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THE IMPACT OF DUAL ENROLLMENT PARTICIPATION
ON DEGREE ATTAINMENT

by

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
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ABSTRACT

THE IMPACT OF DUAL ENROLLMENT PARTICIPATION ON DEGREE ATTAINMENT

Peggy Anne Westcott
Old Dominion University, 2009

Dual enrollment programs continue to grow in the United States; however, little empirical research examines the relationship between this high school experience and future college success and degree attainment. This study examines degree attainment for first-time beginning students who began their postsecondary education at a Virginia Community College during the fall semester, 2002. It follows those students for six years across all institutions attended, comparing degree attainment for two identified groups; students with dual enrollment credit earned prior to fall 2002 (dual enrolled students) and students with no prior dual credit (traditional students). It explores the differences that exist between the two independent samples in regards to attainment of a higher education award and the time it takes to earn a bachelor's degree. It also evaluates whether attainment of a higher education award differs significantly between dual enrollment students who completed identified mathematics and English gatekeeper courses and those who did not.

This non-experimental, retrospective study examined existing data from academic years 2000-01 through 2007-08. Enrollment data, higher education award earned, and demographic information was obtained from databases maintained by the Virginia Community College System (VCCS), State Council of Higher Education for Virginia (SCHEV), and the National Student Clearinghouse. Data extracted from the VCCS

Student Information System included gender; ethnicity; and dual enrollment courses completed. Higher education award data were obtained from the VCCS database, SCHEV, and the National Student Clearinghouse.

It was determined that dual enrollment participation can have many positive benefits for Virginia students. The results indicate that students with prior dual enrollment coursework had statistically significant higher rates of degree attainment and took a shorter time to complete a bachelor's degree. Completion of a gatekeeper course was also positively associated with bachelor's degree attainment.

This dissertation is dedicated to all my friends and family who have supported me through the challenging times and the glorious moments.

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TABLE OF CONTENTS

LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER I	1
INTRODUCTION	1
Background	2
Significance and Purpose of the Study	4
Definition of Terms.....	5
Research Questions and Hypothesis	7
Overview of Method	8
Limitations	9
Conclusion	10
CHAPTER II.....	12
REVIEW OF THE LITERATURE	12
Degree Attainment	12
Dual Enrollment Programs	15
Conclusion	23
CHAPTER III	26
METHOD	26
Research Design.....	26
Research Questions and Hypotheses	27
Participants.....	28
Data Collection and Measures	29
Data Analysis	29
Ethical Protection of Participants.....	31
Limitations and Assumptions	31
Conclusion	32
CHAPTER IV	33
RESULTS	33
Participants.....	33
Conclusion	47
CHAPTER V	48
DISCUSSION	48
Major Findings.....	48
Implications for Practice	51

Limitations of the Study and Recommendations for Future Research	55
Conclusion	58
REFERENCES	61
APPENDICES	70

LIST OF TABLES

Table	Page
1. Program Placement by Dual Enrollment Status	34
2. Gender for Dual Enrolled and Traditional Students	34
3. Ethnicity for Dual Enrolled and Traditional Students	35
4. Highest Level of Award Received by Dual Enrollment Status	36
5. Highest Level of Award Received by Program Plan	37
6. Bachelor's Degree Earned by Dual Enrollment Status	38
7. Advanced Degree Earned by Dual Enrollment Status	38
8. Higher Education Award Earned by Dual Enrollment Status	40
9. Years to Bachelor's Degree Completion	42
10. Dual Enrolled Gatekeeper Course Completion	44
11. Bachelor's Degree Earned by Gatekeeper Course Completion	45
12. Higher Education Award Earned by Gatekeeper Course Completion	46

LIST OF FIGURES

Figure	Page
1. Comparison of time to degree for dual enrolled and traditional students	43

CHAPTER I

INTRODUCTION

Many American students are failing to reach their goal of obtaining a college degree and several countries now exceed the United States in percentage of recent graduates holding an associate's or bachelor's degree. Although 70% of students in the United States complete high school, and 53% go directly to a postsecondary education institution, only 35% earn a college degree (Lerner & Brand, 2006). First-time students entering postsecondary institutions with the intention of obtaining an associate's or bachelor's degree often follow a variety of pathways before completing that goal. Today's students may attend multiple institutions and delay their degree completion for a variety of reasons. Research has found that nearly one-fifth of undergraduates attend more than two institutions, and nearly one-third take time off during their college career (Adelman, 1999; Berkner, He, & Cataldi, 2002). In fact only 37% of first-time freshmen with a declared intention of obtaining a bachelor's degree completed that degree within four years, while an additional 22% finished in five to six years (Berkner, et al., 2002). In 1999-2000 half of all students receiving a bachelor's degree attended a community college prior to receiving their baccalaureate (McPhee, 2006). Only 31% of students attending public two-year institutions went on to complete either an associate's or bachelor's degree within six years.

Differences in bachelor's degree completion rates have been connected to a student's academic preparation, degree goals, enrollment patterns, and demographic characteristics (Berkner, et al., 2002). Tinto (2002) purports that learning is an important condition for college retention especially for highly motivated students. This study

examines the impact that early exposure to college-level coursework through dual enrollment has on a student's ability to attain a degree and if the type of dual enrollment courses taken influence that outcome. Connecting this high school experience to later degree attainment could lend support for further expansion of dual enrollment programs.

Background

Dual enrollment programs were initially created for high-achieving high school students to promote academic rigor and provide an early college experience. Today's dual enrollment programs have expanded to include college coursework for students interested in technical careers. Many initiatives have been developed to provide high school students with the opportunity to earn college credit. International Baccalaureate (IB) and Advanced Placement (AP) are exam-based programs developed in the 1950s as a means to expose high school students to the rigors of a college curriculum. Students achieving the required score on the AP exam are awarded college credit upon matriculation at a two- or four-year institution. AP and IB programs primarily target the advanced or gifted high school student. Middle College high schools began in the 1970s as a means to improve access to college and provide new learning opportunities to at-risk students. Dual enrollment and work-based learning are often combined in Middle College programs. Dual enrollment programs provide opportunities for high school students to earn both high school and college credit. Courses may be taken on campus (concurrent enrollment) or at the high school. The Syracuse Project Advance, established in 1973 for seniors attending high schools in the Syracuse, New York region is one example of an early dual enrollment program. High school and college faculty create the course content collaboratively, and students are required to pass a standardized University exam in order

to gain college credit (Gaines & Wilbur, 1985). During the 1980s dual enrollment programs began to emerge in additional states, and today all 50 states have some form of advanced college credit program available to high school students (Waits, Setzer, & Lewis, 2005). Advanced Placement, International Baccalaureate Diploma, and Dual Enrollment are the three most prevalent programs in high schools today, but bridge programs, Middle College, Tech Prep, and other accelerated learning options may also be offered. Waits et al. surveyed an estimated 16,483 schools in 50 states examining student participation in AP, IB, and dual credit programs and found dual credit programs are increasing throughout the United States and that the variety of course offerings are also expanding.

Currently no single federal policy oversees dual enrollment programs; therefore, the implementation and regulation of state programs varies widely. A recent study found ten key factors that vary within dual enrollment programs: target population; admissions requirements; location; student mix; the background characteristics of the instructors; course content; method of credit-earning; program intensity; funding; and state mandates (Karp, Bailey, Hughes, & Fermin, 2004). Twelve of the states participating in the study did not have any legislation regulating dual enrollment and many of the remaining states did not regulate all ten of the key factors. Nationally dual enrollment programs have grown rapidly (Bailey & Karp, 2003), and this increase is mirrored in Virginia. There were 11,186 high school students enrolled in dual credit courses in 1999-2000, compared to 29,963 in 2007-08, an increase of 168 % (VCCS, 2008).

Significance and Purpose of the Study

The purpose of this study is to relate dual enrollment course completion to college degree attainment for first time beginning students who began their college career at a Virginia Community College in fall 2002. The independent variable, dual enrollment status (DES), is defined as having earned dual credit prior to high school graduation in 2002 or not. The independent variable, gatekeeper course completion (GC) is defined as the completion of a dual enrolled math or English class by a high school student prior to fall 2002. The dependent variable, degree attainment (DA) is defined as the higher education award attained. For question two, the dependent variable time to degree (TD) is defined as the number of years transpired between fall 2002 and completion of a bachelor's degree.

Anecdotal evidence suggests earning college credit while in high school will increase the likelihood of pursuing a college degree. However, most of the research on dual enrollment has been qualitative in nature, focusing on program practices and state policies (Karp, et al., 2004; Karp, Baily, Hughes, & Fermin, 2005; Karp, Calcagno, Hughes, Jeong & Bailey, 2007). Relatively few studies have examined the outcomes of those program practices. While previous research has examined persistence and degree completion for traditional students, few studies have explored the impact of prior dual enrollment coursework on completion of a degree. This study explores whether successful completion of dual enrollment coursework shortens the time to degree attainment or if degree attainment rates of traditional and dual enrolled students differs significantly. Tracking students across multiple institutions provides valuable information regarding degree attainment for students who began their college career at a community

college in Virginia. This information could potentially guide future decisions regarding dual enrollment programs if reviewed by Virginia educators and policy makers.

In Virginia, both the high school and their college partner receive funding for dual enrollment students through average daily membership (ADM) formulas and full-time equivalents (FTE). Results from this study may therefore provide justification for the continuance or modification of this dual funding policy. Virginia has created articulation agreements that allow community college students who meet established grade point averages (GPA) and course requirements to be guaranteed admission into any of the state-supported four-year institutions in Virginia and some private 4-year institutions. Guaranteed admission programs ensure that credits earned through dual enrollment coursework are eligible for transfer. Demonstrating significant differences in degree attainment for dual enrolled students may provide valuable evidence to guide further decisions regarding the guaranteed transfer program.

