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THE IMPACT OF THE NUMBER OF DUAL ENROLLMENT CREDITS ON RACIAL
MINORITY STUDENTS' COMPLETION TIME AT FIVE VIRGINIA COMMUNITY
COLLEGES

by

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A Dissertation Submitted to the Faculty of
Old Dominion University in Partial Fulfillment of the
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ABSTRACT

THE IMPACT OF THE NUMBER OF DUAL ENROLLMENT CREDITS ON RACIAL MINORITY STUDENTS' COMPLETION TIME AT FIVE VIRGINIA COMMUNITY COLLEGES

Elisabeth Gardiner Dingess
Old Dominion University, 2018
Director: Dr. Mitchell R. Williams

The five-year college completion rate for students of color can be 15-20% lower than it is for White students (Fink, Jenkins, & Yanaglura, 2017). Dual enrollment courses have been researched as a predictor of college completion (Taylor, 2015), but fewer racial minority students enroll in dual enrollment courses; this enrollment disparity affects their college preparedness skills and may lead to lower college persistence and graduation rates (Evenbeck & Johnson, 2012). Despite the benefits dual enrollment courses could provide to racial minority students, few studies have examined the differences in college completion outcomes between racial minority and majority dual enrollment students (An, 2013; Pretlow & Wathington, 2014).

Participants in the current study included 292 dual enrollment students who attended one of five Virginia community colleges and completed an associate's degree or certificate. Data were analyzed using multiple linear regression to calculate the impact that the number of dual enrollment credits had on racial minorities' college completion time. Control variables included gender, socioeconomic status, rural or urban college location, first-generation college status, and college degree program.

Dual enrollment students expedited their completion time by 1.706% for every dual enrollment credit completed. Students completed an average of 10.817 credits which decreased their college completion time by 18.45%. There was a not a significant difference in completion time between the racial majority students (White and Asian students) and racial minority

students (Black, Hispanic, and students of more than one race) who dual enrolled ($b = 19.600$, $p = .111$).

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This dissertation is dedicated to my family, who persevered with me on this journey,
and to all those who have a life-long love of learning.

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Chapter I

Introduction

With continually rising tuition costs, decreasing governmental aid (An, 2013), and increasing volume of students attending college, dual enrollment has become a staple to many US community colleges (Zuidema & Eames, 2014). Pressure has increased on community college leaders to find new ways to improve completion rates to compete for government funding (Zemsky, 2013). Dual enrollment courses have become a less expensive alternative to college courses and enable students to complete college in a shorter period (Zuidema & Eames, 2014). Dual enrollment includes more than two million students annually (Cowan & Goldhaber, 2015) and helps to improve collegiate performance, as noted by grade point averages (GPA) (Lukes, 2014). With roughly one-third, 33.2%, of community college students completing their degree or certificate (Juszkiewicz, 2015), dual enrollment has increased the number of college graduates while providing students with a bridge from high school to college. Students who take dual enrollment courses were 10% more likely to complete a bachelor's degree compared to those who did not take dual enrollment courses (Adams, 2014). After students participated in dual enrollment courses, they were more likely to (a) meet the college-readiness standards, (b) enroll in college shortly after graduating high school, (c) require no remedial courses in English or math, (d) earn a higher GPA during their first college semester, (e) remained enrolled in college for their second year, (f) have higher four and six-year completion rates, and (g) complete their bachelor's degree in a shorter amount of time (Zinth, 2014).

A dual enrollment program can help students from all backgrounds succeed in higher education (Hoffman, Vargas, & Santos, 2009) but racial minorities and those of low socioeconomic status seem to be enrolling at a lower rate than the local population (An, 2013).

For the purpose of this study, the term racial minority is defined as an individual whose racial characteristics are not similar to the majority of the surrounding population, including Black, Hispanic, and individuals who are two more races who are not White or Asian. Racial minority populations and low-income students are among the 82% of dual-enrolled high school students who benefit the most, yet states reported that racial minority and “low-income students tend to be underrepresented in statewide dual-enrollment programs” (Adams, 2014, p 2). Currently, almost a dozen states have programs in place to make dual enrollment courses available to racial minority and low-income students at no cost, removing the possible financial barrier that likely contributes to lower than average enrollment among those populations (Adams, 2014).

Black and Hispanic students, along with low-income and first-generation college students, increasingly have comprised a significant portion of the college population. Black students (30%) and Hispanic students (30%) require more remediation than White students (20%) (Flannery, 2014). Over 50% of the students placed in remedial courses never complete the sequence and did not enroll in college-level classes. The majority of students placed in remediation were part-time males and in vocational programs, and they often became discouraged when they were placed in remedial courses (Boylan & Trawick, 2013).

Additionally, underrepresented populations are less college ready and start college with few, if any, college credits compared to the racial majority who leave high school with some college credits (Pretlow & Wathington, 2014). For the purpose of this study, the term racial majority is defined as an individual whose racial characteristics are similar to the majority of the surrounding population, including White, but also Asians, to enable this study to focus on the Black and Hispanic racial minority students. Male students, from low-income households and students with a lower GPA, benefit the most from dual enrollment and display higher college

persistence (Pretlow & Wathington, 2014). A majority of dual enrolled students are female, Caucasian, mid- and upper-socioeconomic status, and native English speakers with a high secondary GPA (Trost, 2016).

Since rural community colleges are outside of highly populated cities, people in these regions experience lower per capita income, slower economic growth, fewer employment opportunities, and lower educational attainment (The Universal Leaf Foundation, 2014). Comprised of a U-shaped group of rural counties that excludes larger urban regions, Virginia's "Rural Horseshoe" initiative serves a recognized region that has a population in which only 19% of adults hold a bachelor's degree (The Universal Leaf Foundation, 2014). Virginia's Rural Horseshoe includes 75% of the state's land and half a million residents who do not have a high school degree, leaving Virginia ranked the 31st state in the US regarding high school graduation rates (VCCS, 2015). There is a lack of empirical research which has compared urban areas to rural areas with regard to dual enrollment.

The current study aimed to fill the void in research between racial minorities' graduation completion times and the number of dual enrollment credits they have accrued. Virginia serves as an interesting location for this study because it has a dichotomy between urban and rural community colleges, a diverse population, and fast-growing dual enrollment programs that are primarily taught in high schools, and not on college campuses (ECS, 2016; VCCS, 2016).

Problem Statement

A gap exists between secondary and post-secondary education, and dual enrollment is a bridge that assists many students in making the transition. Almost half (47%) of high school graduates ages 18-20 matriculate from high school straight into community colleges to start their

higher education trek, making community colleges a significant focus in higher education completion plans (Fink et al., 2017). While in high school, a relatively small number of racial minority students enroll in dual enrollment courses which affect their college preparedness skills and could translate to their lower college persistence and longer graduation time (Evenbeck & Johnson, 2012). Currently, dual enrollment research does not distinguish between the number of dual enrollment credits earned and the student's completion time. Also, little research is available on racial minority and racial majority dual enrollment students and community college completion times. Filling this gap in the literature and identifying possible connections between dual enrollment courses and racial minority students' college completion times were the foci of this study.

Purpose Statement

The purpose of this study was to examine whether there are significant differences in completion times between racial minority students and racial majority students enrolled in degree or certificate programs based on the number of dual enrollment credits earned before graduation from high school while controlling for other factors that can affect college completion.

Research Question

The following quantitative research question was used to determine completion times within racial minority and racial majority student populations with the number of dual enrollment credit hours earned:

Are there significant differences in completion times between racial minority and majority students enrolled in a Virginia Community College System (VCCS) degree or

certificate program based on the number of dual enrollment credits earned before graduating high school, controlling for gender, socioeconomic status, rural or urban college location, status as a first-generation college student, and college degree program?

The Significance of the Study

Although racial minority students may benefit greatly from dual enrollment, few studies examined the differences between the community college completion rates of dual-enrolled racial minority students compared to racial majority students (An, 2013; Pretlow & Wathington, 2014). A low percentage of racial minority students earn dual enrolled credits in high school compared to their White counterparts (Fink et al., 2017), although doing so had a positive correlation to college completion rates. With a large number of racial minority students attending community college, connecting dual enrollment credits to community college completion would provide beneficial information to community college leaders. By increasing the number of dual enrollment courses offered at high schools within a community college's service region while improving the enrollment process to capture as many future high school graduates as possible, community colleges could increase their completion rates.

Definitions of Key Terminology

- *Degree or certificate program:* A program of study in which a student is awarded a degree or certificate upon completion of the required courses and credits (Zinth, 2014).

- *Dual enrollment*: A program in which a high school student takes college-level courses and earns credit for both high school and college simultaneously (Cowan & Goldhaber, 2015).
- *First-generation college students*: A college student whose parents did not complete a bachelor's degree (Zinth, 2014).
- *Persistence*: A student's continual pursuit of a college degree, eventually leading to the completion of a college degree or certificate (Zinth, 2014).
- *Racial majority student*: A student whose racial characteristics are similar to the majority of the surrounding population (An, 2013). In the current study, the race of the majority of students is White; Asian students have been included in the racial majority to enable this study to focus on the Black and Hispanic racial minority students.
- *Racial minority student*: A student whose racial characteristics are not similar to the majority of the surrounding population. In the current study, the racial minority students are Black and Hispanics, not White or Asian (An, 2013).
- *Virginia Community College System (VCCS)*: Virginia's state community college system consists of 23 community colleges of which 14 are rural and nine are urban (VCCS, 2016).
- *Virginia's rural horseshoe*: The Virginia region that consists of the majority of Virginia's rural community colleges that typically have lower graduation rates compared to their urban counterparts (VCCS, 2016).

