18% more likely to attend an open door college ($p < .01$) (see Table 4.13). DE students also represented themselves in greater percentages at open door schools and two-year schools. Chi-square statistics indicating a statistical significance difference between dual enrollment and non-participant's entry into open door institutions mirrored the significance generated by the logistic data. Approximately 5% more dual enrollment students than non-participants entered open door type schools, whereas 9% fewer dual enrollment students attended some type of four-year institution immediately after high school. However, over the duration of the

NELS: 88/2000 survey, 1.5% more dual enrollment students than non-participants attended four-year college (see Table 4.1).

While participation in dual enrollment programs may have inclined more students to attend two-year schools at the beginning of their college careers, bachelor's and advanced degree attainment required students to eventually transfer to four-year schools. The analytic sample for this research showed greater proportions of dual enrollment students earning advanced degrees than their non-dual enrollment counterparts. Adelman (2006) found that 44% of the NELS: 88/2000 sample in his research began their schooling at a two-year institution and transferred with at least 10 community college credits (p. 50). Of those students who transferred to a four-year school after beginning at an open door college, 62.3% earned bachelor's degrees. In terms of Tinto's theory of individual departure from institutions of higher education, dual enrollment students were not as likely to remain at the college of first entry and therefore may not form strong institutional commitments. Possibly, the fact that DE students likely attended one or more post-secondary institutions to gain pre-college credits may have influenced their institutional commitments once official matriculation began.

When students entered a four-year college at any time after high school they increased the likelihood of attaining 50 or more credits (CUMRED) by 23.5% ($p < .001$) (see Table 4.17). The college selectivity variables failed to produce any statistically significant estimates with CUMCRED or NOSTOP, although every parameter estimate was positive. Students who gained AA degrees or certificates were at least 20% less likely to attend a four-year school than those who attended a non-selective college. According to the results of step 5 of the direct effects model for BADEG, students who begin their post-secondary schooling at open door schools were 29% less likely to complete a BA than those who entered a non-selective college. Finally, among students who completed graduate school degrees or credits, attending a four-year school improved the likelihood of completion by 45% when controlling for college variables, and by 40% when controlling for post-secondary variables. These results indicated that where dual enrollment students began their post-secondary careers mattered very little in terms of persistence, but figured prominently for degree attainment, especially for students entering four year or open door schools. Selective school attendance failed to produce statistically significant results when utilized as a control in any of the dependent variable regression equations. Any type of four-year school attendance decreased the likelihood of attaining an AA degree, just as two-year school attendance decreased the likelihood of attaining a bachelor's degree. These results were not at all unusual, and were in fact logical and could be imagined regardless of whether students participated in dual enrollment programs. Although proportionally fewer dual enrollment students attended four-year schools at the beginning of their career, the data generated in this study do not suggest that dual enrollment participation adversely affected the achievement of higher-level degrees. Dual enrollment does not seem to promote social stratification of students by way of advancing the education of inordinately large numbers of students gaining AA at the cost of gaining bachelor's or graduate school degrees.

Post-Secondary Persistence and Degree Attainment Variables

Before beginning the statistical portion of this research project, I hypothesized that dual enrollment students would meet the first year standard of credit momentum (CREDMOM). Acquisition of credits relates to Tinto's theoretical model in the area of

"Academic Performance" and "Institutional Experiences". The analytic sample demonstrated a statistically significant difference in the percent of the sample that earned at least 20 college credits in the first year of post-secondary education and were participants in dual enrollment programs ($p < .001$). When regressed directly in log model #3, DEPARTIC generated positive but non-significant logistic regression estimates with CREDMOM (see Table 4.7). As a control variable entered with the college variable group, CREDMOM produced statistically significant estimates in step 4 of NOSTOP (log model #13) and GRAD (log model #21). CREDMOM also produced statistically significant and positive estimates across steps 4 and 5 with BATIME (log model #15) and BADEG (log model #20). For dual enrollment students who earned an AA or a certificate credential, estimates for CREDMOM were statistically significant but negative (log model #17). These data suggested that dual enrollment students earning 20 or more credits in the first year were between 16.3 and 17.6% less likely to earn an AA degree or certificate than their non-participating counterparts. Most interestingly, students who met the standard of 50 or more credits by the end of the second post-secondary year (CUMCRED) were only 5% more likely to do so if they had also earned 20 credits by the end of the first year (log model #11).

In summary, a statistically significant group of dual enrollment students in this analytic sample met the standard of CREDMOM, with the assumption that dual enrollment credits constituted a part of the first year transcript credit total. Earning these first year credits made a statistically significant difference when appraising the propensity of students to continue on with their education without stopping through the second year, to improve their likelihood of earning a BA degree within the 4.56 year standard, to earn the BA degree, and to earn an graduate credits or an advanced degree. The momentum created by credits earned in the first year of post-secondary school, a portion of which was attributed to dual enrollment courses, suggested a positive impact of enrolling in dual credit courses. Overall, CREDMOM played an important part as a marker for success toward persistence in college and BA or advanced degree attainment.

Moving toward “Academic and Social Integration” in Tinto’s model (Figure 2.1), I considered the influence of the college persistence variable NOSTOP (continuous enrollment with no more than one semester break) in post-secondary education. The direct effects model of NOSTOP (model #13) produced statistically significant, positive estimates for the variable DEPARTIC from the first step through the third step in the logistic equation. Dual enrollment participation improved the likelihood of continuously enrolling in college by approximately 11%. Only when college variables entered the equation did NOSTOP lose significance and likelihoods decreased to 5%. As a control variable in the direct effects dependent variable models, NOSTOP produced positive and statistically significant estimates with BATIME (elapsed time to bachelor’s degree is 4.56 years or less), BADEG (earned a bachelor’s degree), and GRAD (earned graduate credits or an advanced degree). Statistically significant and negative estimates were generated with CERTAA (earned a certificate or AA degree). Dual enrollment students who also continued onto the second year in college without stopping more than one semester experienced greater odds of completing a BA in 4.56 years, and of earning any type of degree requiring more than two years to complete. Parameter estimates of NOSTOP within the log models for CERTAA, BADEG and GRAD were at the highest level of statistical significance, $p < .001$.