Definition of Terms

The following key terms were used during this research study:

Degree attainment (DA) is a variable used to identify the higher education awards earned within the six-year timeframe of this study. Higher education awards include Career Studies Certificate, Diploma, Certificate, Associate of Applied Science, Associate of Arts / Associate of Sciences, Baccalaureate, and advanced degree (Master's degree). For each award, the variable was coded as zero for no award or one for award earned. For example: DA_CSC was coded as zero for those students who did not earn a CSC and one for CSC earned. Students may have earned more than one higher education award as they progressed through the six-year timeframe of the study.

Highest degree attained (HA) is a variable used to identify the highest level of award earned within the six-year timeframe of this study. Higher education award levels were coded as: no degree (0), Career Studies Certificate (1), Diploma (2), Certificate (3), Associate of Applied Science (4), Associate of Arts / Associate of Sciences (5), Baccalaureate (6), and advanced degree (7).

Dual enrolled is a category defined as high school students enrolled in Virginia Community College courses for which students receive both high school and college credit. For the purpose of this study a dual enrolled student is a participant who earned dual credit prior to high school graduation in academic year 2001-02.

Dual enrollment status (DES) is a variable defined as having earned dual credit prior to high school graduation in 2001-2002 or not. Students who did not earn dual credit are termed traditional students and are coded as zero. Dual enrolled students were coded as one.

Gatekeeper course (GC) is defined as a dual enrolled mathematics or English class that was completed by a high school student prior to fall 2002. The English gatekeeper course is ENG 111 (College Composition I); the mathematics gatekeeper courses included both introductory and higher level mathematics courses: MTH 120 or higher. The gatekeeper course variable was coded as zero (no gatekeeper course) or one (completion of one or more gatekeeper courses).

National Student Clearinghouse (NSC) is a non-profit organization that provides postsecondary and secondary student degree, diploma, and enrollment verifications.

State Council of Higher Education for Virginia (SCHEV) makes higher education public policy recommendations to the Governor and General Assembly of Virginia in

such areas as capital and operating budget planning, enrollment projections, institutional technology needs, and student financial aid. Virginia's institutions of higher education are required to regularly report student data to SCHEV.

Time to degree (TD) is defined by this study as the number of years transpired between fall 2002 and completion of a bachelor's degree. All students selected for this study graduated from high school or earned a general equivalency diploma (GED) during 2001-2002 and began their postsecondary education at a Virginia Community College in fall 2002. Time to degree was entered as a continuous variable with each year equal to one unit. Students graduating mid-year had a half unit added.

Traditional student is defined as a first-time beginning student who initially matriculated in a Virginia Community College in fall 2002 and did not complete any dual enrolled coursework.

Virginia Community College System (VCCS) was established in 1966 and currently consists of 23 public two year colleges, on 40 campuses located throughout the state of Virginia.

Research Questions and Hypothesis

This study examined the possible differences between traditional students and dual enrolled students regarding degree attainment. It also explored the relationship between the type of dual enrollment courses completed and degree attainment. The study is framed by the following research questions and hypotheses:

Question 1: Is there a statistically significant difference for degree attainment between students who completed dual enrollment coursework and traditional students?

Hypothesis 1: The relative frequency of degree attainment will show a statistically significant difference between students with prior dual enrollment coursework and traditional students.

Question 2: Is there a statistically significant difference in time to bachelor's degree completion between students who completed dual enrollment coursework and traditional students?

Hypothesis 2: Time to bachelor's degree completion will show a statistically significant difference between students with prior dual enrollment coursework and traditional students.

Question 3: What is the impact of completing one or more gatekeeper courses in high school on the attainment of a degree for the dual enrolled cohort?

Hypothesis 3: Degree attainment for dual enrolled students who have completed one or more gatekeeper course in high school will show statistically significant differences from those who have not.

Overview of Method

This non-experimental *ex post facto* study examined data from academic years 2000-01 through 2007-08. Enrollment data, higher education award attained, and demographic information were retrieved from databases maintained by the Virginia Community College System, State Council of Higher Education for Virginia, and the National Student Clearinghouse. The approval process included authorization from Old Dominion University Darden College of Education's Human Subject Research Committee and the VCCS. The VCCS research team assisted the researcher in obtaining student data from VCCS, SCHEV, and the National Student Clearinghouse. Data from all

three organizations were merged, removing student identifiers from the final dataset. To generate a random sample, the SAS command RANUNI (-1) was utilized. The RANUNI command uses SAS's internal clock as a seed and generates a different random number each time the command is run. The command generated a random vector and all non-dual students were sorted by that random vector. Then the first 1971 observations were selected for the random sample. One record was eliminated due to missing data.

Version 15 of the Statistical Package for the Social Sciences (SPSS) software for Windows was used to analyze the data. Chi-square tests were used to examine if a statistically significant difference in the rate of degree attainment between the dual enrolled and traditional student cohorts existed. For those students who completed a bachelor's degree, an independent-samples *t*-test examined any differences that exist between dual enrolled and traditional students for time to degree completion. A non-parametric test of significance of means (chi-square) examined any differences that exist between dual enrolled students who completed one or more gatekeeper courses and those who did not. Cross-tabulations were used to examine the variables in relation to demographics.

Limitations

The scope of this study is limited to students who began their postsecondary education at a community college in Virginia in fall of 2002. Students who initially attended a four-year institution were not included. The study does not control for pre-existing characteristics such as socio-economic status, a student's intrinsic motivation, family support, financial status, and high school academic standing. These confounding factors may potentially have an impact upon attainment of a higher education award.

Dual enrollment course options vary between high schools and not all students had the option of enrolling in a mathematics or English gatekeeper course. This presents another limitation to this study.

It is assumed that the data collected from the VCCS, SCHEV, and the National Student Clearinghouse is accurate and complete. However some data may be missing due to incomplete reporting by both two- and four-year institutions. This study also did not track enrollment status and students may have stopped out or enrolled part-time during the six-year timeframe of the study. Therefore participant enrollment status could impact the results and presents another important limitation.

Conclusion

Three-quarters of today's high school students enter postsecondary education within two years after graduation (Kleiman, 2001; Plucker, Chien, & Zaman, 2006). However, 60% of all students leave their first institution without achieving a degree, and 73% do not return to college (Koker & Hendel, 2003). Earning a college degree has become vital for those students wishing to remain competitive in today's difficult economic times. A low rate of degree attainment impacts the productivity and earning potential of today's workforce. Individuals who only achieve a high school education earn an average salary of \$39,426 while those with a bachelor's degree earn an average salary of \$75,861 (U.S. Census Bureau, 2009). Acquiring the skills and education to succeed in today's evolving workplace has become increasingly important. Many high-tech companies are outsourcing jobs to other countries where labor is cheaper and there are many well educated workers to draw from (Friedman, 2005). According to the Organization for Economic Cooperation and Development (2006) eleven countries have a

higher percentage of 25-34 year olds that hold a two- or four-year degree. Increasing graduation rates is essential if the United States does not want to fall further behind our global competitors.

The decline in U. S. college graduation rates has been attributed to several important factors, including high college drop-out rates and the increased cost of higher education. Research suggests that the intensity and quality of a student's high school academic experience is strongly associated with their degree attainment (Adelman, 1999). Dual enrollment and other credit-based programs may help prepare students for the rigors of postsecondary education and support eventual degree attainment, however additional research is needed. Qualitative studies that examine state policies and student perceptions of credit-based programs are abundant; but, quantitative studies examining the outcomes of these programs are few (Burns & Lewis, 2000; Clark, 2001; Karp, et al., 2004). This study provides additional quantitative research and adds to the current body of evidence regarding dual enrollment programs.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter is divided into two sections and provides a review of the literature associated with dual enrollment programs and degree attainment. Section one presents research related to degree completion for students attending two- and four-year institutions in the United States. It includes information about postsecondary persistence and college completion rates. The second section presents research related to dual enrollment programs. It includes historical background information; an overview of issues related to access, academic rigor, and policies; as well as the perceived benefits of dual enrollment programs nationally. The final portion of this chapter summarizes the history and growth of dual enrollment programs in Virginia.

Degree Attainment

Each year, the National Center for Education Statistics (NCES) analyzes trends in education. The NCES (2005) *Condition of Education* study states that participation in postsecondary education within 8.5 years of high school graduation is on the rise, reporting 59% in 1982 versus 77% participation in 1992. For individuals aged 25-29 the percentage of students who completed at least some college was 34% in 1971 versus 57% in 2003; however, only 28% of the 2003 cohort attained a bachelor's degree (NCES, 2005). Low-income and minority students often face additional challenges and are less likely to achieve a degree when compared to students of higher socio-economic status (Advisory Committee on Student Financial Assistance, 2002). The Higher Education Act of 1965 was intended to increase access to postsecondary education by providing financial assistance to eligible students; yet, low-income student enrollment still falls

short of expected levels (U.S. Department of Education, 2009; Carey, 2004). Carey (2004) found that successful completion of the first year of college is a strong indicator for future degree completion; however, 25% of first-time, full-time, degree-seeking college freshman drop out during their freshman year. The United States Department of Education (DOE) study, *The Toolbox Revisited*, reports students who earned fewer than 20 credits by the end of their first year of college were less likely to complete a degree (Adelman, 2006). Adelman suggests that earning a minimum of 6 credits through dual enrollment could be an effective strategy for helping students cross that 20-credit goal during their first year.