Delimitations

The present study focused on students with dual enrollment credits in the VCCS and was limited to students with dual enrollment credits before graduating high school who then continued to earn a certificate or degree at a Virginia community college. Students who did not earn dual enrollment credit, students who did not complete a certificate or degree at a community college, or those who transferred to a larger institution, were excluded from this study. The focus of this study was on racial minority students, specifically Black and Hispanic student populations. Black students are 19% of Virginia's population and make up 21.6% of its community college enrollment. Hispanic students are 7.9% of Virginia's enrollment and comprise 6.3% of its community college enrollment. Other racial minorities make up a smaller portion of Virginia's community college enrollment and were not the foci of the current study; Asians (5.2%), Hawaiian/Pacific Islander (2.3%), students who are two or more races (1.5%), and American Indian/Alaska Native (0.5%) (NOVA Office of Institutional Research, Planning, and Assessment, 2012).

Research Design

Quantitative data were acquired from the VCCS database Student Information System (SIS) received from institutions that agreed to participate. Data were collected on student identifiers (gender, race, first-generation college student, racial minority defined by the Free Application for Federal Student Aid (FAFSA), and low-income determined by Pell eligibility) and community college success (certificate or degree of completion within six years, equivalent to 300% time for an associate's degree and 600% for a certificate, the number of dual enrollment credits taken, and program degree, which varied in length). The cohort of 2011 participants were

selected who had dual enrollment credits and earned a certificate or degree at a Virginia community college. The quantitative data were analyzed using multiple linear regression. The independent variable, number of dual enrollment credits and racial minority status, and the dependent variable, completion time, had control variables of gender, race, first-generation college student status, low socioeconomic status, completion time, and program degree, which varied in length.

Conclusion

This chapter delivered a broad introduction to dual enrollment and completion time for a certificate or degree, the focus of this study. The next chapter provides a review of the current and past literature on dual enrollment and how it relates to the community college system, and racial minority completion time, including barriers to the dual enrollment program. The third chapter details the methodology used in conducting this research.

Chapter II

Literature Review

Due to rising tuition costs, decreasing governmental aid (An, 2013), and an increasing volume of college students, dual enrollment has become a basic program at many community colleges (Zuidema & Eames, 2014). High school students in dual enrollment programs were able to earn college and high school credit simultaneously, which helped them get a head-start in college (Hofmann, 2012) and boosted colleges' completion rates using completion of twenty credits in a student's first year of college as a strong predictor of completion (Kinnick, 2012). Dual enrollment courses started in 1976 in California (Mokher & McLenden, 2009), and currently 98% of public two-year colleges and 77% of four-year institutions offer dual enrollment courses (Hofmann, 2012). Although only 57% of high schools offered the program in 2002, dual enrollment programs have grown steadily, leaving dual enrollment ingrained into higher education (Hofmann, 2012). Dual enrollment courses have clearly become a less expensive alternative to traditional college courses, and dual enrollment programs enable students to complete college in a shorter period (Zuidema & Eames, 2014).

The increased number of dual enrollment courses in the past few years has led to greater scrutiny of these programs, especially with performance-based funding already in place or on the horizon for many states (Zuidema & Eames, 2014). Community colleges are endeavoring to improve their completion rates, and there are currently both nationwide (Hofmann, 2012) and several statewide initiatives on completion; at the same time, an increasing need for college remediation courses is discouraging to efforts (Mokher & McLenden, 2009). In this regard, it is significant to note that dual enrollment students who have previously enrolled in one or more dual enrollment courses were less likely to require remedial courses at the college level than

those who did not enroll (An, 2013). Within a community college, roughly one-third, 33.2%, of students graduate (Juszkiewicz, 2015), but only 11.7% of students graduate in the normal completion time of two years, 21.1% of students graduated in 150% of normal completion time, and 26% of students graduate within four years or 200% of normal graduation time (Juszkiewicz, 2015).

Community college dual enrollment programs increased their enrollment, and the colleges have benefited from accepting those students who entered having already earned college credits, (Hofmann, 2012) but were in need of more college courses (Mokher & McLenden, 2009). Through dual enrollment programming, community colleges had a higher impact on their communities and shed positive light on their institutions (Kinnick, 2012). If dual enrollment programs provided colleges with better-prepared students and expedited graduation times, it was in the colleges' best interest to look to their service region and cultivate students while they were still in high school (Hofmann, 2012).

Conceptual Framework

Very few studies have examined the challenges racial minority students face in entering and succeeding in dual enrollment programs, including issues related to race and low socioeconomic status. The concept of 'Track Placement' found in Brian An's study highlights that a student's race and socioeconomic status influences college persistence. The concept could potentially serve as the framework for future research since the number of dual enrollment credits is associated with college completion times. Brian An's dual enrollment research and published articles focused on the difficulties for racially diverse students, in particular, Black and Hispanic students who are underrepresented in community colleges and universities in the US

when compared to their White counterparts (An, 2013). An also noted the gap between socioeconomic status, with those in the middle or high range who more frequently attended and succeeded in college in contrast to those in the low range, who have more difficulty with persistence in their post-secondary schooling. Dual enrollment increases college persistence, but not all students took advantage of the dual enrollment program (An, 2013). To fully embrace the ‘Track Placement’ framework model, multiple mediating variables were investigated in the current study. The present study focused on the number of dual enrollment credits in connection with college completion times and additional variables of race, socioeconomic status, gender, attendance at a rural or urban community college, first-generation college student status, and program degree length.

The Current State of Dual Enrollment

The number of dual enrollment students increased by 75% from 2002 to 2011, from 1.16 to 2.04 million (Kilgore & Wagner, 2017). The large increase left policymakers to consider the costs of the courses and to ensure that the program was a viable option for all high school students (Adams, 2014). Dual enrollment courses are offered in a variety of modes, such as online and hybrid, to further increase the availability of dual enrollment courses to students in all regions (Kilgore & Wagner, 2017). Racial minority populations and low-income students are among the 82% of dual-enrolled high school students who benefit the most, but dealing with the barrier of cost is difficult for both policymakers and students (Adams, 2014). Fees for taking dual enrollment courses vary from state to state, with some that are free, others hugely discounted, and a few that still require students to pay the full college in-state tuition rate (Adams, 2014).

In some states, such as Florida, the cost shifted from higher educational institutions to the public high schools (Adams, 2014). In Alabama, a new tax credit donation system raised almost \$10 million each year to provide scholarships for students pursuing dual enrollment credits in career and technical fields (Adams, 2014). In Delaware, Gov. Markell proposed a scholarship geared toward low-income students taking dual enrollment credit (Adams, 2014). The dual enrollment cost barrier has decreased for racial minorities and low-income students, making earning college credits while still in high school a more viable option (Adams, 2014). Calling it ‘drop-out prevention’, the former U.S. Secretary of Education, Arne Duncan, felt dual enrollment could not only benefit those who are trying to get ahead but also those who were struggling in high school or who did not view college as an option (Adams, 2014). Although it was never approved by Congress, there was a proposal which would have allowed Pell Grant money to be used to pay for dual enrollment courses (Adams, 2014).

Students who take dual enrollment courses are 10% more likely to complete a bachelor’s degree compared to those who did not take dual enrollment courses (Adams, 2014). The likelihood goes up to 12% if the students’ parents did attend college. The Education Commission of the United States reported that racial minority and low-income students are underrepresented in statewide dual-enrollment programs (Adams, 2014). Almost a dozen states have programs in place that offer dual enrollment courses to the racial minority and low-income students at no cost (Adams, 2014).

In addition to costs, the quality of the courses has also been a focus (Adams, 2014). States increasingly have examined the quality of education and the instructors’ credentials of dual enrollment courses (Adams, 2014). As of 2014, 37 states have set quality control measures for content and grading practices that are equal to those of the partnering college as well as for

educational requirements of instructors' which match those of adjunct faculty, including professional development (Adams, 2014). In some states, like Minnesota, state funding is withheld if the quality measures are not met (Adams, 2014). Many states, such as Delaware and Connecticut, have requested an increase in state funding to help cover the costs of dual enrollment (Adams, 2014). Some states are successful, such as Connecticut which received an extra \$1 million for dual enrollment programs, others are not (Adams, 2014). Florida offered dual enrollment courses without tuition, but after dual enrollment numbers rose to over 33,000, higher education institutions were losing \$52 million a year and started charging the participating high schools more than \$200 a course (Adams, 2014). Florida dual enrollment numbers have continued to rise, despite the resulting financial hardships as some high school districts have paid over \$400,000 (Adams, 2014).