Considering the entire set of 21 logistic regression models, NOSTOP (continuous enrollment with no more than one semester break) and NODELAY (no delay in entering post-secondary education) produced the highest positive and most statistically significant parameter estimates when regressed directly with DEPARTIC (dual enrollment participation). Dual enrollment students who also continued to college immediately after high school and persisted through at least the second year in post-secondary education seemed to have the greatest likelihood of completing degrees. These results mirrored those found in the "Toolbox" studies (Adelman, 1999 & 2006). NOSTOP posted the strongest, positive results in Adelman's research on bachelor's degree attainment. Students who continued onto the end of the second post-secondary year were 43.4% more likely to finish a degree than those who stop-out more than one semester (2006, p. 75). The parameter estimates and Delta-*p* statistics in this research were not as strong as Adelman's results. Delta-*p* statistics suggested that dual enrollment students who continued to the second year with no stops were 41.3% more likely to complete a BA within 4.56 years. Similar statistics for NOSTOP as a control variable with BADEG suggested a 22.6% greater likelihood of completing a bachelor's degree for students continuing to the second year of post-secondary school (see Table 4.25). NOSTOP, as a construct enhanced by dual enrollment participation, also serves as a marker for momentum toward degree completion, and correlates with Tinto's theory of academic and social integration.

Parameter estimates for NODELAY (no delay in entering post-secondary education after high school) retained statistical significance throughout all steps of the BADEG (earned a bachelor's degree) regression equations. This is significant because estimates for these variables lost significance in Adelman's 2006 research on bachelor's degree attainment. The fact is that dual enrollment, when regressed with NODELAY, created a more powerful indicator of bachelor's degree attainment than was found in Adelman's 2006 model. This points to the value of participation in DE as a factor in degree attainment – even if direct regression with BADEG produced negative parameters. When NODELAY was coupled with the very strong NOSTOP (continuous enrollment in with no more than one semester break) control variable, these variables created impressive markers for the possible influence of dual enrollment course participation on persistence in college and on degree attainment. Statistics produced by the dual enrollment variable has shown very little direct influence upon either persistence or degree attainment. But, the benefits of dual enrollment can be seen in the influence of participation on persistence in school, without which degree attainment is impossible.

Limitations of the Data

The US Department of Education has performed an important service to the educational research community by collecting information on students in the United States' PK-16 educational system since the early 1970s. The National Longitudinal Study of the High school Class of 1972 (NELS: 72) traced the histories of the graduating class of 1972 until 1986. The High School and Beyond Longitudinal Study of 1980 Sophomores (HS&B/So 80-92) followed the class of 1982 for ten years past high school graduation. The National Education Longitudinal Study of 1988 (NELS: 88/2000) formed the research base for this current study of dual enrollment participation and outcomes. Finally, the Educational Longitudinal Study of 2002 (ELS: 2002), which is currently underway, will trace students in the graduating class of 2004. Each study involved collecting college transcripts from decreasing numbers of students in the original cohort.

The most difficult problems in ascertaining whether students completed dual enrollment credits revolve around transcript acquisition and interpretation. Students may enroll in credit bearing classes from any number of colleges, and may enter a totally different college on their official first post-secondary institution of attendance. Therefore, multiple transcripts must be obtained for each student respondent, even if the student doesn't transfer during subsequent years from one college or university to another. Once transcripts are received, determining if any of the classes were completed before high school graduation is not always easy. To accomplish this part of the task, the high school transcript must also be available for each student. The NELS and the ELS data set included post-secondary transcripts, matched to individual survey respondents, which indicated levels of persistence and degree attainment.

With every part of the transcript collection process open to interpretation and dependent upon multiple transcripts for each individual participant, missing data and decreased numbers of valid cases must be anticipated as a weakness in the data set. Filters used in this study ensured that NELS: 88/2000 cases used were high school seniors in 1992 for whom valid high school and college transcripts had been received and processed by the National Center for Educational Statistics (NCES). These filters decreased nearly by half the number of valid cases for statistical investigation. The small sample and large amounts of missing data represent real limitations in this study. The passage of time and increased participation in DE programs in the past ten years, as described in the Waits and Lewis census report (2005), also has the potential to further decrease the generalizability of the statistical findings in this study.

Because there are no other sources of nationally representative data on dual enrollment participation in relationship to students' academic outcomes, the NELS: 88/2000 continues to provide the most comprehensive and recent data available for research. In spite of the aforementioned limitations, the NELS: 88/2000 produced a wealth of information about American students in the last decade of the 20th century. The analytic sample in this report yields yet another snapshot of educational circumstances experienced by high school and college students in the 1990's.

Recommendations for Educational Policy Development and Practice

At least 42 states have adopted policies, rules, regulations, funding schemes, or incentive programs pertaining to student participation in dual enrollment programs (WICHE, 2006). The financial consequences of dual enrollment courses loom large for community colleges. In some states, both local school districts and community colleges receive state funding for individual students dually enrolled in these educational institutions. Some may label this type of funding as "double dipping". In states where school districts pay tuition for DE students, however, programs have not grown because local school districts cannot afford the additional programmatic costs. Loss of revenue in association with dual enrollment programs may also occur when state aid payments follow high school students to the community college district. State laws have also allowed individual community colleges and four-year institutions to create their own rules governing tuition payments. So, the question remains: Is this investment worth the time, effort and resources in the way of a pay off for student success? The answer, of course, has a lot to do with how success is measured. Were students adequately prepared to enter the degree or training programs? Do students persist long enough in post-secondary education to complete academic or training programs? Dual enrollment program participation, this research suggests, assists most obviously in the persistence phase of post-secondary education. As stewards of the public purse, educational institutions in concert with state legislative bodies should establish realistic guidelines to measure student outcomes of participation in dual enrollment and other forms of acceleration programs (AP/IB) with the same zeal and interest that went into the creation of the laws and regulations that helped establish the programs.

My research supports the contention that policy makers should insist that dual enrollment courses duplicate the content and academic expectations of college credit courses taught on campus by college instructors. Whether the course originates in a high school classroom, is viewed via satellite or cable hook up, or is taken on-line or Internet based offering, dual enrollment courses generate college credits. Course credits are recorded on a transcript, backed by the reputation of an accredited institution of higher education, and a state level higher education board of directors or department of education. The integrity of the credits earned through DE programs rests on the assurance that the fundamental requirements of college and university accreditation are acknowledged and duplicated.

Only one national organization has been formed to monitor programs offering one particular type of dual enrollment program – the National Association of Concurrent Enrollment Partnerships (NACEP). Founded with the charge of bringing uniformity and standards of practice to concurrent enrollment courses, NACEP has adopted a set of standards against which to evaluate programs and student outcomes of participation. Although NACEP boasts memberships and accredited programs from Rhode Island to Washington, hundreds of colleges have yet to join the association and still continue to offer college credit courses to high school students without regard to the standards and guidelines established by NACEP. Only twenty-seven community colleges and universities had satisfied all of the requirements for NACEP accreditation by 2007, with 30 others in provisional status (National Association of Concurrent Enrollment Partnerships, 2008).