Although students may enter college with the intention of completing a bachelor's degree in four years, many factors can influence that final outcome. Historically, college completion rates have remained relatively constant over the past three decades, with 66%-67% of high school graduates enrolled in four-year institutions completing after five years (Barton, 2002; Adelman, 2004). Two longitudinal studies of beginning postsecondary students, BPS: 90/94 and BPS: 96/01, examined degree completion within a 5-year time frame. Analysis of that data found that although there was no overall change in the 5-year bachelor's degree completion rate, there was a measurable change in 5-year persistence rates (Horn & Carroll, 2004). The researchers found that students from the BPS: 96/01 cohort were more likely to be enrolled in a four-year institution after five years as compared to the earlier cohort.

Once a leader in higher education, the United States is now falling behind other nations. Currently the U.S. is ranked 5th in the percentage of 18 to 24 year-old students enrolled in postsecondary education, but only ranks 16th on the proportion of students

who complete a college certificate or degree (Davies, 2006). While other nations begin to catch up and exceed our college completion rates, the United States increasingly needs qualified, highly skilled workers. The baby boomer generation is reaching retirement age, and the percentage of individuals age 20-64 is expected to drop by 6% over the next 50 years (Carey, 2004). As the baby boomers retire, there will be an increased need for highly skilled workers to take their place. The projected increase in the working-age population for 2000-2015 is 8.6% as compared to a 13% increase during 1990-2000 (Ruppert, 2003). As the number of available workers declines there are fewer college graduates prepared to take their place. Eighteen to twenty-four year old postsecondary national participation rates were 34% in 2003. According to Ruppert, participation rates would need to reach 59% by 2015 in order to ensure that we have enough skilled workers to close the gap. Providing programs that prepare today's students for the rigors of college and increasing college access has become a national imperative.

Roughly 3 million students began their postsecondary education in academic year 1995-96, with 46% of those students initially attending a public two-year institution (NCES, 2005). Six years later, 26% of the students had obtained a bachelor's degree, 10% had obtained an associate's degree, 12% had obtained a certificate and 14% were still enrolled. Factors influencing student persistence and degree attainment were cited as: income, academic preparation, student engagement, and social support.

Students attending community college have a variety of goals, from earning a certificate or degree to obtaining job skills. Community college students often attend part-time, balancing work or family commitments. In the 2006 Community College Survey of Engagement (CCSE), researchers found that 50% of respondents noted their

intent to transfer to a four-year institution. However, the goal of obtaining a bachelor's degree is often delayed as students may step out for a semester or longer before returning, or jump between multiple institutions. The *DOE Toolbox Revisited* suggested continuous enrollment increases the probability of degree completion by 43%. The study also reported that students who formally transfer from a community college to a four-year institution were more positively associated with degree completion than were those students who wander between several institutions.

Persistence is on the rise for students who begin their postsecondary education at a two-year institution (Horn & Carroll, 2004). When comparing the BPS: 90/94 and BPS: 96/01 cohorts, researchers found that the later cohort members were more likely to be enrolled in a four-year institution after 5 years (5% versus 10%). For every 100 students who are in ninth grade only about one-fifth will earn an associate's degree within three years of enrolling in a two-year institution or earn a bachelor's degree within six years (Davis, 2006).

Dual Enrollment Programs

History of Dual Credit

Dual credit programs offering early exposure to college coursework have existed for several decades. Early programs began offering some form of college experience primarily for high achieving senior high school students. Local school districts formed articulation agreements with neighboring postsecondary institutions, but there were few statewide policies in place. During the 1970s dual credit options began to expand. The Syracuse University program, Project Advance (SUPA) formed in 1972 is an example of an early dual credit program that is still in existence today (Andrews, 2001).

In response to the 1983 report *A Nation at Risk*, many local, state, and federal reforms were put in place (National Commission on Excellence in Education). There was a call to increase national education standards by improving curriculum content, raising standards for instruction, formalizing programs of study, and implementing new tests to assess achievement. Many educators saw Advanced Placement and dual enrollment programs as a means for providing a more rigorous high school curriculum. The increased demand for dual enrollment during the 1980s prompted many states to form guidelines for the implementation of dual enrollment programs (Andrews, 2000; Giradi & Stein, 2001; Karp, et al., 2005).

During the 1990s dual enrollment was embraced as a way to not only provide challenging coursework for high achieving students but also as a means for increasing college readiness for all students. In a two year span, dual enrollment increased nationally from 96,913 in 1993 to 123,039 in 1995 (Bryant, 2000). Dual enrollment programs continue to expand nationwide, with the most rapid growth reported in Illinois, Missouri, Oklahoma, Virginia, Washington, and Florida (Andrews, 2003). A 2005 report from the U.S. Department of Education states that 71% of high schools participate in some form of dual credit college coursework. In 2002-03 a total of 813,000 secondary students enrolled in a college-credit course (Karp, et al., 2007).

Benefits of Dual Enrollment

Early exposure to rigorous college-level coursework through dual enrollment programs may help high school students gain confidence, learn specialized skills, or improve academic abilities. The Texas P-16 Council (2007) reviewed their current dual credit program and found that “students who enroll in dual credit courses attend college

and earn some type of degree at a higher rate than those who do not participate in dual credit while in high school” (p. 9). Data for Hispanic and Black students who participated in dual credit programs showed even higher rates of college attendance and degree completion. It was reported that 32% of Hispanics who participated in dual credit graduated with baccalaureate degrees versus 11% of Hispanics who never enrolled in dual credit coursework.

Karp et al. (2007) assessed the effects of participation in dual enrollment by examining the persistence, enrollment intensity, credit accumulation, and grade point average (GPA) of students enrolled in New York City’s College Now program and the state of Florida’s dual enrollment program. Findings suggest that participation in dual enrollment was “positively related to students’ overall progress toward a degree” and the Florida students “had statistically significantly higher postsecondary grade point averages one year after high school graduation” (p.5-6). The authors recommended that further studies investigating the relationship between dual enrollment participation and measurable outcomes be undertaken. One of the biggest difficulties in completing a quantitative study of this nature is the lack of a comprehensive national database that can effectively track student graduation rates and performance. The Data Quality Campaign’s goal is to establish an integrated national database that can facilitate the gathering and analysis of student data across secondary and postsecondary institutions by 2009 (Reindl, 2006). Hoffman and Robins (2005) report inconsistencies between the data collected by individual states and national data sets. There are also many confounding factors that may serve to make it difficult to determine the true relationships that exist between participation in dual credit coursework and performance. The influence of pre-existing

factors such as intrinsic motivation, personal academic aspirations, parental support, and home environments on degree completion may be difficult to assess.

Access to Dual Enrollment Programs

Promoting access to dual credit coursework and maintaining high academic standards are topics of heated discussion in the extant literature. There is a national trend toward increasing access and facilitating the transition between secondary and postsecondary institutions by offering a variety of dual credit, AP, IB, Tech Prep, early, or Middle College programs. All 50 states now provide high school students with some type of option for earning college credit for coursework successfully completed while still in high school. Programs can be initiated locally, regionally, or statewide. The College Now program is one example of a city-wide program that serves more than 32,000 students a year and is offered in all 17 City University of New York (CUNY) campuses, encompassing 240 public high schools (Colton, 2006).

A comprehensive P-16 educational model is being supported in many states. The P-16 movement attempts to connect secondary education with postsecondary schools by providing clear career pathways and increased opportunities for earning college credit while still in high school. In North Carolina, high school students have the option of earning up to two years of college credit or an associate's degree through the Learn and Earn program funded by the Melinda Gates Foundation. Collaborative initiatives between secondary and postsecondary institutions are being funded by both public and private money.

Academic Rigor of Dual Credit Programs

Limited research explores the effectiveness of dual credit programs and compares dual credit courses to their on-campus counterparts. Catron reported (2001) that dual enrollment students participating in English 111-112 courses believed they were better prepared for future college coursework in English. Further analysis found that most students with prior dual credit experience were able to earn the same or better grades in subsequent writing intensive courses at Wytheville Community College. In a policy brief from the Education Commission of the States, Krueger (2006) purports that academic rigor can be maintained if eligibility requirements are correctly structured. The perception of dual enrollment courses being less rigorous than their on-campus counterparts continues to spark debate amongst educators. In fact many four-year institutions throughout the United States refuse to accept dual credit courses for transfer. Virginia recently established guaranteed admission agreements between the VCCS and all of the public, state supported, four-year institutions in Virginia and some of the private four-year institutions. The admission agreements guarantee acceptance of a pre-determined number of credits earned through dual enrollment (VCCS, 2009b). Demonstrating an association between prior dual enrollment experience and degree attainment and may lend support to this new program.

Persistence and Success of Dual Enrolled Students

Credit-based transition programs that help prepare high school students for further education are numerous and varied. The success of these programs, however, is often difficult to measure due to many confounding factors. There is a consensus that students who participate in dual enrollment tend to have greater success than their non-dual

enrolled counterparts. However, the factors that contribute to “success” as defined by distribution of grades within a discipline or overall GPA are multi-faceted.

Demographics, parents’ level of education, high school GPA, academic preparedness, social, and motivational factors all may contribute to the level of academic achievement. Herbert (2001) found that students with prior dual enrollment coursework performed as well as traditional college students in subsequent coursework and once enrolled in college were able to maintain as high or higher grade point averages.

Welsh, Brake, and Choi (2001) investigated the role and impact of dual credit programs in the reform of Kentucky postsecondary education. The authors addressed three critical areas that impact dual enrollment programs: (1) the number of students enrolling and succeeding in dual credit courses in Kentucky; (2) the success of underrepresented populations in dual credit courses; and (3) predictors of student participation and success in dual credit courses. The findings revealed that there were not only significant increase in enrollment in dual credit coursework but the students also had a higher success rate.