Dual enrollment, previously designed for the gifted and talented high school populations, has now expanded in an attempt to be accessible to all students in part due to federal and state initiatives to improve college success through readiness. In some states, the Common Core State Standards have been set in place to help transition all students into accelerated learning programs, like dual enrollment. (Kilgore & Wagner, 2017). The perception of dual enrollment is changing, and the need for its presence in the drive for community college survival is becoming evident. Secondary educators and higher education institutions both see the benefits (Kilgore & Wagner, 2017). After graduation, almost half of students who completed dual enrollment credits through a community college, attend a community college immediately after graduation. Of those students, 84% enroll in the community college where the dual enrollment credits stemmed, and 41% enroll at a four-year institution. Only 12% of dual enrollment students do not enroll in

college by the age of 20. On average, of all dual enrollment students who started their college career by age 20, 46% earned a college credential within five years (Kilgore & Wagner, 2017).

Statistics on degree and certificate completion vary significantly by the state: from 28% completion in West Virginia to 64% in Florida, with several states close to 50%; in 13 states, there is a more than 10% completion rate difference between high and low-income students, who first attended a community college (Fink et al., 2017). Former dual enrollment student completion rates increase to a national average of 64% as students move directly from high school to a four-year institution. Within the four-year institutions, a majority of states have a 10% or more significant difference in completion rates between high and low-income students, with a disparity as large as 20% in some states (Fink et al., 2017).

Financial support at the state level impacts the number of dual enrollment students who attend a community college and complete a credential. Many states are financially supporting Advanced Placement courses instead of dual enrollment courses. Without state support or subsidies for dual enrollment, many students have financial obstacles that cannot be overcome. Pennsylvania has low state support and provides no subsidies, which translates into low dual enrollment participation. Washington State, in contrast, provides subsidies and has a large dual enrollment population. College completion outcomes were seen to improve in those states that support dual enrollment and in which students continued to community college directly from high school (Fink et al., 2017).

Contrary to what many educators assume or predict, most students who dual enrolled in high school initially attend a community college, instead of a four-year school. By state, dual enrollment students who first attend a community college range from 26% to 66%, with Virginia falling in the middle at 46% (Fink et al., 2017). When students proceed directly from dual

enrollment to community colleges, retention and completion times are significantly improved. Dual enrollment students may be able to complete a community college credential before graduating from high school or with a minimal number of classes. Additionally, students who complete a community college credential often utilize transfer agreements to ease their academic transition to a four-year institution (Fink et al., 2017). Students who enroll in community college after high school graduation earn more college credits in a shorter period of time than students who enroll in a four-year institution after high school graduation (Fink et al., 2017).

The age at which students start taking dual enrollment credits is an important factor, and it is associated with whether students continue with dual enrollment credits after their first term. A national study determined that 30-50% of dual enrollment students stop taking courses after their first semester (Fink et al., 2017). Students who start taking dual enrollment courses at age 14 and 15 are less likely to take additional dual enrollment courses. If students are 16 years of age or older when they take their first dual enrollment course, 62% will continue to take additional dual enrollment courses. If students are 17 years of age when they first enroll in dual enrollment courses, they have an even greater increased likelihood to enroll in additional dual enrollment courses (Fink et al., 2017).

Dual Enrollment in Virginia

As of 2017, a total of 241,412 students earn Virginia community college credit each year (VCCS, 2017). Over half of Virginia students take courses at community college to start their college careers, and 44% of all Virginia students who earned a bachelor's degree took one or more community college course. Over half of all Virginia community college graduates transfer to a four-year school to pursue a bachelor's degree or higher. Over 32,000 degrees, diplomas,

and certificates are earned annually at Virginia community colleges, and community college students pay roughly 4,500 dollars for tuition annually, while four-year students average 12,700 dollars per year (VCCS, 2017). Of all students who moved on to be successful in community colleges and four-year institutions, over 40,000 started out as dual enrollment students, earning college credit while still in high school (VCCS, 2017).

VCCS dual enrollment data for the year of 2016-2017, showed a total of 26,408 students or 12.5% of the total Virginia community college enrollment. The proportion of dual enrollment students as a percentage of total college enrollment ranges from 7% to 44% in Virginia community college (VCCS, 2017). Dual enrollment numbers have been holding steady between 10-13% for the past decade. In the 2017-18 academic year, as Virginia community colleges had a decrease in overall enrollment, dual enrollment students accounted for a larger percentage of all Virginia community college students. The percentage of dual enrollment students in community colleges was 12.4% in the academic year 2008-2009 but dropped to 10.8% and 10.9% during the boom in overall community college enrollment in 2010-2011 and 2011-2012. Participation in dual enrollment courses increased to 13% in 2014-2015 as total enrollment declined (VCCS, 2016).

Community Colleges in Virginia

The Rural Horseshoe initiative in Virginia includes 14 community colleges: Blue Ridge, Dabney S. Lancaster, Danville, Eastern Shore, Lord Fairfax, Mountain Empire, New River, Patrick Henry, Paul D. Camp, Rappahannock, Southside Virginia, Southwest Virginia, Virginia Highlands, and Wytheville. Outside of the rural horseshoe are the metropolitan and large suburban areas of Richmond, Norfolk, and Northern Virginia (suburban Washington DC) which

includes nine community colleges: Central Virginia, Germanna, J. Sargeant Reynolds, John Tyler, Northern Virginia, Piedmont Virginia, Thomas Nelson, Tidewater, and Virginia Western (The Universal Leaf Foundation, 2014). Since the rural community colleges are outside of highly populated cities, their regions experience a lack of economic growth and a gap in educational attainment (The Universal Leaf Foundation, 2014). Looking at the Rural Horseshoe of Virginia, excluding Virginia's larger city regions, only 19% of its population holds a bachelor's degrees (The Universal Leaf Foundation, 2014). Virginia's rural horseshoe includes 75% of the state geographically, with half a million of its residents lacking a high school degree, leaving Virginia nationally ranked 31st in the United States in high school graduation attainments (VCCS, 2015).

In order to help students meet their higher educational goals, an initiative by the Virginia Foundation for Community College Education provides career coaching and assists students with college searches and financial aid information (The Universal Leaf Foundation, 2014). This is part of several initiatives in Virginia to increase the number of community college graduates (Virginia Community College System, 2015). The Virginia Foundation for Community College Education initiative focuses on three goals (Virginia Community College System, 2015). First, the goal is to reduce the number of residents who lack a high school diploma from 20% to 10% (Virginia Community College System, 2015). Second, the plan is to increase the number of residents who complete an associate's degree or certification from 26% to 52% (Virginia Community College System, 2015). The last goal is to increase the number of foster youth who graduate with an associate's or certificate through the Great Expectations program (Virginia Community College System, 2015). Locally and statewide, fundraising has been put in place to reach these goals and assist rural community colleges financially for support staff, career

coaches, and scholarships (Virginia Community College System, 2015). In the three years that the initiative has been in place, Virginia experienced an 8% increase in community college enrollment and an 11% increase in enrollment in high school dual enrollment programs (The Universal Leaf Foundation, 2014).

State Dual Enrollment Policies

Students must be aware of, have access to, and be willing to participate in the dual enrollment program to reap the benefits of dual enrollment. After students participate in dual enrollment courses, they are more likely to (a) meet the college-readiness standards, (b) enroll in college shortly after graduating high school, (c) not require remedial courses in English and math, (d) earn a higher GPA during their first college semester than students who did not take dual enrollment courses, (e) continue to enroll in college for a second year, (f) have higher four and six year completion rates, and (g) complete their bachelor's degree in a shorter amount of time than those who did not dual enroll (Zinth, 2014). To encourage students to participate in dual enrollment courses and eventually contribute to higher completion rates, some states have created policies to assist students who participate in dual enrollment programs.

State policies have been targeting the dual enrollment obstacles of access, finance, transferability of credits, and quality (Zinth, 2014). Some states, such as Ohio, require each public school district to have a dual enrollment program and to eliminate as many barriers to participation as possible (ECS, 2016). However, just as eligibility for a college course may require prerequisites or placement tests, participation in dual enrollment courses is ultimately based on a student's academic abilities among other factors (Zinth, 2014). Currently, the following eleven states have policies that allow high school students to register as a part-time or

full-time college student in a college program: California, Florida, Georgia, Idaho, Massachusetts, Michigan, Minnesota, Ohio, Oregon, Rhode Island, and Wisconsin (Zinth, 2014). Virginia leaves the decision to be made locally by school districts and community colleges (Zinth, 2014). Due to costs, some states limit the number of dual enrollment courses a student can take during each semester of their junior and senior year (ECS, 2016). Within the US, 24 state policies require that credit for dual enrollment courses must be given to both secondary and postsecondary institutions, while 13 states have dependent policies (ECS, 2016). Contingency policies often include applying and gaining admittance into the postsecondary institution and a transfer agreement between the high school and college (Zinth, 2014).

Not all states have policies in place to inform all students and parents of students of the availability of dual enrollment programs. Virginia requires that all local school board must have a plan in place to educate students and parents about dual enrollment programs as well as Advanced Placement programs, International Baccalaureate Programs and Governor's School programs (ECS, 2016). The plan must include enrollment details, qualifications, agreements with the Virginia community college program and degrees that the courses could fulfill. Virginia does not require counseling or advising sessions, with either the student or parent, for the student to gain admittance into the dual enrollment program (ECS, 2016). Neighboring states Maryland and West Virginia have no such policies or requirements, although Maryland does inform students who meet the enrollment requirements that the program is available without parent notification (ECS, 2016).