In order to ensure quality programming, systematic oversight must be designed by dual enrollment providers – colleges and local school districts. Otherwise, students will continue to face the challenge of gaining widespread and consistent credit recognition by institutions that do not currently offer dual enrollment programs or have not yet established articulation agreements. For all of the aforementioned circumstances, research must continue to test and monitor the efficacy of dual enrollment programs for students.

Through the College Board's efforts, Advanced Placement programs have steadily grown throughout the country to serve not only students of the highest aptitude, but increasingly opening the doors to AP classrooms to whomever wishes to attempt the rigorous work. In the past year, the College Board's Advanced Placement program has undergone an audit process that requires all schools that offer AP classes to submit syllabi, course book lists, examples of activities and examinations to a panel of college professors to be judged against some criteria of rigor. The AP audit not withstanding, Advanced Placement classes across the country use a variety of syllabi, utilize teacher selected texts and teachers generated exams. The one and only common factor in an AP class is the final national exam, which is not a required condition of participation in the course. Common course exams, scored with long established rubrics by a group of trained high school teachers and college professors, do much to advance consistency as an underlying ideal of the AP program. Even so, not all colleges accept AP scores in lieu of college course experiences. In contrast with dual enrollment courses, college credits are not automatically generated upon completion of the course, but may be awarded to students if the score meets the standard of a particular college, department, or degree program.

One advantage that the AP program currently enjoys over dual enrollment programs, however, is the central role of the College Board as the executor of nationwide examinations for each course offered. In this way, the College Board dictates the content, concepts, and skills necessary to prove college level proficiency for each AP designated course offered in high schools across the country. Dual enrollment course legitimacy rests within the sponsoring college or university, with college department chairs guiding the development of course syllabi and end of term exams.

Comparing the practices and outcomes of Advanced Placement and dual enrollment programs was not the focus of this paper. However, with so much attention placed on AP and increasing amounts of funding being directed toward training high school teachers to teach AP classes, I believe that more in depth research should be conducted to clearly understand the outcomes of Advanced Placement courses. Special attention should be directed to investigating the impact of both AP and International Baccalaureate programs in relation to student college persistence and degree attainment.

The No Child Left Behind Act of 2002 included AP courses in a list of recommended activities to increase student achievement. Dual enrollment courses, to date, have not been included in that listing, despite efforts by members of NACEP to lobby members of the US Congress. The results of this study suggest that dual enrollment program participation may improve the odds of completing a degree program. Therefore, the relationship between DE and AP in regards to persistence and degree attainment should be investigated further.

To this end, I recommend that state and federal departments of education begin to organize a national system to follow students through their PK-12 years in schools across the country, and then continue to trace the steps used by students through to post-secondary education. By developing and maintaining a database of students and their enrollment histories, researchers and policy makers can obtain consistent information on the outcomes of dual enrollment programs. The State of Florida has made such an attempt at tracking students from their K-12 public school districts into community colleges and the state university system. However, when students leave Florida to attend post-secondary institutions elsewhere, their progress is lost to the data system. Student identification numbers in the State of Illinois follow student movements across public school systems throughout the state when students participate in the Illinois Standards Achievement Test and Prairie State Achievement Exam. School secretaries and administrators maintain identification numbers on students and share these numbers as students transfer or attend schools outside of their home district. The NELS: 88/2000 data, while striving to become a nationally representative sample, offers researchers a snapshot in time of student behaviors, attitudes and outcomes. But, transcript studies fall victim to data loss and misinterpretation. Finding a better way to track student movements between different types of post-secondary institutions would enable researchers to better understand the types of programs that assist students who attempt to complete certificate, associate in arts, bachelor's degree or advanced degree programs.

High school reform has caught the attention of the media and of philanthropists, such as Bill and Melinda Gates. The Gates Foundation's efforts to establish early college high schools across the country has given further credence to the idea that students in high school may benefit from exposure to college courses before high school graduation. I believe this iteration of dual enrollment programming, if embraced more enthusiastically by school districts, community colleges and universities, could provide a better alternative to early college entrance or CBTPs. Although primarily aimed at troubled youth, early college high schools have the potential to benefit a broad spectrum of students and provide yet another way to build a better and smoother pathway between secondary and post-secondary education and workforce training.

Schools can also benefit from having better data to advise students for post-secondary education, beginning perhaps as early as middle school. High school and middle school counselors need training and up to date information regarding training programs available to students who might not consider themselves as college bound. Students and their parents need and deserve to be given information and encouragement to enroll in dual enrollment programs in order that all students are afforded the opportunity to attempt college credits before they graduate from high school. However, it cannot be over stated, that academic preparation for college credit courses, such as those offered through dual enrollment programs, must be interwoven into both high school and middle school curricular offerings. Placing a student into any class, but especially a college level course, without appropriate pre-cursor skills is a recipe for failure. Policy makers need to acknowledge the vital role of PK-12 schooling in preparation for post-secondary school and training. Therefore, as politicians and school/university administrators contemplate creating or expanding dual enrollment programs, attention must be given to the academic preparation students should expect to complete and the educational planning necessary for student success.

Future Research

A new cohort study of high school and post-secondary events and outcomes is currently underway. The US Department of Education's Education Longitudinal Study of 2002 (ELS: 2002) has already gathered information from high school sophomores in the year 2002, high school seniors in the year 2004, and young adults in the second year after high school in 2006. Restricted use data from the ELS: 2002/2006 (second follow-up) was released to screened institutions in the Fall 2007. The ELS: 2002 study includes some transcript data from students' high school records, as well as entry-level post-secondary education information. Subsequent follow-up data collections are planned by the US Department of Education to include information about persistence and degree attainment of this latest cohort of American high school students.

New to the ELS: 2002 survey is data collected from high school counselors regarding actual dual enrollment classes. Specific questions were asked in the following areas: if dual enrollment courses were listed in high school course guides, if DE courses were granted for high school credit only, and if dual enrollment courses were offered for both high school and college credit. The ELS: 2002 survey question did not specifically ask students about their participation in dual credit courses in high school. After transcript evaluation, the ELS: 2002 data will uncover new insights on student involvement in dual enrollment programs during the high school years. These new data should describe the achievement implications resulting from increased student participation in DE programs, as detailed in the 2005 NCES census reports (Kleiner & Lewis, 2005; Waits, Setzer & Lewis, 2005). Until transcript data are processed from the ELS: 2002, the NELS: 88/2000 will remain the most current and most comprehensive data source available to researchers.