Researchers for the National Center for Career and Technical Education examined the postsecondary achievement of students who participated in dual enrollment in Florida and New York (Karp, et al., 2007). The authors found that participation in dual enrollment was positively related to enrollment in college, the likelihood of initially enrolling in a four-year institution, and persistence to a second semester. They also reported that after two years of college, dual enrollment course completers had statistically significant higher grade point averages than their non-participating peers. Since dual enrolled high school students in Virginia are required to achieve satisfactory

scores on placement tests and meet the same academic pre-requisites for college-level coursework as community college students, one might expect them to be at least as successful as their non-dual enrolled counterparts. Virginia has a vital Tech Prep program that supports students interested in following a Career and Technical Education (CTE) pathway. CTE students often earn industry standard certifications or move on to postsecondary education in support of their chosen career field. Karp et.al (2007) found that CTE students who took part in dual enrollment were more likely to enroll in college and persist to a second semester than their peers who did not participate in dual enrollment. High school students in Virginia are encouraged to identify a career pathway that they wish to follow early on in their high school career. Students following a Career and Technical Education pathway may choose to continue that course of study as they enter a two- or four-year institution. Participants for this study were identified by the VCCS as CTE, transfer, or unclassified.

Other positive contributions towards academic success include the effect on a student's motivation or beliefs. Peterson, Anjewierden, and Corser reported that students from Salt Lake Community College (SLCC) believed that their participation in prior dual enrollment coursework encouraged them to attend college (2001). A survey of students from Maricopa Community College, Arizona, found that students with prior dual enrollment classes had higher first semester grades than those of a typical community college transfer student (Finch, 1997). Adelman (1999) reported that the strongest predictor of bachelor degree completion was the intensity and quality of a student's high school curriculum. According to Bailey, Hughes, and Karp (2002), dual enrollment students enroll in college and have greater success than the typical high school student,

although this may be due to the student's characteristics and not necessarily the program itself. Robertson reports that students who take advantage of earning college credit while in high school earn higher grades in college, require less remediation, and have higher rates of persistence (2005).

Dual Enrollment in Virginia

In the early 1980s, 2 + 2 and Tech Prep programs were prevalent in Virginia. Both programs provided articulated credit for students that completed vocational courses in high school and were then program placed at a community college. In the mid to late 1980s, agreements between secondary and postsecondary institutions also began to emerge, offering college-level general education courses delivered at the high school. In 1988, the Virginia Plan for Dual Enrollment established procedures and governance for dual enrollment programs in Virginia (Catron, 1988). In recent years articulated credit programs have diminished in Virginia, as dual enrollment programs continue to expand.

The Virginia Code § 22.1-253.13:1 established the Standards of Learning (SOL) requirements for Virginia students and granted schools divisions the ability to offer dual enrollment, advanced placement, IB, and Governor's School programs (Virginia General Assembly, 2009). Virginia has created a number of programs to help improve the rigor of high school courses and provide a clear pathway from secondary to postsecondary education. The Education for a Lifetime initiative spearheaded by previous Governor Mark Warner in 2004, offered two options for Virginia students. The Early College Scholars program encourages seniors to complete at least 15 credits of transferable college credit through dual enrollment, advanced placement, or the Virtual Virginia program. The Path to Industry Certification program allows students to work toward

achieving an industry standard certification, while in high school (Virginia Department of Education, 2009). Many of the required CTE courses that lead to industry certification are offered as dual enrollment courses. The outcomes for these programs have yet to be fully investigated. Linking positive outcomes to completion of dual enrollment coursework could lend support for continuation of those programs.

Dual enrollment in Virginia has shown tremendous growth since the signing of the 1988 agreement. Dual enrollment contracts between secondary and postsecondary institutions continue to expand, while new guaranteed admission agreements between two- and four-year institutions support the transfer of dual credit in Virginia. In 2002 the VCCS Chancellor established his Dateline 2009 goal to triple the number of high school students who take college courses and receive college credits, raising total enrollment to 45,000 (VCCS, 2008b). Although the Dateline 2009 goal may fall short of the anticipated 45,000 students projected in 2002, dual enrollment headcount has more than doubled over the past 6 years. The 2007-08 unduplicated headcount for dual enrollment in Virginia Community Colleges was reported as 29,963 (VCCS, 2008).

In 2001-02, 14,607 students participated in dual credit coursework through the Virginia Community College System (2008b). From those students who attended a Virginia Community College directly after high school, 1,971 students were selected for this study.

Conclusion

Educators, parents, and students generally perceive dual enrollment programs to be beneficial (Andrews, 2000; Boswell, 2001; Bailey, et al., 2002; Clark, 2001). Some benefits cited include early exposure to rigorous college curriculum, increasing high

school course options, shortening time to college degree completion, and financial savings. While college participation rates have risen, the percentage of U. S. students completing a degree has fallen behind other nations (Davies, 2006). Dual credit programs have been hailed as a way to help close that gap but additional studies connecting this high school experience to future college success and degree completion are necessary. Few quantitative studies establish a direct link between the completion of college coursework in high school and a student's attainment of a college certificate or degree (Adelman, 2006; Karp, et al., 2007; Swanson, 2008). Connecting dual enrollment participation to degree attainment can be difficult because there are many confounding factors that influence a student's ability to earn a degree. Each student's socio-economic background, academic preparation, engagement, motivation, financial aid eligibility, and family support may either promote or undermine eventual degree completion. The other barrier to this type of research is a lack of a national database that links secondary and postsecondary institutional data with individual student record information. Researchers must rely on gaining access to several data sets across multiple sectors. This creates its own set of difficulties when merging files and verifying the accuracy of the data. Researchers often mention the lack of reliable national data sets as well as the difficulty in isolating the effects of dual enrollment from other factors that support academic success as being a limiting factor to quantitative studies (Bailey, et al., 2003; Blanco, Prescott, & Taylor, 2007; Bragg & Kim, 2006; Lerner & Brand, 2006).

Increasing the rigor of high school coursework, establishing clear pathways that ease the transition between secondary and postsecondary education, and reducing the need for remedial courses during the freshman year of college are some of the many

important issues facing educators today. Dual enrollment programs may begin to help address those important issues. Additional research that investigates the efficacy of dual credit programs and clearly ties measurable outcomes to prior participation in dual enrollment is needed. This study is descriptive in nature, following two independent samples of students that initially attended a public two-year institution in Virginia in the fall of 2002. It is beyond the scope of this investigation to examine the intrinsic motivation and other factors that may lead to eventual degree completion.

CHAPTER III

METHOD

To examine the potential impact of completing dual enrollment coursework on a student's eventual degree attainment an *ex post facto* study was undertaken. Data from two independent samples were examined to determine if any association between degree attainment and dual enrollment participation could be established. This statewide quantitative study creates a baseline comparison of traditional and dual enrolled students in Virginia as they progress towards their degree. It compares the rate at which both groups achieved a higher education award and explores the time it takes to attain a bachelor's degree. It also examines the impact that completion of identified gatekeeper courses prior to high school graduation has on degree attainment for the dual enrolled cohort.

Research Design

The design of this study is a non-experimental *ex post facto* examination of existing data from academic years 2000 through 2007. Data was obtained from the National Student Clearinghouse, State Council of Higher Education for Virginia (SCHEV), and the Virginia Community College System (VCCS). Data extracted includes gender, ethnicity, gatekeeper course type, program plan, graduation date, and higher education award attained. The participants were selected from 10,316 first-time beginning students who were recent high school graduates and began their college career in fall 2002 at a Virginia Community College. The dual enrolled sample consisted of 1,971 students. The traditional sample contained 1,970 students. Requests for data are authorized through the VCCS proposal process. The VCCS selected the sample using a

SAS algorithm that performs a simple random sampling process. The SAS command uses SAS's internal clock as a seed and thus generates a different random number each time the command is run. The command generated a random vector, and all non-dual students were sorted by that random vector. Then the first 1,971 observations were selected for the random sample. One record was eliminated due to data error.

The VCCS research team assigned anonymous identifiers to the data supplied by the National Student Clearinghouse and the two-year institutions. SCHEV provided additional data for those students that attended four-year institutions in Virginia. All data sets were merged based on the anonymous identifiers. Human Subjects approval was obtained from the Old Dominion University Darden College of Education's Human Subject Research Committee.

Research Questions and Hypotheses

This study examined the differences that exist between two independent samples in regards to time to degree and degree attainment. It also evaluates whether the type of dual enrollment courses completed influences degree attainment for the dual enrolled sample. The following research questions frame this study:

Question 1: Is there a statistically significant difference for degree attainment between students who completed dual enrollment coursework and traditional students?

Question 2: Is there a statistically significant difference in time to bachelor's degree completion between students who completed dual enrollment coursework and traditional students?

Question 3: What is the impact of completing one or more gatekeeper courses in high school on the attainment of a higher education award for the dual enrolled cohort?

The study tests the following hypotheses:

Hypothesis 1: The relative frequency of degree attainment will show a statistically significant difference between students with prior dual enrollment coursework and traditional students.

Hypothesis 2: Time to bachelor's degree completion will show a statistically significant difference between students with prior dual enrollment coursework and traditional students.

Hypothesis 3: Degree attainment for dual enrolled students who have completed one or more gatekeeper course in high school will show statistically significant differences from those who have not.