In some states or locations within a state, high school students must pay to enroll in a dual enrolled course, leaving financial cost a barrier for some students. High school students have the option to take an Advanced Placement course without a fee but come with no guarantee

of credit without passing the exit exam. Students can also pay for a dual enrollment course that guarantees college credit, although some are unable to pay and despite the guaranteed college credit, will opt for the Advanced Placement course due to cost (Zinth, 2014). Currently, nine US states require students to pay the cost of tuition, 18 states rely on high school and college agreements to decide the student's dual enrollment bill, and 10 have a formula based on the programs in which students are enrolled in (ECS, 2016). Some states, like Washington, waive tuition fees for low-income students while others rely on grants and assistance to pay the tuition (Zinth, 2014).

In 2013, the Advisory Council of Community Colleges Presidents approved a tuition payment policy for all dual enrolled VCCS students who are taught on a high school campus by a high school teacher with proper credentials (ECS, 2016). Tuition and fees must be paid to the accrediting community college, with the least being 60% reimbursement and up to 100% if specific requirements are met (ECS, 2016). If the high school student does not qualify for in-state tuition through the Virginia community college but does attend a Virginia high school where a dual enrollment program exists, the student will receive the in-state tuition rate. Students can earn financial assistance through the Virginia Guaranteed Assistance Program (VGAP) if they qualify (ECS, 2016). Dual enrollment students often pay less tuition for a course than a community college student would who attends on-campus classes (Taylor, 2015).

Drawbacks of community college's holding dual enrollment programs are that the community college receives less than 1.0 full-time equivalency approbations and less tuition (Zinth, 2014). Currently, twenty-two states, not including Virginia, require that dual enrollment program courses transfer to their related institution (Zinth, 2014). Some students in Virginia

have taken dual enrollment courses but after transferring to a post-secondary institution, they find the credits paid for will not contribute to their college degree (Zinth, 2014).

Maintaining course quality is difficult. An increase in the number of states that have put instructor and course quality assurance into place, rising from 29 states in 2008 to 37 states currently, excluding Virginia (ECS, 2016). Regardless of who is teaching or where the course is taking place, the rigor should be the same as its college class counterpart (Ferguson, Baker, & Burnett, 2015). Most states, including Virginia, require that the instructor has 18 graduate credit hours or more in the discipline they are teaching, and the instructor will be observed and evaluated the first year they are teaching a dual enrollment course (Zinth, 2014).

Twenty-six states require an evaluation of dual enrollment programs, excluding Virginia (Zinth, 2014). Thirty states, including Virginia, and the District of Columbia, require that statistics be kept to report dual enrollment participation (Zinth, 2014). Reports, including those maintained in Virginia, record enrollment numbers, gender, income status, race, special education status and more. The reports also create more advanced statistics, such as the number of dual enrollment students graduating high school, number obtaining a post-secondary degree and diversity demographics of dual enrollment populations (ECS, 2016).

The Importance of Dual Enrollment to Both Students and Community Colleges

With funds tied to graduation rates, the pressure is on community college leaders to find new ways to increase their retention and completion rates (Zemsky, 2013). Typically, community colleges graduate about 30% of their students, with the rest either transferring to four-year institutions or not completing a degree or certificate program (Zemsky 2013). If community college leaders could increase the number of graduates thereby contribute to the local

workforce, they would be tapping into the full value of community colleges which could play an active role in strengthening our local economies (Boggs, 2011). College leaders have two main concerns: costs and outcomes (Zemsky 2013). Community colleges have to work within their budget constraints while addressing accountability concerns that arise from the state and federal level (Zemsky, 2013). In efforts to graduate more high school students that are college ready, leaders have been adapting developmental education programs and expanding their dual enrollment programs (Zemsky, 2013). Redesigning dual enrollment programs would increase functionality with the hopes of improving completion rates, but dealing with decreasing monetary funding from the state makes installing new initiatives difficult (Boggs, 2011).

A student who enrolls in dual enrollment courses has an increased chance of initial enrollment into college and postsecondary success (Allen & Dadgar, 2012). In a New York State study, participation by students enrolled in dual enrollment programs was positively related to college enrollment and persistence from the first to second semester in college, to a higher GPA, and to earning more credits within their last three years of college (Allen & Dadgar, 2012). Taking one or more dual enrollment courses was associated with positive gains towards earning more credits or ‘academic momentum’ along with a 0.16 higher GPA their first semester of college compared to students who took no dual enrollment courses (Allen & Dadgar, 2012).

In the 2010-2011 academic year, 82% of high schools nationwide reported students in dual enrollment programs (Thomas, Marken, Gray, & Lewis, 2013). Over half of the high school reported students (59%) were enrolled in both dual enrollment courses and either Advanced Placement courses or International Baccalaureate courses (Thomas et al., 2013). In the academic year of 2010-2011, two million high school students participated in dual enrollment courses

compared to 3.5 million in Advanced Placement courses or International Baccalaureate courses (Thomas et al., 2013).

Over three-quarters, 76% or 1.4 million, of dual enrolled students had an academic focus, and 49% were on a career, technical or vocational path (Thomas et al., 2013). Half of the academic-focused dual enrollment students and a third of technical and vocational-focused students obtained their dual enrolled credit while on a high school campus (Thomas et al., 2013). Almost all dual enrolled students (93%) earned automatic college credit after completing an academically focused course, while 83% of those in technical and vocational focus courses earned college credit (Thomas et al., 2013). A majority of high school students (61%) in academic classes and even more (67%) in technical and vocational classes obtain dual enrollment credits with a high school instructor (Thomas et al., 2013).

An increasing number of first-year college students are not college ready and start their college experience taking remedial courses (Mokher & McLenden, 2009). Dual enrollment could be the bridging step between high school and college for these students (Cassidy, Keating, & Young, 2010; Hofmann & Voloch, 2012). Students who are enrolled in dual enrollment courses are less likely to need remedial courses at the college level and have increased college readiness (An, 2012). Dual enrollment students have a 9% reduced likelihood of taking remedial classes and are 26% more likely to graduate in two years and 28% more likely to graduate in three years (Grubb, Scott, & Good, 2017).

In a Florida study, dual enrollment students were 23% more likely to complete an associate degree within five years than non-dual enrolled students (Speroni, 2011). In a Texas study (Struhl & Vargas, 2012), dual enrollment students were 1.83 times more likely to complete their course of study in 3 years, which is a larger increase than the Speroni study in Florida. This

rate compares to 33% of non-dual enrollment students completing in 3 years or 31% finishing in 2 years. The 2011 Speroni study showed 31% of dual enrollment students completed a degree in 3 years, compared to 15% of non-dual enrollment in two years.

Comparing dual enrollment students to those who were not in dual enrollment, a study on Florida and New York students revealed a positive relationship between dual enrollment participation and high school graduation (Cassidy et al., 2010). Former dual enrollment students completed their bachelor's degrees in 4.25 years, compared to 4.65 years for students with no dual enrollment experience. Shortening the degree completion time can translate into reduced overall college cost (Cassidy et al., 2010).

Dual enrollment programs can help students acclimate, both academically and socially, to the demands of college life, potentially hastening the students' college graduation date (Mokher & McLendon, 2009). Students who participate in dual enrollment courses have been shown to be more likely to graduate from high school, increase their future college GPA (Zuidema & Eames, 2014), and improve their persistence toward completing college (An, 2012), which are positive metrics for the hosting community college. For students with a history of dual enrollment courses, their GPA in the first year of college alone can rise between 0.31-0.37 points (An, 2012). Dual enrollment has no tuition in some states and may offer reduced college tuition in others thus mitigating the cost of college and helping low socioeconomic status (SES) students (An, 2012). Students who come from a low SES background often have a less structured higher education plan than those of a higher SES background, and dual enrollment courses can serve as a solid starting point towards a successful college plan (An, 2012).

In one study, 43% of surveyed students who attended Kennesaw State University (KSU) in the 2010-2011 school year responded that they did participate in dual enrollment courses as

preparation for college (Kinnick, 2012). Since 2008, 86% of higher education faculty feel that students who attended dual enrollment courses were more successful in their KSU courses than those who did not (Kinnick, 2012). Research indicates that dual enrollment improves their collegiate performance, as noted by their GPA (Lukes, 2014). Although many dual enrollment students came from Honors programs and were highly motivated indicated those in dual enrollment programs had a positive impact on the college's recruitment, retention, student progression, and graduation Kinnick (2012). While limited research exists on community colleges' dual enrollment programs, the study on KSU conclusions could be transferable to other universities and community colleges.

Not only does dual enrollment help students earn college credits during high school, but it also helps the college (Kinnick, 2012). The college would ideally recruit a portion of these high-achieving students, which in turn, improves the classroom environment all while shedding a favorable light on the college (Kinnick, 2012). When surveyed, KSU faculty noted that the dual enrolled students were more capable and mature than the typical first-year student (Kinnick, 2012). In 2006 the U.S. Department of Education found that the completion of twenty credits in a student's first year of college is a strong predictor of completion (Kinnick, 2012). Many dual enrolled students are capable of achieving twenty or more credits before graduating high school, contributing to improved degree completion numbers (Kinnick, 2012) and boosting community colleges graduation rates (Zemsky, 2013).