New ELS: 2002 data could eventually be used to replicate this study. Special interest should be paid to the impact of the first school of attendance on subsequent degree attainment. Care should be taken to include college transfer data in the research, likely with smaller amounts of missing data. A comparative study of dual enrollment and Advanced Placement program participants should also be conducted. The exponential grow in both AP and DE participation will allow researchers a larger sample in the ELS: 2000 than is currently available in the NELS: 88/2000. Such a study would likely yield insights on the effects of participation in acceleration programs, and on vocationally oriented dual enrollment programs. Other possibilities include learning more about program participation in relation to student career decisions, especially among dual enrollment students who complete training programs or associate in arts degrees. Finally, identification of racial or ethnic group participation in dual enrollment programs is needed, as is continued examination of participation factors related to immigrant and first generation student populations.

Implications and Conclusions

This study sought to determine the possible influence that dual enrollment course participation, functioning as a means of anticipatory socialization to college, may exude upon persistence and degree attainment. Building upon prior research, I utilized the construct of anticipatory socialization, in conjunction with Tinto's theory of institutional departure (see Figure 2.1), to build a strong theoretical case for investigating possible effects of dual enrollment course participation upon post-secondary student outcomes. Although statistically significant results were generated for DEPARTIC and for a number of control variables when regressed with the dependent variables in the causal model (Figure 3.1), answering the primary questions of the research project has not been a straightforward or elementary task.

Three major implications for dual enrollment participation and programming have emerged as a result of this research study:

1) Demographic and high school characteristics of students in dual enrollment programs, as listed in the causal model, were of little consequence to students' degree attainment, or where they attended college. Momentum toward a degree was negatively associated with Hispanic and male dual enrollment participants.

2) Students who gain college credits through dual enrollment are more likely to enter college immediately after high school and persist to the second year in post-secondary education. DE participants who demonstrate academic momentum (early acquisition of credit and immediate entry to college) were also more likely to complete bachelor's degrees or advanced degrees.

3) Dual enrollment participation, in relation to Tinto's theory of institutional departure, may have provided students with experiences that changed their outlook on achieving a bachelor's degree. Dual enrollment participation may act as a means to anticipate the attitudes and behaviors necessary for college success.

Demographic and High School Characteristics of Dual Enrollment Students

Overall, demographic and high school attributes of students entering dual enrollment programs played an inconsistent and often insignificant role in describing the types of colleges students attended, academic momentum, or degrees attained. The only consistent exceptions to this statement predicted outcomes for male and Hispanic students. Males who participated in dual enrollment programs were more likely to attend open door colleges as their initial post-secondary experience and less likely to enter a four-year college immediately after high school graduation as compared to female participants. Males and Hispanic students were less likely to acquired 20 or more credits at the end of the first year of post-secondary education, as well as less likely to have continuously enrolled in college or acquired a bachelor's degree in 4.56 years or less when compared to female and White participants. Therefore, credit momentum to degree was less likely for males and Hispanic students who participated in dual enrollment programs than for females and Whites. However, statistically significant results did not consistently reflect decreased likelihoods of males or Hispanics achieving one of the three types of post-secondary credentials investigated in this study as compared to females or White students. These results imply that dual enrollment participation did not impact the beginning of males' and Hispanic students' post-secondary careers in a positive way, nor did participation help or hinder degree attainment.

The implications of these findings are two fold. First, more research and subsequent action should be undertaken to determine the causes of decreased male enrollment in post-secondary education. This trend seems to repeat itself in the percentage of males who participated in dual enrollment programs when compared to females in the analytic sample (see Table 4.1). Males are not taking advantage of the opportunity to participate in dual enrollment courses in proportion to their population, and these courses are not having the same positive effect on males when compared to females. Second, because dual enrollment course participation has shown to positively impact students' academic momentum, high schools and colleges should encourage participation by males and Hispanic students. With increasing numbers of Hispanic students in the general school-aged population, working to improve rates of participation by this demographic group (who are the largest the fastest growing minority group in the US) are paramount to maintaining an educated workforce. As a first opportunity to experience a college level course, dual enrollment classes may be the opening to post-secondary education for Hispanic students, who are not only first generation Americans, but also first generation college enrollees. The analytic sample for this research showed that 30% of participants came from first generation families, and considering that nearly 60% of American adults age 29 and older have not earned a BA, the odds are great that increasing numbers of our students will be considered first generation college students (Bergman, 2007, p. 1). Reaching this growing population with dual enrollment programs should be a vital part of any new initiatives to promote accessibility to a broader demographic base.

Overall, student demographic attributes played an inconsistent and often insignificant role in describing the post-secondary achievement of DE students. In other words, it mattered less who you are, however actions applied directly to educational goals mattered greatly. Dual enrollment program participation, therefore, increased the likelihood of students in realizing their post-secondary aims.

Academic Momentum of Dual Enrollment Participants in Relation to Degree Attainment

Results of logistic equations point decidedly to statistically significant positive estimates for dual enrollment participants who persist toward a degree. These results are a consequence of academic momentum in college to the end of the second year. Academic momentum describes students who enter post-secondary education immediately after high school, acquire at least 20 credits by the end of the first post-secondary year and continuously enroll in college courses with no more than one semester break until the end of the second year. Students who participated in dual enrollment programs and who also exhibited these characteristics of academic momentum were more likely to complete Bachelor of Arts or advanced degrees. Interestingly, the acquisition of credits in the first year was more important toward degree attainment than credit momentum by the end of the second year in college. DE students reaped the benefits of earning initial year credits, some which were a result of college classes successfully completed in high school and subsequent continuous enrollment in college. Although a greater percentage of DE participants had completed at least 50 hours of college credit by the end of their sophomore year in college than had non-participants (see Table 4.1), this fact did not translate into an increased likelihood of degree attainment. Earning college credits early in the post-secondary career positively impacted students' abilities to complete degrees through academic momentum. Credits earned in dual enrollment classes contributed positively to academic momentum.

Dual enrollment participation, in concert with academic momentum, did not assist students who ultimately earned certificates or associate in arts degrees, even though DE students were more likely to earn two-year degrees and more likely to enter two-year or open door colleges immediately after high school than non-participants. This outcome may be very desirable, however, for students who need two years of post-secondary college experience and accessibility to training programs. Dual enrollment may provide a stepping-stone for students whose post-high school pathway does not include a four-year college degree.