Participants

The participants were selected from 10,316 first-time beginning students who began their college career in fall 2002 at a Virginia community college. Two independent samples included students who completed at least one dual enrollment course, and traditional students with no prior dual enrollment experience. The dual enrolled sample consisted of 1,971 students. The traditional sample contained 1,970 students. Enrollment and degree attainment data was examined for a six year period (2002-2008), across all institutions attended. The research sample consisted of students who graduated from high school or earned a General Educational Development (GED) certificate in 2001-2002, and began regularly attending a Virginia Community College in fall 2002. The following data were obtained for students within each group for a six-year period as applicable: higher education award earned, date of award, demographic characteristics, program plan, and dual enrollment courses taken.

Data Collection and Measures

Data elements included the number and type of dual enrollment courses taken, gender, ethnicity, higher education award attained, date of graduation, and dual enrollment status. Enrollment data, higher education award earned, and demographic information were obtained from databases maintained by the Virginia Community College System, State Council of Higher Education for Virginia, and the National Student Clearinghouse. There are 23 community colleges within the Virginia Community College System. This study was statewide and included data from all 23 colleges. Data extracted from the VCCS student information system included gender, ethnicity, program plan, and dual enrollment courses taken. Two-year award completion data were extracted from the VCCS database as available. Four-year and advanced degree information was obtained from SCHEV and the National Student Clearinghouse. Permission to access the VCCS, SCHEV, and National Student Clearinghouse data was obtained through the VCCS proposal process completed in January 2009. The VCCS gathered all datasets, and individual student records received unique identifiers to ensure that student records remained anonymous. Data is retained on a laptop computer and kept in a secure, limited-access location. The data files will be destroyed one year after completion of the research.

Data Analysis

Version 15 of the Statistical Package for the Social Sciences (SPSS) software for Windows was used to analyze the data. A table of variables and associated statistical tests is included in appendix A. For question one, a non-parametric chi-square test was used to determine if dual enrolled students showed a statistically significant difference in degree attainment from traditional students. The dependent variable, degree attainment,

represents the higher education award completed. Students were classified in terms of dual enrollment status (traditional, dual enrolled) and completion of a higher education award. Two-way contingency table analyses were conducted to evaluate the significance of the relationships between the dichotomous outcome (award earned, or not) and the categorical variable dual enrollment status. A series of chi-square tests of independence were conducted to assess whether degree attainment was associated with dual enrollment status. The alpha level was set at .05. Strength of relationship was assessed using Cramér's V levels as proposed by Cohen (1988). For $df = 1$, $.10 < V < .30$ = small effect, $.30 < V < .50$ = medium effect, and $V > .50$ = large effect. Cramér's V was chosen since it is one of the most popular of the chi-square-based measures of nominal association and is equivalent to Phi for 2 X 2 contingency tables.

For question two, after excluding all students who did not obtain a bachelor's degree, an independent-samples t -test was used to determine whether or not time to bachelor's degree showed a statistically significant difference between dual enrolled and traditional students. The dependent variable, time to degree (TD), is a continuous interval variable representing the number of years it took to complete a bachelor's degree. The level of significance was set at .05. Cohen's d was used to determine the effect size using the standard operational definition of small, $d = .20$, medium, $d = .50$, and large, $d =$ greater than .80 (Salkind, 2008).

Question three examined if there were statistically significant differences in degree attainment between dual-enrolled students who completed one or more gatekeeper courses and those who did not complete any gatekeeper courses. Two-way contingency table analysis using crosstabs was used to compare gatekeeper course completion in

relation to degree attainment. A non-parametric test of significance of means (chi-square) was employed. Calculated chi-square values were compared to the standard critical values to determine if the *p* value showed a statistical difference. A .05 level of significance is a conventionally accepted value for chi-square tests and was utilized in this study (Green & Salkind, 2004). Frequencies and percentages were reported for demographic information and program plan.

Ethical Protection of Participants

The study involved research activities that present no more than minimal risk to human subjects, and can be classified as exempt under federal regulations 45CFR46.101 (b). Human Subjects approval was obtained from the Old Dominion University Darden College of Education's Human Subject Research Committee and verified by the Virginia Community College System Office of Research.

All student records were assigned a unique identifier by the VCCS research team prior to disseminating the data for research. All data sets were matched based on the unique identifiers and only group statistics were reported. Data for this research study has been stored in a secure, limited access location and will be destroyed one year after completion of the study.

Limitations and Assumptions

It is assumed that the data collected from the VCCS, SCHEV, and the National Clearinghouse is accurate and complete with the exceptions as previously noted. This study does not attempt to examine or control for any pre-existing intrinsic factors that may influence a student's motivation or ability to achieve a college degree.

The independent sample was randomly selected and assumed to be normally distributed. For the independent-samples *t*-tests it is assumed that the test variable is normally distributed in each of the two populations; the variances of the normally distributed test variable for the populations are equal; the cases represent a random sample from the population and the scores on the test variable are independent of each other. Assumptions underlying the chi-square test include the observations are from a random sample, and the scores associated with the observation are independent of each other. Assumptions underlying two-way contingency table analysis include the observations are independent of each other; and two-way contingency table analyses yield a test statistic that is approximately distributed as a chi-square when the sample size is relatively large (Green & Salkind, 2004).

Conclusion

The purpose of the study was to determine the impact that dual enrollment participation has on degree attainment for Virginia community college students. The findings contribute to the greater body of knowledge regarding the impact of dual enrollment programs on degree attainment. The results will be shared with local stakeholders and presented in conferences and professional journals. The study utilized pre-existing data extracted from databases maintained by the VCCS, SCHEV, and the National Student Clearinghouse. Data from all three databases were merged based on unique student identifiers and analysis was undertaken using SPSS. The results of the analysis are found in the following chapter.

CHAPTER IV

RESULTS

This chapter summarizes the demographic characteristics of the participants and reports the results of the statistical analysis. The study examined the influence of dual enrollment participation on degree attainment for students who began their postsecondary education at a Virginia community college in fall 2002, testing the following hypotheses:

Hypothesis 1: The relative frequency of degree attainment will show a statistically significant difference between students with prior dual enrollment coursework and traditional students.

Hypothesis 2: Time to bachelor's degree completion will show a statistically significant difference between students with prior dual enrollment coursework and traditional students.

Hypothesis 3: Degree attainment for dual enrolled students who have completed one or more gatekeeper course in high school will show statistically significant differences from those who have not.

Participants

Participants for this study were identified by the VCCS as CTE, transfer, or unclassified (Table 1). More than half of the students for both the dual enrolled (55.2%) and traditional population (55.9%) were identified as transfer students.

Table 1

Program Placement by Dual Enrollment Status (DES)

Program	Dual Enrolled (n = 1971)		Traditional (n = 1970)	
	Frequency	Percent	Frequency	Percent
CTE	569	28.9	522	26.5
Transfer	1088	55.2	1101	55.9
Unclassified	314	15.9	347	17.6

Participant Demographic Characteristics

Table 2 shows a greater percentage of female students for both the traditional and dual enrolled groups, which is consistent with enrollment patterns at Virginia's community colleges. The traditional and dual enrolled samples were similar in gender distribution.

Table 2

Gender for Dual Enrolled and Traditional Students

Gender	Dual Enrolled (n = 1971)		Traditional (n = 1970)	
	Frequency	Percent	Frequency	Percent
Male	819	41.6	850	43.1
Female	1152	58.4	1120	56.9

The population contained a representative sample of first-time beginning students enrolled in a Virginia community college in regards to ethnicity (Table 3). The dual

enrolled group had a higher percentage of white students (86.9%) when compared to the traditional group (72.8%). A higher frequency of Asians, Blacks, Hispanics, and American Indians were present in the traditional sample.

Table 3

Ethnicity for Dual Enrolled and Traditional Students

Ethnicity	Dual Enrolled (n = 1971)		Traditional (n = 1970)	
	Frequency	Percent	Frequency	Percent
American Indian	7	.4	10	.5
Asian	18	.9	62	3.1
Black	202	10.2	379	19.2
Hispanic	16	.8	48	2.4
White	1712	86.9	1434	72.8
Other	16	.8	37	1.9

Research Question 1

Is there a statistically significant difference for degree attainment between students who completed dual enrollment coursework and traditional students?

Hypothesis 1: The relative frequency of degree attainment will show a statistically significant difference between students with prior dual enrollment coursework and traditional students.

Seven levels of higher education awards were reported for both samples: Career Studies Certificate, Diploma, Certificate, Associate of Applied Science, Associate of

Arts/Associate of Science, bachelor's degree, and advanced (Master's degree). In support of Hypothesis 1, the findings show a greater proportion of awards were earned by dual enrollment students (Table 4). Only 10.8 % of the traditional students received a bachelor's degree as their highest degree earned, as compared with 22.2 % of dual enrolled students. In addition, more dual enrollment students went on to complete an advanced degree.

Table 4

Highest Level of Award Received (HA) by Dual Enrollment Status (DES)

Award	Dual Enrolled (n = 1971)		Traditional (n = 1970)	
	Frequency	Percent	Frequency	Percent
CSC	39	2.0	32	1.6
Diploma	42	2.1	26	1.3
Certificate	20	1.0	4	.2
AAS	196	9.9	115	5.8
AA/AS	181	9.2	171	8.7
Bachelor's	417	21.2	205	10.4
Advanced	21	1.1	8	.4
None	1055	53.5	1409	71.5

A crosstab comparison of highest degree earned and program plan revealed that for students identified as CTE, the greatest frequency of award earned was the Associate of Applied Science degree, n = 202, 18.5% (Table 5). For those students identified as

transfer students, the greatest frequency of award earned was bachelor's degree, $n = 432$, 19.7%.