The Challenges of Dual Enrollment

Concerns about dual enrollment courses have been present since their creation. Dual enrollment barriers are often experienced by low-socioeconomic, first-generation, and racial

minority students. Obstacles to the dual enrollment program exist in policy, access to funds, and depending on the state, access to student transportation (Roach, Vargas, & David, 2015). The three main concerns are, first, that the rigor of the dual enrollment courses does not match that of their college counterpart. Second, the revenue accrued from the reduced-rate tuition fees paid by high school students is diminished with dual enrollment (Kinnick, 2012). Third, funding provided by the public school districts often does not cover the materials needed for dual enrollment courses (Khazem & Khazem, 2012). In recent years, overall enrollment in community colleges has slowly declined, and with unstable funding, many colleges have been raising tuition and fees to keep their budgets balanced, which makes accepting reduced tuition from dual enrollment programs problematic (Kinnick, 2012). A fourth concern that has arisen is that dual enrollment course populations are not as diverse as the populations the colleges frequently serve, with racial minorities often represented in low numbers (An, 2012).

Kilgore and Wagner (2017) found that obstacles differ on whether dual enrollment is viewed from the secondary education perspective or from that of postsecondary higher education. The top concerns that arise from the secondary education level include the lack of credentialed instructors, the cost to the family, and the cost to the school district. The top concerns for higher education include the institutional culture and the cost to the higher educational institutions, little time for building partnerships, lack of faculty support, and lack of curricular alignment (Kilgore & Wagner, 2017).

Some states, like New York, have passed accountability metrics for high schools to improve the percentage of students who graduate on-time with college or career plans (Kim, 2012). One of New York's benchmarks required that a student earn a C or better in a dual enrollment course (Kim, 2012). Community colleges are interested in dual enrollment students

to boost their overall enrollment numbers, and new programs in urban communities, such as New York's 'College Now' help generate increased student interest in dual enrollment programs (Kim, 2012). The new program requires that all dual enrollment instructors have the same credentials as college instructors and sometimes are even appointed by college departments (Kim, 2012). Public school districts in the Bronx and Manhattan put forth efforts to recruit racial minority male students, both Black and Hispanic, and to improve their subsequent retention (Kim, 2012). The focus on these underrepresented populations paid off with a 27% increase in dual enrollment over six years (Kim, 2012). Programs that bring high school districts and community colleges together often help students transition into higher education, in particular, those students with mid-range academic abilities or with remedial needs (Kim, 2012). Other studies have noted that for a student to register for dual enrollment courses, many states and regions have a GPA requirement policy, which can divert students over to a non-college prep pathway (Roach et al., 2015).

The rigor of dual enrollment programs has been questioned, yet is difficult to evaluate since most states do not have a system in place to assess dual enrollment programs. Colleges typically initiate dual enrollment data, and its dissemination is limited to the college, with no external monitoring (Kinnick, 2012). If high school students are not prepared for college courses, yet they are dual enrolled, it is possible that the overall academic quality could decline to accommodate the level of student, to boost the appearance of student success by lowering educational standards (Mokher & McLendon, 2009).

High school districts also have difficulty balancing the cost of dual enrollment courses, within their finite state budgets (Mokher & McLendon, 2009), which may not provide for the resources and materials needed to align the high school's dual enrollment course curriculum with

its college-counterpart. Colleges can increase tuition to cover the costs of advanced equipment and materials associated with a high level of learning, but high schools cannot (Mokher & McLendon, 2009). Colleges have difficulty addressing the reduced tuition rates that dual enrollment students receive leaving many states trying to find a way to subsidize the programs (Kinnick, 2012) through private donations or foundation support (Mokher & McLendon, 2009). In addition to losing money through reduced or free tuition rates, higher education does not receive full-time equivalency state funds per dual enrollment student (Kinnick, 2012).

In some states, dual enrollment students travel to a college campus and take the course along with college students. Over half of dual enrollment courses have a mix of high school dual enrollment students and college students in the same classroom. In many cases, these are technical or vocational courses (Thomas et al., 2013). A possible student barrier to dual enrollment programs could be transportation to dual enrollment courses if they are not taught on the high school campus or during school hours (Thomas et al., 2013). Over half of dual enrollment students need to find transportation for one or more of their dual enrolled courses (Thomas et al., 2013). Only 5% of students had transportation costs covered by the state, 31% by the school district and 86% of students had to cover their costs, either by transporting themselves or relying on parents (Thomas et al., 2013). In some states, other than Virginia, students have to be transported to the college to take part in a dual enrollment course. If they do not have the means to get there, they will not likely sign up for the course (Roach et al., 2015).

Another barrier to dual enrollment accessibility is tuition (Taylor, 2015). When surveying school districts serving dual enrolled students, including both academic focused and technical or vocational students, districts reported that 43% of students paid partial or full tuition, 33% paid additional fees, and 44% were required to purchase textbooks for the course (Thomas

et al., 2013). The cost of the dual enrollment course tuition can be a substantial barrier to take the course when other high school classes come without a price tag (Roach et al., 2015).

The Movement from Advanced Placement Courses to Dual Enrollment Is Slow

Not only do community colleges have hurdles associated with the dual enrollment program but the high schools also face difficulties. High school districts lose their full-time equivalency numbers when students dual enroll which may decrease the enrollment in their Advanced Placement (AP) courses (Kinnick, 2012). Many students view dual enrollment courses as a better option than AP courses, in which a student must pass a final exam to order to receive college credit (Khazem & Khazem, 2012).

Public school districts have difficulty balancing their budgets when AP courses and dual enrollment courses both require funding, although both provide a similar service to enhance a student's college readiness (Khazem & Khazem, 2012). Funding policies are significantly varied, such as in Florida where Advanced Placement courses absorb 37% of the high schools' budget, while dual enrolled courses only receive 12.5% (Khazem & Khazem, 2012).

In comparison, only 75% of Advanced Placement courses will transfer college credit, compared to 95% of the dual enrolled courses, and only 48% of AP students pass the course compared to 98% of dual enrolled students (Khazem & Khazem, 2012). For some students, dual enrolled courses are not an option if college students fill the seats before dual-enrolled high school students have a chance to enroll (Khazem & Khazem, 2012). While dual enrollment programs require a bigger budget, the courses do save students tuition dollars, decrease college seat time, offers a variety of articulation agreements, and increases the colleges' completion rates (Khazem & Khazem, 2012).

In addition to the Advanced Placement program receive more funding compared to dual enrollment, issues arise with dual enrollment facilities, rigor of the dual enrollment program and difficulties of enrolling. Since dual enrollment courses have a bigger impact on a high school student's GPA and a larger variety of courses are offered in the dual enrollment format, compared to the limited 30 Advanced Placement courses, dual enrollment courses appear to be more beneficial than Advanced Placement courses (Khazem & Khazem, 2014). Rigor has been questioned in both Advanced Placement and dual enrollment courses. Many dual enrollment courses have access to college facilities, and their faculty generally possess a higher level of education compared to Advanced Placement courses taught at the high school whose instructors may not have graduate credits (Khazem & Khazem, 2014).

Lastly, dual enrolling students are not as diverse as the populations they serve. Many of the high schools' students who take dual enrolled courses are in the upper to mid-socioeconomic status and are White (An, 2012). In New York City, Black and Hispanic students are between 14-15% of the junior and senior high school population, but only 6% take advantage of dual enrollment courses (An, 2012). Greater class inequality could occur since most of the students who take dual enrolled classes are often the ones who do not need it, such as the already high-achieving high SES White students (An, 2012).

Racial Minorities in College

With an increasing number of students going to college in 2010, the type of student heading to college became more diverse (Handel & Williams, 2011). There are over 29 million students enrolled in college, and only 36% are racial minorities, with the highest of those students enrolled in two-year colleges, where retention and graduation rates are low (Trost,

2016). Within 30 years, from 1977 to 2007, there was an increase in African-American (42% to 56%) and Hispanic (48%-62%) high school graduates who enrolled in college (Gilbert & Heller, 2013). Even with the increase in racial minority college enrollment, this does not reflect the racial minority populations that require developmental education services at higher rates than other populations, increasing their college completion time (Flannery, 2014). Over 50% of students placed in remedial courses never complete the remedial sequence and subsequently do not enroll in college-level courses. A majority of students who needed remediation are Black male part-time students and vocational program students (Boylan & Trawick, 2013). These underrepresented students are often discouraged from the start when placed in remedial courses (Boylan & Trawick, 2013).

With performance-based funding on the rise in many states, community colleges may be penalized for admitting at-risk students due to their low completion rates (Ramirez, 2015). The students with the lowest percentage of successful completions are Black, older students, part-time students, students with a GED, and students taking developmental education courses (Ramirez, 2015). A few states, like Massachusetts, have modified their performance-based funding criteria for community colleges to include developmental education milestones and increased 'points' for at-risk students (Salomon-Fernandez, 2014), while other colleges prefer to enroll the 'successful students' and not adhere to an open-access mission (Ramirez, 2015). Some institutions have discouraged prospective at-risk students from enrolling, which could lead to reduced recruitment (McKinney & Hagedorn, 2014).