The implications for dual enrollment programming and support of these programs by boards of higher ed., state legislatures and local school districts are unmistakable. Dual enrollment programming can provide students with the initial impetus to complete a post-secondary credential. Students and families should be made aware that participation will not necessarily decrease time to degree, as this study shows a negative interaction between DE participation and completing a BA in 4.56 years or less. More importantly, DE participation provides students with the inertia to persist, without which a degree is unlikely. No matter how many credits are earned by students in their collegiate careers, the strongest indicator of bachelor's and advanced degree completion was persistence to the second year in post-secondary education (NOSTOP). Dual enrollment participation, as a positive factor in persistence, also proved to be a stronger influence than was found utilizing the NODELAY (no delay in entering post-secondary education after high school) variable in Adelman's "Toolbox Revisited" (2006). I encourage proponents of dual enrollment programming to shift away from proclaiming that DE courses decrease the overall cost and time to complete college degrees towards suggesting that completion of a college credential is more possible when students participate in DE programs. Completion of a credential is the most desired outcome of post-secondary attendance. Dual enrollment participation increases the likelihood of persistence toward that goal.

Sociological Impact of Dual Enrollment Course Participation

Educational anticipations, the goals and aspirations of students as they embark on their high school and college careers, tell much about what students believe they will achieve. Regression results show that dual enrollment program participants who had not originally planned to earn a bachelor's degree were more likely to do so than participants who had consistently planned to earn a BA. At the onset of this research, I had hypothesized that dual enrollment participation might serve as a means to socialize students to college expectations. Successful completion of college level courses in high school, therefore, may have provided students who wondered about their chances at succeeding in college with confidence to continue with their education after high school. Results of this research show that for students who ultimately earned a BA, DE students with initially low expectations for a degree were more likely to succeed than those who had always intended on completing a BA. As was stated previously, credit momentum through the second year was less a factor in degree attainment than was continuous enrollment. Continuous enrollment was more closely related to credits earned in the first year of college than those in the second year. The activity of participating in college courses and college activities likely played a role in changing students' attitudes toward degree attainment. Dual enrollment course participation provides students with the earliest college experiences. Positive, successful completion of college courses, while technically remaining a high school student, can change attitudes and reinforce retention rather than departure from college. Following Tinto's model, educational expectations are analogous to the "Goals and Commitments" section (see Figure 2.1). Successful dual enrollment course completion likely has an impact upon the type of institutional experiences students have in college, along with relationships formed with faculty members who teach DE classes. Academic integration to college may be assisted by way of DE course work, which in turn can influence students' decisions to continue on in college or discard the experience. With the strong impact DE course participation has suggested in relation to post-secondary persistence, it stands to reason that Tinto's theoretical model may explain this phenomenon as it relates to dual enrollment students. Not only does dual enrollment participation provide a statistical likelihood of persistence, the act of participation in high school may influence students' beliefs about themselves as future college graduates. Above all else, this may prove the most important reason to participate in DE programming.

Conclusion

Results of the logistic equations point decidedly to positive and statistically significant estimates for dual enrollment participation and persistence toward a degree by continuing enrollment in college through the end of the second year. Therefore, as dual enrollment participation positively impacted students' persistence, it likewise positively affected students' accomplishments in degree attainment at both the bachelor's and the advanced/graduate degree levels. These data lend credence to the idea that dual enrollment participation may create for students the "nest egg" effect: when students accumulate credits, it is harder to give them up. Furthermore, students who participate in dual enrollment may receive a psychological boost of confidence about their chances of college success while still within the safer confines of the high school.

The analytic sample taken from the NELS: 88/2000 data provides a glimpse of the past; when dual enrollment participation was beginning to grow, but had not reached the coverage seen today. While there are definite differences in the types of program offerings labeled as dual credit courses, the results of this research support the premise that dual enrollment programming positively impacts students' abilities to persist toward the completion of post-secondary credentials. Options for students to participate in accelerated courses while remaining in high school appear to be advantageous for the long-term achievement of students in the post-secondary setting. Dual enrollment may provide a means to support students as they experiment with college and make decisions about enrollment and future academic endeavors. Dual enrollment course participation likely provides a catalyst for student success in post-secondary education.

BIBLIOGRAPHY

Adelman, C. (1999a). *Answers in the tool box: Academic intensity, attendance patterns, and bachelor's degree attainment*. (PLLI1999-8021). Washington, DC: US Department of Education, Office of Education Research and Improvement, National Institute on Postsecondary Education, Libraries, and Lifelong Learning.

Adelman, C. (1999b). Crosscurrent and riptides – Asking about the capacity of the higher education system. *Change, 21*(1), 21-27.

Adelman, C. (2004). *Principal indicators of student academic histories in post-secondary education 1972-2000*. Washington, DC: US Department of Education, Office of Vocational and Adult Education.

Adelman, C. (2006). *The toolbox revisited: Paths to degree completion from high school through college.* Washington, DC: US Department of Education. Office of Vocational and Adult Education.

Adelman, C., Daniel, B., & Berkovits, I. (2003). *Post-secondary attainment, attendance, curriculum, and performance: Selected results from the NELS: 88/2000 postsecondary education transcript study*. (NCES 2003-394). Washington, DC: US Department of Education, National Center for Education Statistics.

American Association of Colleges and Universities. (2007). *College learning for a new global century*. National Leadership Council for Liberal Education and America's Promise. Retrieved on January 10, 2008 from http://www.aacu.org

American Association of State Colleges and Universities. (2002). The open door: Assessing the promise and problems of dual enrollment. *State Policy Briefing, 1*(1), 1-10.

American College Testing, Inc. (2001). *ACT average composite scores steady for fifth straight year.* Iowa City, IA.: Author

American College Testing, Inc. (2005). *Crisis at the core: Preparing all students for college and work.* Iowa City, IA.: Author

Andrews, H. (2001). The dual credit explosion at Illinois' community colleges. *Community College Journal*, *73*(3), 12-16.

Bailey, T., Hughes, K, & Karp, M. (2002). *What role can dual enrollment programs play in easing the transition between high school and postsecondary education?* New York: Teachers College, Columbia University, Community College Research Center.

Bailey, T., Hughes, K., & Karp, M. (2004). *Accelerating student success: How credit-based transition programs can serve a broad range of students*. Washington, DC: US Department of Education, Office of Vocational and Adult Education.

Bailey, T. &. Karp, M. (2003). *Promoting college access and success: A review of credit-based transition programs*. New York: Teachers College, Columbia University, Community College Research Center.

Barefoot, B. (2000). The first-year experience: Are we making it any better? *About Campus, 5*, 12-18.

Barnett, E., Gardner, D., & Bragg, D., (2004). *Dual credit in Illinois: Making it work*. Champaign, IL: University of Illinois at Urbana-Champaign, Office of Community College Research and Leadership.

Barth, P. (2003). A new core curriculum for all: Aiming high for other people's children. *Thinking K-16, 7*(1), 1-31.