Table 5

Highest Level of Award Received (HA) by Program Plan

Award	CTE (n = 1091)		Transfer (n = 2189)		Unclassified (n = 661)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
CSC	40	3.7	24	1.1	7	1.1
Diploma	54	4.9	9	.4	5	.8
Certificate	20	1.8	1	.0	3	.5
AAS	202	18.5	79	3.6	30	4.5
AA/AS	15	1.4	289	13.2	48	7.3
Bachelor's	81	7.4	432	19.7	109	16.5
Advanced	1	.1	24	1.1	4	.6
None	678	62.1	1331	60.8	455	68.8

** Percent of higher education award earned within program placement*

As can be seen by the frequencies cross tabulated in Table 6, there is a significant association between bachelor's degree attainment and dual enrollment status, $\chi^2(1, N=3941) = 93.016, p < .001$, Cramér's $V = .154$, with dual enrollment students earning a bachelor's degree at a significantly higher rate.

Table 6

Bachelor's Degree Earned by Dual Enrollment Status

Degree Earned	Dual Enrolled (n = 1971)	Traditional (n = 1970)
	Frequency	Frequency
Yes	438	213
No	1533	1757

For those students that earned a bachelor's degree, a total of 29 students went on to earn an advanced degree within six years. Frequencies cross tabulated in Table 7 show a significant association between advanced degree attainment and dual enrollment status, $\chi^2(1, N=3941) = 5.864, p = .015$, Cramér's $V = .039$, with dual enrollment students earning an advanced degree at a significantly higher rate. The effect size indicates a very small strength of association.

Table 7

Advanced Degree Earned by Dual Enrollment Status

Degree Earned	Dual Enrolled (n = 1971)	Traditional (n = 1970)
	Frequency	Frequency
Yes	21	8
No	1950	1962

Chi-square results also showed an association between dual enrollment status and earning an Associate of Applied Science degree, $\chi^2(1, N=3941) = 22.859, p \leq .001$,

Cramér's $V = .076$, and Certificate, $\chi^2(1, N=3941) = 10.724, p = .001$, Cramér's $V = .052$.

No significant differences were shown for those students earning a Career Studies

Certificate, $\chi^2(1, N=3941) = .699, p = .403$, Cramér's $V = .013$, Diploma, $\chi^2(1, N=3941)$

$= 3.823, p = .051$, Cramér's $V = .013$, Associate of Art and Associate of Science degrees

$\chi^2(1, N=3941) = .306, p = .580$, Cramér's $V = .009$.

The dual enrolled group showed the largest rate of degrees earned overall, with bachelor's degree having the strongest strength of association for awards earned. Table 8 lists the frequencies for each level of higher education award earned.

Table 8

Higher Education Award Earned by Dual Enrollment Status

Award	Earned	Dual Enrolled (n = 1971) Frequency	Traditional (n = 1970) Frequency
CSC	Yes	39	32
	No	1932	1938
Diploma	Yes	42	26
	No	1929	1944
Certificate	Yes	20	4
	No	1951	1966
AAS	Yes	196	115
	No	1775	1855
AA/AS	Yes	181	171
	No	1790	1799
Bachelor's	Yes	438	213
	No	1533	1757
Advanced	Yes	21	8
	No	1950	1962

Research Question 2

Is there a statistically significant difference in time to bachelor's degree completion between students who completed dual enrollment coursework and traditional students?

Hypothesis 2: Time to bachelor's degree completion will show a statistically significant difference between students with prior dual enrollment coursework and traditional students.

A two-tailed independent samples *t*-test found a significant difference between dual enrollment status and time to bachelor's degree completion, $t(473.88) = -5.35, p \leq .001, d = -.44$. Students in the traditional group ($M = 5.16, SD = .725$) on average took longer than dual enrolled students ($M = 4.82, SD = .828$) to complete a bachelor's degree. The confidence interval for the difference in means ranged from -.4648 to -.2151. Table 9 shows the frequency and percentage for each year that a bachelor's degree was earned by a dual enrolled or traditional student.

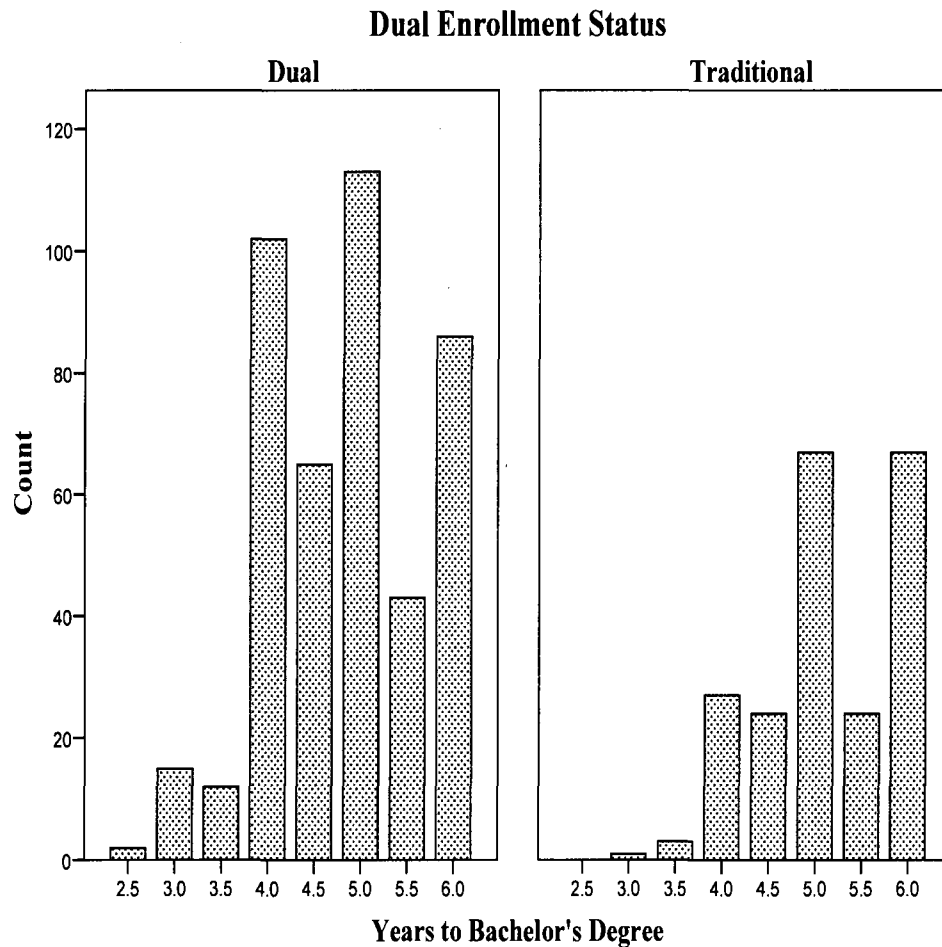
Table 9

Years to Bachelor's Degree Completion

Years	Dual Enrolled (n = 1971)		Traditional (n = 1970)	
	Frequency	Percent	Frequency	Percent
2.5	2	.1	0	0
3.0	15	.8	1	.1
3.5	12	.6	3	.2
4.0	102	5.2	27	1.4
4.5	65	3.3	24	1.2
5.0	113	5.7	67	3.4
5.5	43	2.2	24	1.2
6.0	86	4.4	67	3.4
Not completed	1533	77.8	1757	89.2

As illustrated in Figure 1, the largest frequency of bachelor's degree attainment clustered within the four to five year time period for the dual enrollment student group. The traditional group had the greatest frequency of bachelor's degree attainment during the five to six year timeframe. High school students with previous dual enrollment coursework were found to earn a bachelor's degree in a statistically significant shorter time than their traditional peers in this study.

Figure 1. Comparison of time to degree for dual enrolled and traditional students



Research Question 3

What is the impact of completing one or more gatekeeper course in high school on the attainment of a degree for the dual enrolled cohort?

Hypothesis 3: Degree attainment for dual enrolled students who have completed one or more gatekeeper course in high school will show statistically significant differences from those who have not.

To address research question three, the dual enrollment students were classified in terms of completion of one or more gatekeeper courses. A total of 553 dual enrolled

students completed one or more English or mathematics courses prior to enrollment at a Virginia community college. This study found that 71.9% of dual enrollment participants did not complete a gatekeeper course (Table 10).

Table 10

Dual Enrolled Gatekeeper Course Completion

Gatekeeper	Frequency	Percent
None	1418	71.9
English	448	22.7
Math	61	3.1
Both	44	2.2

Two-way contingency table analyses were conducted to explore the significance of the relationships between the dichotomous outcome (earning an award, or not) and the categorical variable for gatekeeper course completion. A series of chi-square tests of independence were conducted to assess whether degree attainment was associated with gatekeeper course completion. The alpha level was set at .05. As can be seen by the frequencies cross-tabulated in Table 11, there is a significant association between bachelor's degree attainment and gatekeeper course completion, $\chi^2(1, N=1971) = 18.964$, $p \leq .001$, Cramér's $V = .098$. Students who completed one or more gatekeeper courses earned a bachelor's degree at a significantly higher rate. The effect size indicates a small strength of association.