As racial minority, low-income and first-generation college students made up of a larger portion of the college population, the need for remediation increases (Flannery, 2014). Although some four-year institutions do offer remediation, many racial minority students are more likely to

start their education at a two-year college (Chase, Dowd, Pazich, & Bensimon, 2014). High attritions rates can be attributed not only to the need for developmental courses for racial minorities, but also to competing family obligations, the college's social environment, and the lack of academic preparation (Crisp & Nora, 2014). Racial minorities, mainly Black students, often have an increased likelihood of graduating from college if they enroll at a four-year institution the next semester after graduating high school. Those same racial minority students who take dual enrollment courses further narrow the racial gap and improve their probability of completing college (Trost, 2016).

Educational equity has long been a concern for dual enrollment courses since the enrollment numbers do not reflect the population. In Tennessee, Black students make up 20% of the population, but only 9% are dual enrollment students. This number could have many explanations including the fact that within Tennessee, dual enrollment students are required to attend classes on a community college campus, and do not have the convenience of taking courses at their local high school. Some areas provide grants to equip students with computers and internet access to bridge the gap (Grubb et al., 2017). Many students feel they are unable to take dual enrollment courses due to their grades. One Tennessee study that evaluated all high school student records found that 25% of students not taking dual enrollment courses were qualified through their math and English ACT (American College Testing), scores (Karp, 2013). Other studies indicated students were unclear of their dual enrollment options or were unaware that they were eligible (Grubb et al., 2017).

Dual Enrollment and the Underrepresented Population

As dual enrollment programs continue to expand, the percentage of participating racial minorities, in relation to the local population, has been decreasing (Pretlow and Wathington, 2014). As more racial minority students fail to enroll in dual enrollment opportunities, underrepresented populations are less college ready and start college with few, if any, college credits when compared to the majority who leave high school with some college credits (Pretlow & Wathington, 2014). Male students from low-income households and students with a lower GPA benefit from dual enrollment through higher graduation rates compared to those who do not dual enroll (Pretlow & Wathington, 2014). A majority of dual enrolled students are female, White, mid and upper-socioeconomic status, and native English speakers with a high secondary GPA (Trost, 2016). Benefits of dual enrollment include the likelihood that students will enroll in college, earn a higher college GPA, and persist after the first and second semester of college when compared to those who did not take dual enrollment courses (Pretlow & Wathington, 2014). Some underrepresented students in Florida are restricted from participating in dual enrollment courses due to a minimum high school GPA policy, and Florida only allows students with a 3.0 or higher GPA to participate in dual enrollment courses, thus potentially widening the success gap between high and low achieving students (Pretlow & Wathington, 2014). Other states, like Virginia, do not take students' previous GPA into account and allow all students to take a placement test to earn a 'satisfactory' or better score to provide access to dual enrollment courses (Pretlow & Wathington, 2014).

The completion agendas of many community colleges focus on awarding more dual enrollment credits while students are still in high schools, which should eventually promote college graduation (Evenbeck & Johnson, 2012). Advisors help high school students choose the

most beneficial dual enrollment classes to take and offer help on determining college credit they can earn, where they can transfer, and degrees they could obtain (Evenbeck & Johnson, 2012). Once in college, however, some students may have greater difficulty navigating college programs or creating their schedules and must seek out an advisor for assistance (Evenbeck & Johnson, 2012). In college, student success coaches, counselors, and advisors serve an essential purpose for new students, easing their transition.

Many of the racial minority students participating in dual enrollment programs have an improved perspective on college and view the transition from dual enrollment courses to college courses as an attainable move; this perspective improves their persistence to succeed in college (Evenbeck & Johnson, 2012). One study found this increased persistence to succeed is greater for racial minority students if their dual enrollment courses were held on a college campus instead of in a high school classroom (Evenbeck & Johnson, 2012).

In a study by Pretlow and Wathington (2014), dual enrollment participation in Virginia among racial minority students, primarily Black and Hispanic, has increased in recent years. A large increase of 25.6% occurred from 2004 to 2006 (Pretlow & Wathington, 2014). Although racial minority enrollment is improving, it is still far less than represented in the local population (Pretlow & Wathington, 2014). White students make up 66.2% of high school graduates but account for 81.6% of the dual enrollment numbers (Pretlow & Wathington, 2014). When considering all racial minority groups collectively, Blacks, Hispanics, and Asians accounted for 34.7% of the high school graduating class, yet this group represented only 16.6% of the dual enrollment population (Pretlow & Wathington, 2014). In another study by Hughes, Rodriquez, Edwards, and Belfield (2012) dual enrollment programs were more appealing to racial minorities when they were career focused and led to an employable future in less time. This study also

noted that after tuition costs, the major barriers for racial minorities were family obligations and work commitments (Hughes et al., 2012).

Although the dual enrollment program was created for high achieving students as a form of enrichment, it is now being seen as a way to help underrepresented students (Hofmann & Voloch, 2012). If at-risk students could take dual enrollment classes, it would decrease the need for developmental education and increase their motivation to complete college by having already accrued some college credits (Hofmann & Voloch, 2012). When traditionally underrepresented students enter a dual enrollment classroom, they may struggle with the higher level assignments and their ability to handle the course, and underrepresented students will often become frustrated with course content and may not perform well in the dual enrollment courses (Hofmann & Voloch, 2012). If these underrepresented students would view dual enrollment courses as contributing to their future and as an introduction to their college career, they could begin to make college plans; however, this perspective is not yet widespread or prevalent (Hofmann & Voloch, 2012).

Dual enrollment could be used as a bridge to span the college readiness gap between high school and college. Students view community college as a viable educational option while remaining local and saving tuition dollars (Hofmann & Voloch, 2012). Underrepresented students who are taking dual enrollment courses in high school, have already applied to and have been accepted into a community college. They have already begun the transition into a community college (Hofmann & Voloch, 2012). A positive association between high school dual enrolled students and their future college GPA exists, regardless of their race (Ganzert, 2012). Ganzert (2012) found simply getting students to register and to support the idea of taking college

courses often appeared to be the greater barrier to dual enrollment among racial minority students than the rigor of the dual enrollment course itself.

The Future of the Dual Enrollment Program

Improvements could make dual enrollment programs more effective, better funded, and more readily accessible through easier the registration processes (Khazem & Khazem, 2014). While dual enrollment programs have been growing for over 15 years and have evolved to fulfill an essential niche in both high schools and colleges, most research on dual enrollment has only been conducted within the last five years. As the program evolves, research opportunities will open up that could that could inform high school administrators and community college leaders about ways to better assist their students (Khazem & Khazem, 2014).

One statewide and national improvement that could improve the dual enrollment program would be to increase the funding that colleges receive to support the program (Khazem & Khazem, 2014). At the moment, colleges only receive a fraction of the cost of program operations for dual enrollment students compared to a non-dual enrollment student who attends the college (Khazem & Khazem, 2014).

Another funding improvement to help the dual enrollment program purchase college-level textbooks and materials is to receive funding equal to that provided for the Advanced Placement high school program (Khazem & Khazem, 2014). The Advanced Placement program is limited to 30 courses and receives a majority of the college preparatory class budget. In Florida, Advanced Placement programs receive three times the amount of funding compared to dual enrollment programs. When comparing the two, Advanced Placement programs offer fewer courses, fewer students passing the courses, and less AP coursework being transferable to higher

education institutions (Khazem & Khazem, 2012). Conversely, the dual enrollment program boasts more course offerings, higher pass rates, and more successful transfer rates (Khazem & Khazem, 2012). Based on accountability measurements and improved outcomes that produce more college-ready students, some researchers feel dual enrollment courses should be funded at a higher full-time equivalency than currently allotted (Khazem & Khazem, 2012).

Registering for the dual enrollment programs can be a lengthy process since students are essentially applying for college. Required paperwork and possible placement tests must be completed (Ganzert, 2012). Once the application process is finalized and students are ready to sign up for their desired class, they often have to wait to register for classes (Khazem & Khazem, 2014). Finding a seat in their desired class only a few days before the semester starts can be difficult, and many students are unable to find a class that works with their high school schedule or that has available seats for dual enrollment students (Khazem & Khazem, 2014). High school students may become frustrated when colleges give registration priorities to college students and only fill the “unsold” remaining seats with dual enrollment students (Khazem & Khazem, 2014). High schools that offer dual enrollment courses on their campus can sometimes better accommodate students, estimate enrollment numbers, and reduce travel time for the high school student (Khazem & Khazem, 2014). One of the drawbacks of having high school teachers teach the college dual enrollment courses is that it may be difficult to find faculty with the proper credentials to teach at the college level (Hofmann & Voloch, 2012).