Bergman, M. (2007). *Earnings gap highlighted by Census Bureau data on educational attainment*. Retrieved on March 7, 2008 from US Census Bureau Web site: http://www.census.gov/Press-Release/www/releases/archives/education/009749.html.

Boldt, M. (2007, February 7). Tomorrow's schools, today. *St. Paul Pioneer Press*, A1, Main.

Boswell, K. (2001). Dual enrollment programs: Accessing the American dream. *Update On Research and Leadership, 13(*1). (ERIC Document Reproduction Service No. ED467856).

Bradburn, E., Berger, R., Li, X., Peter, K., & Rooney, K. (2003). *A descriptive summary of 1999-2000 bachelor degree recipients 1 year later, with an analysis of time to degree. (*NCES 2003-165). Washington, DC: US Department of Education, National Center for Education Statistics, Institute of Education Sciences.

Cabrera, A. (1994). Logistic regression analysis in higher education: An applied perspective. In J.C. Smart (Ed.), *Higher Education: Handbook of Theory and Research Vol. X*. New York: Agathon Press.

Calcagno, J. (2006). *The post-secondary achievement of career and technical students in New York City's dual enrollment program.* Paper presented to the meeting of the Association for the Study of Higher Education Conference, Anaheim, CA.

Carey, K. (2004). *A matter of degrees: Improving graduation rates in four-year colleges and universities*. Washington, DC: The Education Trust.

Carey, K. (2005). *One step from the finish line: Higher college graduation rates are within our reach*. Washington, DC: The Education Trust.

Clark, B. (1960). The "cooling out" function in higher education. *American Journal of Sociology*, 65, 569-576.

Cleveland, D. (2001). *Out of the blocks: Hawaii's Running Start pilot program*. Retrieved on March 10, 2005 from University of Hawaii Web site: http://www.hcc.hawaii.edu/hcc_research/RS.pdf.

Cleveland, D. & Maslowski, J. (2002). *The second lap: HCC's Running Start program: Second year evaluation spring/summer 2002*. Retrieved on March 11, 2005 from University of Hawaii Web site: http://www.hc.hawaii.edu/hcc_research/secondlap.htm.

Cohen, J., West, S, Aiken, L, & Cohen, P. (2003). *Applied multiple regression/ correlation analysis for the behavioral sciences* (3rd ed). Mahwah, NJ: Lawrence Erlbaum & Associates.

Colangelo, N., Assouline, S. & Gross, M. (2004a). *A nation deceived: How schools hold back America's brightest students: Vol. 1*. (Templeton National Report on Acceleration). Iowa City, IA: The Connie Belin and Jacqueline Blank International Center for Gifted Education and Talent Development**.**

Colangelo, N., Assouline, S. & Gross, M. (2004b). *A nation deceived: How schools hold back America's brightest students: Vol. 2*. (Templeton National Report on Acceleration). Iowa City, IA: The Connie Belin and Jacqueline Blank International Center for Gifted Education and Talent Development.

College Board. (2005). *Annual AP program participation 1956-2005***.** New York: author.

Colton, T. (2006). *Ready or not: Insufficient collaboration between Department of Education and CUNY could hinder effectiveness and future growth of programs designed to improve students' college readiness levels*. New York: Center for an Urban Future. (ERIC Document Reproduction Service No. ED491637).

Commission on No Child Left Behind. (2007). *Beyond NCLB: Fulfilling the promise to our nation's children*. Washington, DC: The Aspen Institute.

Conley, D. (2005). *College knowledge: What it really takes for students to succeed and what we can do to get them ready.* San Francisco: Jossey-Bass.

Curtin, T., Ingels, S.J., Wu, S., & Heuer, R. (2002). *National education longitudinal study of 1988 base-year to fourth follow-up data file user's manual.* (NCES 2002-323). Washington, DC: US Department of Education, National Center for

Education Statistics.

Curtin, T., Wu, S., Adelman, C., Daniel, B., & Scott, L. (2004a). *Post-secondary education transcript study (PETS), 2000 supplement to the NELS: 88/2000 base-year to fourth follow-up data file user's manual)*. (NCES 2004-401*)*. Washington, DC: US Department of Education, National Center for Education Statistics.

Curtin, T., Wu, S., Adelman, C., Daniel, B., & Scott, L. (2004b). *Post-secondary education transcript study (PETS) 2000 supplemental file users manual*. Washington, DC: US Department of Education, National Center for Education Statistics.

Delicath, T. (1999). The influence of dual credit programs on college students' integration and goal attainment, *Journal of College Student Retention, 1*(4), 377-398.

Dougan, C. (2005). The pitfalls of college courses for high school students*. The Chronicle of Higher Education, 52*(10), B20.

Eimers, M. & Mullen, R. (2003)*. Dual credit and Advanced Placement: Do they help prepare students for success in college?* Paper presented at the meeting of the Association for Institutional Research, Tampa, FL.

Feemster, R. (2002). *High school plus: Middle college morphs into early college*. Retrieved August 5, 2004 from the Ford Foundation Web site: http://www.fordfound.org/publications;ff_report/view_ff_report_detail.cfm?report_index=356&print_version=1.

Goedecke, P. (2006). *Tracking student progress after concurrent enrollment*. Paper presented at the meeting of the National Association of Concurrent Enrollment Partnerships, Washington, DC.

Graham, D. (2006). *Model core curriculum for Iowa high schools: Final report to the State Board of Education, May 2006*. Des Moines, IA: Iowa Department of Education.

Hanson, S. (2003). *Running Start: 2002-03 annual progress report*, Olympia, WA: State of Washington, State Board for Community and Technical Colleges**.**

Hanson, S. (2004). *Running Start: 2003-04 Annual Progress Report*, Olympia, WA: State of Washington, State Board for Community and Technical Colleges.

Hanson, S. (2005). *Running Start: 2004-05 Annual Progress Report*, Olympia, WA: State of Washington, State Board for Community and Technical Colleges**.**

Harvey, J. (2001a). *The lost opportunity of senior year: Finding a better way*.

Washington, DC: National Commission on the High School Senior Year.

Harvey, J. (2001b). *Raising our sights: No high school senior left behind.* Washington, DC: National Commission on the High School Senior Year.

Haycock, K. (1999). Ticket to nowhere: The gap between leaving high school and entering college and high-performance jobs. *Thinking K-16 3*(2), 1-31.

Haycock, K. & Huang, S. (2001). Are today's graduates ready? *Thinking K-16 5*(1), 3-17.