Table 11

Bachelor's Degree Earned by Gatekeeper Course Completion

	Bachelor's degree (n = 438)	No Bachelor's degree (n = 1533)
Gatekeeper	Frequency	Frequency
None	279	1139
One or more	159	394

The chi-square analysis found statistically significant associations between gatekeeper course completion and degree attainment for students who earned a Career Studies Certificate, an associate's degree, and bachelor's degree. Chi-square results were as follows: Career Studies Certificate, $\chi^2(1, N=1971) = 4.576, p = .032$, Cramér's $V = .048$, Associate of Applied Science, $\chi^2(1, N=1971) = 5.494, p = .019$, Cramér's $V = .053$, and Associate of Arts/Associate of Science, $\chi^2(1, N=1971) = 31.282, p \leq .001$, Cramér's $V = .126$. Chi-square results for advanced degree $\chi^2(1, N=1971) = .003, p = .958$, Cramér's $V = .001$, Certificate, $\chi^2(1, N=1971) = 1.707, p = .191$, Cramér's $V = .029$, and Diploma were not significant, $\chi^2(1, N=1971) = .178, p = .673$, Cramér's $V = .010$. Dual enrolled students not previously enrolled in a gatekeeper course earned a larger percentage of Career Studies Certificates, Certificates, and Associate of Applied Science degrees. Students who previously enrolled in one or more gatekeeper courses earned a greater percentage of Associate of Arts, Associate of Sciences, and bachelor's degree. The frequency and percentages for each higher education award earned within the gatekeeper grouping variable are displayed in Table 12.

Table 12

Higher Education Award Earned by Gatekeeper Course Completion

Award	Earned	Gatekeeper (n = 553)		No Gatekeeper (n = 1418)	
		Frequency	Percent	Frequency	Percent
CSC	Yes	5	.9	34	2.4
	No	548	99.1	1384	97.6
Diploma	Yes	13	2.4	29	2.0
	No	540	97.6	1389	98.0
Certificate	Yes	3	.5	17	1.2
	No	550	99.5	1401	98.8
AAS	Yes	41	7.4	155	10.9
	No	512	92.6	1263	89.1
AA/AS	Yes	83	15.0	98	6.9
	No	470	85.0	1320	93.1
Bachelor's	Yes	159	28.8	279	19.7
	No	394	71.2	1139	80.3
Advanced	Yes	6	1.1	15	1.1
	No	547	98.9	1403	98.9

Conclusion

This chapter presented the analysis of the data and the findings. A higher percentage of females were present in both groups and more than half of the participants were identified as transfer students. Dual enrollment students examined in this study were more likely to earn a higher education award than were their traditional counterparts. The results of the chi-square analyses showed a statistically significant association between dual enrollment status and earning a Certificate, Associate of Applied Science degree, bachelor's degree, and advanced degree.

Question two examined the time it took to complete a bachelor's degree for both groups. Dual enrolled students earned a bachelor's degree in a shorter time ($M = 4.820$) than did traditional students ($M = 5.16$). The effect size was moderate indicating that an association could be assumed. The research suggests that completing dual enrolled coursework can shorten the time it takes to earn a bachelor's degree for some students.

Question three explored the relationship between higher education award attainment and prior completion of a gatekeeper course. Completing one or more gatekeeper courses while in high school was positively associated with earning an associate's degree, bachelor's degree, and Career Studies Certificate but no association was demonstrated for earning a Certificate, Diploma, or advanced degree. The research suggests that completing college-level English or mathematics courses prior to graduation from high school can give student's seeking an associate's or bachelor's degree an advantage over those students who do not complete those courses.

CHAPTER V

DISCUSSION

The purpose of this study was to examine the influence that dual enrollment participation had on degree attainment. It also explored the relationship between completion of a gatekeeper course and the attainment of a higher education award. This chapter provides a summary and interpretation of the findings, presents some of the limitations of the study, and suggests recommendations for future research. The results of this study could help improve the understanding of the association between dual enrollment participation and degree attainment and potentially influence future policy decisions regarding dual enrollment programs. Funding and policy decisions can have a large impact on the growth and development of dual enrollment programs. A 1997 policy change in Illinois, allowing both high schools and colleges to receive funding for dual enrollment students, helped stimulate a growth in dual enrollment high school participation by 240% during the next two years (Andrews, 2001).

Major Findings

The findings of this study begin to reveal the impact of dual enrollment participation on future degree attainment. Although limited in its scope, the results of this study point to encouraging outcomes for those students who chose to participate in dual enrollment programs. Early exposure to college level coursework has been associated with a greater rate of degree attainment (Texas P-16 Council, 2007) and higher postsecondary grade point averages (Karp et al., 2007). The findings of this study add further evidence that dual enrollment programs support positive academic achievements for Virginia students. The first question examined if the relative frequency of degree

attainment would show statistically significant differences between the dual enrolled and traditional students. The findings indicated that dual enrollment students earned a larger frequency of higher education awards overall, with significant differences shown for earning a Certificate, Associates of Applied Science, bachelor's and advanced degree. Due to the many confounding factors that influence a student's motivation and academic success, it would be difficult to conclude that dual enrollment participation alone resulted in the significant differences in degree attainment. Students who chose an early college experience by enrolling in dual enrollment coursework may be more motivated than their traditional peers and thereby influence the eventual attainment of a higher education award. Although this study has some limitations, the results demonstrate that Virginia students with prior dual enrollment experience are outperforming traditional students in terms of earning a higher education award.

Prior research has show that many factors influence the time it takes for a student to complete a bachelor's degree (Adelman, 2004; Adelman, 2006; Barton, 2002; Horn & Carroll, 2004). Students may choose to attend part-time, stop-out for a semester, or switch between institutions. Adelman suggested that completion of dual enrollment courses may be an effective way to increase the likelihood of degree completion (2006). Time to bachelor's degree completion for the dual enrolled group was found to be statistically significantly shorter in this study. The results showed that a greater frequency of dual enrollment students ($M = 4.82$) completed a bachelor's degree in less than five years, while the traditional students ($M = 5.16$) tended to need more than five years to complete their degree. Completing a bachelor's degree in a shorter time period allows students to reduce college costs and possibly enter the workforce sooner.

A student's high school academic experience can have an impact on that student's future college success. The type and number of college-level courses completed prior to graduation may influence continued persistence and degree attainment (Adelman, 2006; Karp & Hughes, 2008). This study explored the association between degree attainment and completion of an English or mathematics gatekeeper course. The dual enrolled sample contained 553 students that completed one or more gatekeeper courses. The results indicated that students with prior gatekeeper coursework completed a bachelor's degree at a higher rate than dual enrolled students with no prior gatekeeper courses. Although this outcome is encouraging, several other factors need to be considered. Dual enrollment academic transfer courses in English and mathematics require a student to achieve a satisfactory score on a standardized placement test (COMPASS, SAT, or PSAT) prior to enrolling in the course. This selection process screens for higher achieving students. Students who enroll in academic transfer courses may also have other intrinsic factors which motivate them to persist and reach higher achievement levels. Tinto suggests that academic engagement and social integration can play a large part in persistence and degree attainment (1975). Thus several confounding factors may have influenced the results of this study.

Although not definitive, these findings suggest that participating in dual enrollment coursework contributes to higher rates of higher education award attainment and may also shorten the time it takes to earn a bachelor's degree. Dual enrollment programs have experienced tremendous growth during the past ten years. Additional quantitative studies that demonstrate positive academic outcomes could lend support for future expansion of dual enrollment programs nationally.

Implications for Practice

Implications and Recommendations for Students and their Families

The findings of this study have many implications for Virginia students, parents, and educators. High schools in Virginia offer a variety of college-credit program options to students (AP, IB, and dual enrollment). Demonstrating a clear association between dual enrollment participation and eventual college degree attainment may influence a high school student's choice in college-credit program participation. High school counselors, administrators, teachers, students, and parents should be given the opportunity to review information and current research pertaining to the different credit based programs, so that they can fully understand the value and potential outcomes of each.

Career and Technical Education (CTE) career pathways have recently been aligned with dual enrollment courses in Virginia. Expanding outreach and counseling to CTE students could potentially increase participation in dual enrollment programs throughout the state. Increasing dual enrollment CTE course offerings could allow students the opportunity to earn college credits that transfer directly to career and technical programs at two- and four-year institutions, thus increasing the enrollment for those programs. CTE programs often contain a greater percentage of underrepresented high school students. Providing a positive early college experience for those students may help to close the achievement gap that currently exists for underrepresented groups. Dual enrollment CTE courses that lead to industry standard certifications also afford students additional career options once they graduate from high school.

Several difficulties arise for some students who wish to participate in dual enrollment courses in Virginia. Access to academic transfer and CTE courses isn't consistent across the state, placement requirements vary, and tuition payment policies differ between colleges. The Virginia Community College System (VCCS) allows each community college to set their funding practices for dual enrollment courses. Some community colleges require students and their families to pay full tuition, while others charge zero or partial tuition. Requiring payment for tuition, books, and placement testing could also present a barrier to participation for some students. System-wide funding policies that take the burden of payment off of the student and their families could potentially have a positive impact on dual enrollment participation rates.

Students and their parents should be made aware of the many positive benefits of participation in dual enrollment. Research suggests that a positive dual enrollment experience can encourage students to attend college and may provide an easier transition to a postsecondary institution (Peterson, Anjewerden, & Corser, 2001). The results of this study indicate that dual enrollment students in Virginia are attending college and obtaining a higher education award at a greater rate than their traditional counterparts. The dual enrollment students also took less time to earn a bachelor's degree. If this trend continues, dual enrollment students will be able to earn a degree and enter the workforce sooner than traditional students.

Implications for High School Educators and Recommendations for Practice

Dual enrollment programs enable high schools to offer a broader range of rigorous academic and CTE courses and help support career pathways. However it is sometimes difficult to find high school instructors that are credentialed to teach college-

level transfer courses, which can limit course offerings. Larger school districts are also forming specialty high schools which focus on a particular pathway, such as allied health, engineering, art, or math/science. Specialty high schools within a school district may be able to offer more rigorous college-credit courses in their specified pathway, but generally students who live closest to those specialty high schools are the ones afforded the benefit of those programs. To address some of these inequities, transportation to technical and specialty high schools could be provided for those students who wish to attend.