Summary of Research and Relationship to Current Research

Few studies have examined the differences between racial minority and majority enrollment in dual enrollment classes (An, 2013; Trost, 2016) or more specifically if an

increased number of dual enrollment credits affects college success for racial minority students. Past studies point out that minority and low socioeconomic students benefit from dual enrollment, although little quantifiable evidence is available. Brian An is one of the few researchers who has focused on dual enrollment and its effects on different populations. White students are more likely to participate in dual enrollment courses compared to racial minority students, but low socioeconomic (SES) students are more likely to benefit from dual enrollment courses compared to high SES students (An, 2013). In one study in New York City, Black and Hispanic students made up 14-15% of the 11th and 12th-grade population, but only 6% of them dual enrolled (An, 2013). Little research exists focusing on the low percentage of racial minority students in dual-enrolled courses and its connection to college completion. This study will attempt to fill this gap in the literature.

Chapter III

Method

This quantitative study employed ex post facto data collected by community colleges in Virginia. Participants included former dual enrollment students who were part of the 2011 cohort and who completed an associate's degree or certificate. Multiple linear regression was used to analyze data with completion time as the dependent variable, and racial minority status and dual enrollment credits as the independent variables, along with control variables.

Research Question

The purpose of this study was to examine whether significant differences exist in completion times between racial minority students and racial majority students enrolled in degree or certificate programs based on the number of dual enrollment credits earned before graduation from high school while controlling for other factors which can affect college completion.

The following research question was examined:

Are there significant differences in completion times between racial minority and majority students enrolled in a Virginia Community College System (VCCS) degree or certificate program based on the number of dual enrollment credits earned before graduating high school, controlling for gender, socioeconomic status, rural or urban college location, status as a first-generation college student, and college degree program?

The data were acquired from individual VCCS school databases that included student identifiers (gender, race, first-generation college student, racial minority defined by FAFSA, and low-income defined by Pell eligible). Data were also collected for community college success

variables; certificate completion in 600% time, six years, or associate's degree completion in 300% time, six years, the number of dual enrollment credits earned, and program degree which varies in length.

Design

This study's research utilized ex post facto data since the independent variables were not manipulated, was assigned after the data has already been collected, and therefore precluded any cause-and-effect inferences (Sprinthall, 2007). Based on the dependent variable of completion time, additional independent variables were identified that might affect completion time. The Old Dominion University College of Education Human Subjects Committee granted a letter of exemption with a project number of 1035884-1. Quantitative data were acquired through the VCCS database Student Information System (SIS) from institutions that agreed to participate. Data were collected on student identifiers (gender, race, first-generation student, racial minority defined by Free Application for Federal Student Aid, FAFSA, and low-income defined by Pell Grant eligibility) and community college success certificate completion in 600% of normal time, six years, or associate's degree completion in 300% time, six years, the number of dual enrollment credits taken, and program degree (which varied in length).

The cohort of 2011 was used, with participants selected who had dual enrollment credits and earned a certificate or degree at a Virginia community college. Within this quantitative study, a correlational research design using multiple linear regression was applied to analyze data since a single dependent variable was acted upon by multiple variables (Keith, 2006). The independent variables were the number of dual enrollment credits and racial minority status, and the dependent variable was completion time. Controlling categorical variables included gender,

race, first-generation college student status, low socioeconomic status, completion time, and program degree, which varied in length.

The origin of the data for the present study was individual VCCS colleges that agreed to participate. The VCCS variables used in this study were identified as either student characteristics or college completion time factors. The VCCS-defined variables with the supporting articles from the professional literature are found in Table 1.

Participants and Settings

After individually contacting all 23 Virginia community colleges, five agreed to participate, three urban and two rural colleges. Colleges were coded as A-E. The college with the largest overall enrollment was coded A, and the smallest E. Based on fall 2016 enrollment data, urban College A has an annual headcount of over 10,000 students, with two-fifths of whom were racial minority students. College A has multiple campuses and is in a town with a population of 20,000 and is on the outskirts of a large metropolitan city. College B has an annual headcount of just under 8,000, with racial minorities constituting one-fifth of the student body. College B with a single campus is located in an urban city with almost 100,000 residents. College C had just under 7,000 students, with one-fifth being racial minorities in a rural environment. College C has multiple campuses and is located in a small town of 4000, with a few nearby larger cities of 25,000 residents or less. College D has just over 4,000 students with a quarter being racial minorities in an urban environment. College D has one main campus, with smaller satellite campuses, and is located in a town with a population of around 80,000. Lastly, College E was rural, with less than 2,000 students and almost half, of which, are racial

minorities. College E has multiple campuses and resides in a city of nearly 90,000 people (VCCS, 2016; Virginia Demographics, 2018).

Table 1.

VCCS Defined Variables with Supporting Literature Review Articles

	Variables	Supporting Articles
Student Characteristics	Gender	An, 2013; Ganzert, 2012; Juskiewicz, 2015; Pretlow & Wathington, 2014; Trost, 2016
	Race	Adams, 2014; An, 2013; Evenbeck & Johnson, 2012; Ganzert, 2012; Pretlow & Wathington, 2014; Trost, 2016
	First-generation College Student Status	An, 2013; Juskiewicz, 2015
	Attending a Rural or Urban Community College	Kim, 2012; The Universal Leaf Foundation, 2014
	Racial Minority Defined by FAFSA	Adams, 2014; An, 2013; Evenbeck & Johnson, 2012; Ganzert, 2012; Pretlow & Wathington, 2014; Trost, 2016
	Low-income Defined by Pell Eligible	Adams, 2014; An, 2013; Evenbeck & Johnson, 2012; Ganzert, 2012
Community College Completion Time Factors	College Certificate or Degree Completion in 300%'s Time or Six Years for an Associate Degree, 600% or Six Years Certificate Programs, Cohort 2011	Adams, 2014; Allen & Dadgar, 2012; An, 2013; Coffey, 2016; Evenbeck & Johnson, 2012

Number of Dual Enrollment Courses Completed (0-60+ credits or equivalent to an associate's degree)	Adams, 2014; Allen & Dadgar, 2012; An, 2013; Coffey, 2016; D'Amico, Morgan, Robertson, & Rivers, 2013; Evenbeck & Johnson, 2012
Degree Program with its Corresponding Length (Arts & Humanities, Business, Education, General Studies, Health Sciences, Social Sciences, STEM, and Industry and Trades)	Hughes et al., 2012

The VCCS population data used the cohort of 2011, allowing students a completion time for an associate's degree from 100% or two years, 200% or four years, up to 300% or six years, with the latest graduation year being 2017. Some students graduated with a certificate, with college completion times ranging from 100% or completing in one years' time, up to 600%, if completed in six years' time. Individual colleges provided the investigator systematically collected data from non-identifying information that students provided on their college applications, student profiles, and FAFSA forms. The investigator eliminated all identifying information. All data were kept on a password-protected computer to protect the anonymity of the students. The data were shared with the investigator's Old Dominion University dissertation committee.

Instrumentation

The instrumentation used to collect data for this study is the Student Information System (SIS), which is part of the VCCS database. The SIS database was used by the five participating VCCS community colleges that agreed to retrieve and provide data concerning their service

regions (dichotomous, urban/rural). The data included student characteristics of race (categorical), first-generation college student (dichotomous, Y/N), racial minority defined by FAFSA (dichotomous, Y/N), low-income defined by Pell eligibility (dichotomous, Y/N), and community college completion time factors of the number of dual enrollment credits completed (continuous, 1-52), certificate or degree completion time based on program length (50-600% of program length), and degree (categorical: associate's or certificate).

Categorical variables were separated into groups. The Race variable included six categories; White, Black or African American, Hispanic or Latino, Asian, American Indian/Alaska Native, and Two or more races. There were no Hawaiian/Pacific Islander students were present in this population (US Department of Education, 2016). Races were later categorized as racial minority and racial majority (White and Asian). If students completed an associate's degree, completion times ranged from two years (100%, coded as 1) up to six years (300%, coded as 3). If students earned a certificate, their completion times ranged from one year (100%, coded as 1) up to six years (600%, coded as 6). Program degrees were separated into the following eight categories; Arts and Humanities, Business, Education, General Studies, Health Sciences, Social Sciences, STEM (Science Technology, Engineering, and math), and Industry and Trades. Program types included associates' degrees being two years in length, (associate's in arts, associate's degree in science, associate's of applied arts degree, associate's in arts and sciences degree), and certificates that are one year in length (certificates and career study certificates). Variables can be found in Tables 2 and 3.

Table 2.

Student Characteristics Variables

Variable	Type of Variable	Categories
College	Ordinal	A, largest overall enrollment B C D E, smallest overall enrollment
Region	Dichotomous	Urban Rural
Gender	Dichotomous	Female Male
Race	Categorical	White Black/African American Hispanic/Latino Asian American Indian/Native Alaska Two or more races
Minority	Dichotomous	N Y
First-generation		
College Student	Dichotomous	N Y
Pell Eligible	Dichotomous	N Y

Table 3.

College Completion Time Variables

Variable	Type of Variable	Categories
Number of Dual Enrollment Credits	Continuous	1-60*
Degree	Categorical	Associate Certificate
Program	Categorical	Arts and Humanities Business Education General Studies Health Sciences Social Sciences STEM Industry and Trades

Note: *60 dual enrollment credits is equivalent to an Associate's degree.