Hicks, R. & Lerer, N. (2003). *NSSE and retention: Does integration affect the probability of leaving?* Paper presented at the meeting of the Northeast Association for Institutional Research, Cambridge, MA.

Hoachlander, G., Sikora, A. & Horn. L. (2003*). Community college students: Goals, academic preparation, and outcome* (NCES 2003-164). Washington, DC: US Department of Education, National Center for Education Statistics, Institute of Education Sciences.

Hoffman, N. (2003). College credit in high school: Increasing college attainment rates for underrepresented students. *Change*, July-August, 1-4.

Horn, L., & Kojaku, L. (2001). *High school academic curriculum and the persistence path through college: Persistence and transfer behavior of undergraduates 3 years after entering 4-year institutions*. (NCES 2001-163). Washington, DC: US Department of Education. National Center for Education Statistics.

Horne, J. (2004*). Dual enrollment students are more likely to enroll in postsecondary education*.(Fast Fact No. 79)*,* Tallahassee, FL: Florida Department of Education.

Hughes, K., Karp, M., Bunting, D., & Friedel, J. (2005). Dual enrollment/dual credit: Its role in career pathways (Chapter 9). In D. Hull, Ed., *Career Pathways: Education with a Purpose*. Waco, TX: CORD.

Hughes, K., Karp, M., Fermin, B., & Bailey, T. (2005). *Pathways to college access and success.* Washington, DC: US Department of Education, Office of Vocational and Adult Education**.**

Hugo, E. (2001). Dual enrollment for underrepresented student populations. *New Directions for Community Colleges, 113,* (Spring 2001), 67-72.

Jencks, C. & Phillips, M. (1998). *The Black-White test score gap*. Washington, DC: Brookings Institution Press.

Johnstone, D. & del Genio, B. (2001). *College-level learning in high school:*

Purposes, policies and practical implications. Washington, DC: Association of American Colleges and Universities.

Jordan, D., McKinney, G., & Trimble, J. (2000). *The transition of Running Start program participants into Western Washington University*. (Dialogue, Issue No. 4). Bellingham, WA: Western Washington University, Office of Institutional Assessment and Testing,

Karp, M. (2006). *Academics aren't the only outcomes: Role and identity development among College Now students.* Paper presented at the meeting of the Association for the Study of Higher Education, Anaheim, CA.

Karp, M., Calcagno, J., Hughes, K., Jeong, D., & Bailey, T. (2007). *The post-secondary achievement of participants in dual enrollment: An analysis of student outcomes in two states*. St. Paul, MN: University of Minnesota, National Research Center for Career and Technical Education.

Karp, M., Calcagno, J., Hughes, K., Jeong, D., & Bailey, T. (2008). Dual enrollment students in Florida and New York City: Post-secondary outcomes. (CCRC Brief No. 37). New York: Teachers College, Columbia University, Community College Research Center.

Kirst, M. & Venezia, A. (2004). *From high school to college: Improving opportunities for success in post-secondary education*. San Francisco: Jossey-Bass.

Kleiman, N. (2001). *Building a highway to higher ed: How collaborative efforts are changing education in America*. The Center for an Urban Future, Education Commission of the States. Retrieved December 28, 2006, from http://www.nycfuture.org/context/reports/report-view.cfm?repkey=10.

Kleiner, B. & Lewis, L. (2005). *Dual enrollment of high school students at post-secondary institutions: 2002-03*. (NCES 2005-008) Washington, DC: US Department of Education, National Center for Education Statistics.

Krueger, C. (2006). *Dual enrollment: Policy issues confronting state policymakers*. Denver, CO: Education Commission of the States.

Lerner, J. & Brand, B. (2006). *The college ladder: Linking secondary and post-secondary education for success for all students*. Washington, DC: American Youth Policy Forum.

London, H. (1992*). Transformations: Cultural challenges faced by first generation students*. *New Directions for Community Colleges, 80*(Winter), 5-11.

Lotkowski, V., Robbins, S., & Noeth, R. (2004). *The role of academic and non-academic factors in improving college retention: ACT Policy Report*. Iowa

City, IA: American College Testing, Inc.

Marshall, R., & Andrews, H. (2002). Dual-credit outcomes: A second visit. *Community College Journal of Research and Practice, 26*, 237-242.

Menzel, M. (2006). Type III concurrent enrollment program participation effect on time and cost to baccalaureate degree completion, *Dissertation Abstracts International, 67* (01), July 2006, (UMI No. 3205232).

Merton, R. (1957). *Social theory and social structure*. New York: The Free Press.

Meyers, L., Gamst, G., & Guarino, A. (2006) *Applied multivariate statistics: Design and interpretation*. Thousand Oaks, CA: Sage Publications.

Napoli, A. & Wortman, P. (2005). *A meta-analysis of the impact of academic and social integration on persistence of community college students*. Unpublished manuscript.

National Association of Concurrent Enrollment Partnerships. (2008). *NACEP roster Accredited Institutions*. Retrieved on February 20, 2008 NACEP Web site: http://www.nacep.org/pdfs/membership_roster.pdf.

National Center on Education and the Economy. (2007). *Tough choices or tough times: The report of the New Commission on the Skills of the American Workforce*. Washington, DC: Author.

Nora, A. (2001-2002). The depiction of significant others in Tinto's "rites of passage": A reconceptualization of the influence of family and community in the persistence process. *Journal of College Student Retention, 3*(1), 41-56.

Nora, A. & Wedham, E. (1991). *Off-campus experiences: The pull factors affecting freshman-year attrition on a commuter campus*. Paper presented at the meeting of the American Educational Research Association, Chicago, IL.

Nunez, A. & Carroll, D. (1998). *First generation students: Undergraduates whose parents never enrolled in post-secondary education*. (Post-secondary Education Descriptive Analysis Report), Washington, DC: US Department of Education, National Center for Education Statistics, Office of Educational Research and Improvement.

Olson, L. & Richard, A. (2005). High schools in limelight for summit: Governors are prepared to talk about change. *Education Week, February 23, 2005*.

Orrill, B. (2003). *Grades 11-14: The heartland or wasteland of American education?* Princeton, NJ: Woodrow Wilson National Fellowship Foundation. Retrieved on October 25, 2006 from the Early College High School Initiative

Library Web site: http://www.earlycolleges.org/Library.html.

Pampel, F. (2000). *Logistic regression: A primer*. Thousand Oaks, CA: Sage Publications.

Pascarella, E. & Terenzini, P. (1980). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. *Journal of Higher Education, 51, (1),* 60-75.

Pascarella, E. &. Terenzini, P. (2005). *How college effects students: Findings and insights from thirty Years of research*. San Francisco: Jossey-Bass.