High school administrators also need to be cognizant of credentialing requirements for dual enrollment instructors, so that they can encourage the hiring of teachers with advanced degrees. School division administrative and financial policies can have an impact on dual enrollment programs. Currently some high schools in Virginia assign AP and IB courses a higher GPA weighting than dual enrolled courses. This policy has the potential to negatively impact participation in dual enrollment if students choose a college-level course based on GPA weighting. Counseling and early exposure to information about the benefits of dual enrollment programs can help students make an informed choice regarding their options for college-level coursework.

Implications for Community College Educators and Recommendations for Practice

Dual enrollment requires collaboration between the high schools and their local postsecondary institutions. During 2002-03, 98% of public two-year institutions had high school students enrolled in college credit courses, as compared to only 77% of public four-year institutions (Kleiner & Lewis, 2005). In Virginia, the community colleges are the largest provider of dual enrollment coursework. For the most part the academic

eligibility requirements for dual enrollment students are the same as the admissions standards for regular college students, but standards for acceptable entrance scores on placement tests can vary from college to college. The Virginia Plan for Dual Enrollment allows the individual community colleges some flexibility in setting their own institutional policies (VCCS, 2009). Tuition requirements can vary throughout the state, with each community college setting its own rate of reimbursement for dual enrollment classes. In order to provide equitable access to dual enrollment coursework throughout the state, higher education policymakers in Virginia could establish uniform eligibility policies and costs for dual enrollment.

Implications for four-year Institution Educators and Recommendations for Practice

The community colleges act as a bridge to four-year institutions, providing general education and technical coursework for students. Statewide articulation agreements are in place between the community colleges and all of the public four-year institutions in Virginia (VCCS, 2009b). The agreements provide a smooth transition for students that are transferring between two- and four-year institutions and strengthen the partnerships between those institutions. These newly established guaranteed admission agreements ensure that dual enrollment courses are transferred as partial fulfillment of the four-year general education requirements. The guaranteed transfer of dual enrolled classes can reduce the total cost of obtaining a bachelor's degree and may shorten the time to achieve that degree.

Implications and Recommendations for Virginia Policymakers

Dual enrollment is generally viewed as a positive strategy for expanding educational opportunities for high school students and a method for facilitating the

transition from high school to college. As dual enrollment programs expand nationally, policymakers need to ensure that access to dual enrollment is equitable for all students and any financial barriers that may currently exist are reduced or eliminated. Research has shown that underrepresented students and students from low-income families are often less likely to attend college. Policies that promote dual enrollment programs need to address the needs of all students. Funding strategies that support all constituents are essential. Providing funding streams for career coaches, mentoring programs, student scholarships, placement testing, and academic support will help to develop and expand dual enrolment programs.

Limitations of the Study and Recommendations for Future Research

Limitations

Several limitations of this study have been mentioned throughout. The study examined quantitative data only; any qualitative factors that could possibly contribute to the eventual attainment of a higher education award were not included. The time to degree variable included the number of years that transpired from fall 2002 to completion of a bachelor's degree. Student enrollment patterns were excluded from this study, potentially impacting the results for the time it takes to complete a bachelor's degree.

The study relied on data from three different sources, the VCCS student information system, the State Council of Higher Education for Virginia data warehouse and the National Student Clearinghouse. The data is assumed to be complete and accurate; however, errors due to inaccurate reporting from the sending institutions were possible. The establishment of a national data warehouse that compiles annual student data from K-20 institutions could facilitate future research.

High school students throughout the Commonwealth of Virginia lack equal access to gatekeeper dual enrollment courses. This can be due to the inability to obtain a credentialed instructor to teach at the high school, small class size, or lack of administrative support. Only 28% of the dual enrollment students in this study completed one or more gatekeeper courses. This inequity presents another limitation to this study because it is difficult to determine if the small percentage of gatekeeper course participation was due to student choice or lack of access.

Recommendations for Future Research

Several recommendations may be made for future research. This study was limited to students who initially attended a Virginia community college. Research suggests students who attend more than one postsecondary institution often take longer to complete a bachelor's degree or have lower completion rates (Adelman, 2006; Horn & Carol, 2004; NCES, 2006). Future research could examine degree attainment for dual enrollment students who initially attended four-year institutions to determine if those students complete a bachelor's degree in less time or at a greater rate than students who transferred from a 2-year institution. Future research also needs to expand the scope of this study by including socio-economic, motivational factors, and other qualitative variables that may influence degree attainment. A mixed methods study may serve to broaden the understanding of the association between qualitative factors and degree attainment. It is difficult to establish a causal relationship between dual enrollment participation and future college success. Future research could utilize experimental and quasi-experimental designs to investigate dual enrollment's impact on degree attainment and further clarify any associations that may exist.

The results of this study may have implications nationally. Dual enrollment programs vary from state to state in regards to credentialing of instructors, location and quality of instruction, and admission criteria. This study could be replicated in other states to determine if students attending community colleges in other regions of the country have similar results.

Students who follow a Career and Technical Education pathway may have different academic goals than students who plan on transferring to a four-year institution. Further investigations that explore the academic progress of CTE students in comparison to transfer students may provide additional data in support of Career and Technical programs. This could potentially impact national Tech Prep programs and may influence Perkins funding for high schools and colleges.

Researchers often mention the lack of a comprehensive national data warehouse as a limiting factor in quantitative studies (Bailey, Hughes, & Karp, 2003; Blanco, Prescott, & Taylor, 2007; Bragg & Kim, 2006; Lerner & Brand, 2006). This study utilized three separate datasets in order to track students across all institutions attended. Establishment of a new national reporting system that tracks students from Kindergarten through college would help future research efforts. A national K-20 database would create a single point of access and could provide a more efficient means for tracking students across institutions.

The transfer of dual enrollment college credit from high school to postsecondary institutions varies widely. Academic transfer courses are more widely accepted than CTE courses at many four-year institutions. Statewide initiatives that guarantee transfer of dual enrollment coursework to the four-year institutions may have a positive impact on future

degree attainment. Future research could examine the impact of statewide articulation and guaranteed transfer agreements on the success of dual enrolled students.

Results of this study show a positive impact on the attainment of a higher education award for dual enrolled students but do not examine some of the inequities that may exist for underrepresented students. In Virginia, each community college determines the tuition rate that students are required to pay for dual enrolled coursework. Tuition rates vary from no net charge to a percentage of the full tuition. This may present a barrier to enrollment for some students. Additional research that examines the relationship between a student's ability to pay tuition and enrollment in dual enrollment coursework may be useful.

Conclusion

Dual enrollment programs are generally perceived as beneficial (Andrews, 2000; Boswell, 2001; Bailey, et al., 2002; Clark, 2001). Supporters claim that participation in dual enrollment coursework has many positive advantages. It provides high school students with exposure to more rigorous coursework, which may in turn make them better prepared for their postsecondary experience (Adelman, 1999). It can potentially save students time and money, if they are able to successfully complete college level transfer courses prior to high school graduation. Dual enrollment programs may also help to increase collaboration between secondary and postsecondary institutions and expand course options for high school students (Orr, 1999; Andrews, 2001). Opponents argue that dual enrollment students are no better prepared than their traditional counterparts and take just as long to complete a degree. The findings of this study provide support for the

benefits of dual enrollment participation. Although the findings are unable to indicate direct causality, some positive general tendencies have been shown.

The results indicate that students with prior dual enrollment coursework completed a bachelor's degree at a higher frequency than their traditional counterparts and finished in a shorter amount of time. The findings also showed that dual enrolled students earned an advanced degree at a higher rate than traditional students, within the six year timeframe of this study. Students are clearly benefiting from their early exposure to college-level coursework. In fact, dual enrollment participation may be an effective strategy for increasing college achievement for many students. System-wide Guaranteed Admission Agreements between the 23 Virginia Community Colleges and 20 colleges and universities in Virginia ensure that dual enrollment transfer courses are accepted by participating four-year institutions as long as students meet minimum GPA and other admission requirements. This guaranteed acceptance of dual enrollment transfer credits strengthens the connections between two- and four-year institutions and affords students more opportunities to succeed.

The results of this study indicate that the type of dual enrollment coursework completed may also influence degree attainment. Students who completed English and mathematics gatekeeper courses showed a positive association with bachelor's degree attainment. Successful completion of a rigorous gatekeeper course while in high school may provide additional motivation to attend college for some students. Increasing access to gatekeeper courses may give high school students an academic advantage once they enroll in a postsecondary institution. Students who successfully complete introductory English and mathematics courses while in high school are able to enroll directly into

advanced level coursework once they attend college. Having completed a freshman mathematics or college composition course prior to matriculation also provides students with more flexibility in their college schedule. Students could potentially take a lighter course load their freshman year, allowing more time for study and acclimation to the college environment.

Early exposure to college-level coursework through dual enrollment provides a clear advantage for Virginia students. Accumulation of dual credit while in high school can increase the likelihood of earning a higher education award and may also shorten the time it takes to earn a bachelor's degree. The findings of this study lend support for the continuation and expansion of dual enrollment programs in Virginia and provide a baseline for further studies.

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Appendices

Appendix A

<i>Variables and statistical tests</i>			
Question	Independent Variable	Dependent Variable	Test
1	Dual enrollment status (DES)	Degree attainment (DA)	Chi-square
2	Dual enrollment status (DES)	Time to degree (TD)	Independent samples <i>t</i> -test
3	Gatekeeper course (GC)	Degree attainment (DA)	Chi-square

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