Pascarella, E., Terenzini, P., & Wolfle, L. (1986). Orientation to college and freshman year persistence/withdrawal decisions. *Journal of Higher Education, 57*(2),155-175.

Peterson, M., Anjewierden, J., & Corser, C. (2001). Designing an effective concurrent enrollment program: A focus on quality of instruction and student outcomes. *New Directions for Community Colleges, 113*(Spring), 23-31.

Piorkowski, G. (1983). Survivor guilt in the university setting. *The Personnel and Guidance Journal, 61*(10), 620-622.

Porter, R. (2003). *A study of students attending Tennessee Board of Regents universities who participated in high school dual enrollment programs*. Unpublished doctoral dissertation, East Tennessee University.

Powell, A., Farrar, E., & Cohen, D. (1985). *The shopping mall high school: Winners and losers in the educational market place*. Boston: Houghton Mifflin.

Puyear, D. (1998). *Concurrent and dual enrollment of high school students in Arizona community colleges: A status report*. Phoenix, AZ: Arizona State Board of Directors for Community Colleges.

Puyear, D., Thor, L., & Mills, K. (2001). Concurrent enrollment in Arizona: encouraging success in high school. *New Directions for Community Colleges, 113*(Spring), 33-41.

Reisberg, L. (1998). Some professors question programs that allow high school students to earn college credits. *The Chronicle of Higher Education 44(*42), A39.

Rendon, L, Jalomo, R., & Nora, A. (2000). Theoretical considerations in the study of minority student retention in higher education. In J.M.Braxton(Ed.), *Reworking the Student Departure Puzzle* (pp. 127-56) Nashville, TN: Vanderbilt University Press.

Richardson, R. (1999). *Community colleges and dual enrollment*. Retrieved January 3, 2007, from University of Arizona Web site: http://aer.arizona.edu/Enrollment/Papers/dualenr.pdf

Rosenbaum, J. (2001). *Beyond college for all: Career paths for the forgotten half*. New York: Russell Sage Foundation.

Ruddock, M. (1996). *Retention: Modified literature review*. Austin, TX: University of Texas.

Ruppert, S., Harris, Z., Hauptman, A., Nettles, M., Perna, L., Millett, C., et al. (1998). R*econceptualizing access in post-secondary education: Report of the policy panel on access*. (NCES 98-283). Washington, DC: US Department of Education, National Center for Education Statistics, Council of the National Post-secondary Education Cooperative, Subcommittee on the Policy Panel on Access**.**

Schneider, B. & Stevenson, D. (1999). *The ambitious generation: America's teenagers, motivated but directionless*. New Haven, CT: Yale University Press.

Seal, K. (2004). Alternative pathways to college. *Carnegie Reporter*. *Spring 2004*, 1-9.

Shireman, R. (2004). *Rigorous courses and student achievement in high school: An options paper for the governor of California.* (Research & Occasional Paper Series) Berkeley, CA: University of California, Center for the Study of Higher Education.

Simpson, R. (1962). Parental influence anticipatory socialization, and social mobility. *American Sociological Review, 27*(4), 517-522.

Somers, P., Woodhouse, S. & Cofer, J. (2000). *The persistence of first generation college students*. Sacramento, CA: Association for the Study of Higher Education.

Spurling, S. & Gabriner, R. (2002). *The effect of concurrent enrollment programs upon student success at City College of San Francisco*. San Francisco: City College of San Francisco, Office of Research, Planning and Grants.

Stoops, N. (2004). *Educational attainment in the United States: 2003 population characteristics*. (Current Population Reports). Washington, DC: U.S. Census Bureau, US Department of Commerce, Economics and Statistics Administration.

Syracuse University. (2007a). *Project Advance Schools*. Retrieved January 30, 2007 from Syracuse University (SUPA) Web site: http://supa.syr.edu/schools/schools.php

Syracuse University. (2007b). *Project Advance Program History.* Retrieved January 30, 2007 from Syracuse University (SUPA) Web site:

http://supa.syr.edu/about/history.php.

Swail, W. (2004). *The art of student retention: A handbook for practitioners and administrators*. Paper presented at the meeting of the Texas Higher Education Coordinating Board 20th Annual Recruitment and Retention Conference, Austin, TX.

Thomas, S. (2000). Ties that bind: A social network approach to understanding student integration and persistence. *The Journal of Higher Education, 71*(5), 591-615.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, *45*(1), 89-125.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition (2nd ed.)*. Chicago: The University of Chicago Press.

Townsend, B. (2001). *Four-year college students' use of the community college: A middle-class takeover? Inequity for whom? Equity issues facing the contemporary community college*. Paper presented at the meeting of the Association for the Study of Higher Education Annual Conference, Richmond, VA.

US Department of Education. (1983). *A nation at risk: The imperative for educational reform*. Washington, DC: The National Commission on Excellence in Education.

Vemezia, A., Callan, P., Jinney, J., Kirst, M., & Usdan, M. (2005). *The governance divide: A report on a four-state study on improving college readiness and success*. Washington, DC: The National Center for Public Policy and Higher Education and The Stanford Institute for Higher Education Research.

Venezia, A., Kirst, M., & Antonio, A. (2003). *Betraying the college dream: How disconnected K-12 and post-secondary education systems undermine student aspirations*. Palo Alto, CA: The Bridge Project, Stanford Institute for Higher Education Research.

Vogt, P. (2007). *Quantitative research methods for professionals*. Boston: Pearson Education, Inc.

Waits, T., Setzer, J., & Lewis, L. (2005). *Dual credit and exam-based courses in US public high schools: 2002-03*. (NCES 2005-009). Washington, DC: US Department of Education, National Center for Education Statistics.

Warburton, E., Bugarin, R., & Nunez, A. (2001). *Bridging the gap: Academic preparation and post-secondary success of first-generation students*. (NCES 2001-153). Washington, DC: US Department of Education, National Center for Education Statistics, Office of Educational Research and Improvement.

Wechsler, H. (2001). *Access to success in the urban high school: The middle college movement*. New York: Teachers College Press.

Western Interstate Commission for Higher Education (WICHE). (2006). *Accelerated learning options: Moving the needle on access and success*. Retrieved on October 26, 2006 from http://www.wiche.eud/Policy/Accelerated_Learning/reports.asp.

Western Washington University. (1999). Running Start student profile. *Focus Research Summary, 4*(2), 1-2.

Windham, P. &. Perkins, G. (2001). *Dual enrollment as an acceleration mechanism: Are students prepared for subsequent courses?* Paper presented at the meeting of the Association for Institutional Research Forum, Long Beach, CA.