Procedures and Data Analysis

Data were acquired through individual VCCS colleges' research or institutional effectiveness office and were sent to the investigator with a password-protected file. Data included student characteristics of race, first-generation student, racial minority defined by FAFSA, low-income defined by Pell-eligible, and community college completion time factors of the number of dual enrollment credits earned, certificate or degree completion time up to six years, and degree type.

Multiple linear regression was the most appropriate statistical analysis for examining the research question and examining the effect of the many categorical variables on completion time. Many independent variables acted upon the dependent variable of college completion time including the number of dual enrollment credits, minority status, gender, socioeconomic status (Pell Grant eligibility), college location (rural or urban), first-generation college student status, and college program. The set of student characteristic variables predicted the outcome or college completion times variable (criterion).

The data gathered from the individual VCCS schools submitted student records were sent to the investigator on a password protected excel spreadsheet, which was then consolidated into an excel spreadsheet for ease of statistical analysis in Statistical Package for the Social Sciences (SPSS). Multiple linear regression was performed using SPSS to analyze data applying the dummy coding for the control variables to account for the different variable units.

Multiple linear regression was the best statistical calculation since many predictor variables that affect the one dependent variable of completion time (Sprinthall, 2007). The independent variables included the student characteristics (gender, race, first-generation college student, racial minority status as defined on the FAFSA form, Pell-eligible determined by low-income) and community college success factors (number of dual enrollment credits completed, certificate or degree completion in 1, 2, 3, 4, 5 or 6 years or up to 300% for an associate's program or 600% for a certificate, number of dual enrollment credits completed, and program degree which varied in length). With many independent variables and one dependent variable, multiple linear regression was able to predict the outcomes correlations on completion time more accurately. After the multiple regression analysis, the best combinations of all the predictor variables are

displayed in a linear fashion, to emphasize the overall correlation (Keith, 2006). Table 4 lists coded categorical variables.

Table 4.

Coding Categorical Variables

Variable	Category	Code	Category	Code
Colleges with Dummy Variables				
College A vs. B	College A	0	College B	1
College A vs. C	College A	0	College C	1
College A vs. D	College A	0	College D	1
College A vs. E	College A	0	College E	1
Geographic Region (GeographicalRegion)				
Urban vs. Rural	Urban	0	Rural	1
Gender (Gender1)				
Female vs. Male	Female	0	Male	1
Race with Dummy Variable (WhAsVS.AAHis)				
Racial majority vs. Racial minority	White & Asians	0	Black/African Americans, Hispanic/Latino, American Indian/Alaskan Native, Two or more races)	1
First-generation College Students (FirstGen1)				
First-generation vs. Non-first generation	First-generation	0	Non-first generation	1
Pell eligibility (PellEligible1)				
Pell vs. Non-Pell eligible	Pell	0	Non-Pell Eligible	1
Degree (Degree1)				
Associate vs. Certificate	Associate	0	Certificate	1
Program with Dummy Variables				
General Studies vs. Arts and Humanities (GenStuVS.ArtsHum)	General Studies	0	Arts and Humanities	1
General Studies vs. Business (GenStuVS.Business)	General Studies	0	Business	1
General Studies vs. Education (GenStuVS.Edu)	General Studies	0	Education	1

General Studies vs. Health Sciences (GenStuVS.HeSci)	General Studies	0	Health Sciences	1
General Studies vs. Social Sciences (GenStuVS.SoSci)	General Studies	0	Social Sciences	1
General Studies vs. STEM (GenStuVS.STEM)	General Studies	0	STEM	1
General Studies vs. Industry and Trades (GenStuVS.IndTra)	General Studies	0	Industry and Trades	1

Limitations

This study examined the connection between racial minorities that have dual enrollment credits and their completion time from a Virginia community college. Potential limitations of the methodology included the breadth of the data acquisition. After individually contacting all 23 Virginia community colleges, five agreed to participate, three urban colleges and two rural. The five colleges constitute a small percentage of Virginia's dual enrollment student population and may not reflect the student populations at other VCCS colleges.

This study examined the connection of dual enrollment credits on racial minorities' completion time to graduate from a Virginia community college. First, students in the VCCS without dual enrollment credits were excluded. Second, the data cannot be generalized to all rural and urban community colleges in the United States, due to geographic variations in racial minority populations and varying socioeconomic statuses. Third, Virginia has a unique dual enrollment system, in which a majority of dual enrollment students earn credits while seated in a high school classroom taught by a credentialed high school instructor. Dual enrollment courses offered in high schools provide a different experience than in states in which community college or university faculty teach dual enrollment courses on campus. The difference between high school and college campus locations could affect the generalization of this study's data to other

states. Racial minority students have an added increased persistence to succeed in college if their dual enrollment courses are held on a college campus as opposed to in a high school classroom (Evenbeck & Johnson, 2012).

This study focused on the completion time of students earning a certificate or associate's degree from a community college. Other similar studies use persistence with continued enrollment instead of degree completion, which could affect data comparison. Students who did not persist in completing an associate's degree or certificate at a Virginia community college were excluded from this study even if the students who accumulated dual enrollment credits subsequently transferred directly to a four-year institution without completing a degree or certificate through the community college from which the dual enrollment credits were earned. Lastly, Virginia has a higher population of community college students who are White, followed by racial minorities Black or African Americans and Hispanic or Latino. The present study's conclusions may not be generalized to areas with more substantial populations of Asian, Pacific Islander, and Native American or regions with different underrepresented populations (VCCS, 2016).

Conclusion

Chapter III discussed the research design and methodology for this study to analyze Track Placement in term of the independent variables of racial minority student status and the number of dual enrollment credits a student earns before college affecting the dependent variable of student completion time (An, 2013). Control variables were college location, gender, socioeconomic status through Pell eligibility, first-generation college student status, and degree program with varying length. Chapter IV includes the results and analysis report. Chapter V

consists of a discussion of the findings, possible implications, noted conclusions, and areas for future research.

Chapter IV

Findings

The five-year college graduation rates are 15-20% lower for racial minority students than White students (Fink et al., 2017). Dual enrollment courses have been studied as a predictor of college completion (Taylor, 2015). The difficult step between secondary and postsecondary education could be bridged by dual enrollment, helping students make the transition. Almost half of the 18-20 year-olds who enter postsecondary education do so at the community college, and completion rates at those institutions are under scrutiny (Fink et al., 2017). A relatively small number of racial minority students are enrolled in dual enrollment courses which can affect college preparedness skills, college persistence and time to degree or certificate completion (Evenbeck & Johnson, 2012).

Even though racial minority students greatly benefit from dual enrollment courses, few studies have examined the differences between racial minority and majority dual enrollment students (An, 2013; Pretlow & Wathington, 2014) and the number of dual enrollment credits they earn. The purpose of this study is to examine whether there are significant differences in completion times between racial minority students and racial majority students enrolled in degree or certificate programs and the number of dual enrollment credits earned before graduation from high school while controlling for other factors which can affect college completion.

The findings of this study are presented in this chapter. Due to the number of categorical variables, dummy coding was necessary to run multiple linear regression, while utilizing the control variables to note the significance of individual variables.

Data Screening

Data were obtained from five community colleges in Virginia that participated in the study. The five data files were received as password protected excel files containing cohort 2011 students. Data were received on 1278 students, and each was designated a participant number. Student files included their community college of origin, gender, race, racial minority status, first-generation status, resides in an underrepresented jurisdiction (fewer number of students contribute to the overall college student base in comparison to surrounding counties), Pell eligibility, the number of dual enrollment credits earned, initial academic plan, academic graduation year, type of degree, academic plan, and program length. Colleges were labeled as either urban or rural based on their VCCS designated service region (VCCS, 2015). The total number of students in the sample was reduced to 469 after removing those students who did not graduate by the year 2017 and those who did not take dual enrollment courses. Information that was provided to the investigator, but was not used in the current study included the initial academic plan (did not contribute to this study's focus), if students resided in an underrepresented jurisdiction (only four out of the five schools reported this information), and program length (variable was redundant with degree type).

Many students earned more than one degree or certificate while enrolled in community college. If a student was awarded both a certificate and an associate's degree, the associate's degree was used as the outcome variable in the present study, and the certificates were removed. Students in the current study earned up to four degrees or certificates. In the data presented by the colleges, some students were listed more than once since data files obtained tallied the number of degrees awarded by any given college, and not by the number of individuals who earned the degrees or certificates. Each student was counted only once in this study. A total of

170 duplicates were removed, leaving the study with 299 individual students, each student listed with a single degree or certificate. Students who either had an unknown race or were resident aliens were removed from the study, leaving a total of 292.

Descriptive Data on Dual Enrollment Students

Colleges were ordered by letters, with College A having the largest overall student enrollment and E the smallest. College B contributed 35.5% of the students in the present study, followed by College C, 28.3%, College D, 23.5, College A, 9.6%, and lastly College E 2.7%. More students in the present study came from urban locations, 68.6%, than rural, 31.1%. Slightly more females (52.7%) were in this study than males, (47.3%). As indicated in Appendix A, the participants in their study were overwhelmingly White (84.9%), compared to Black/African Americans (6.8%), Hispanic/Latino (3.1%), Asian (4.1%), two or more races (1.7%), and American Indian/Alaskan Native (0.7%). No Hawaiian or Pacific Islander students were represented in this study. There were 16.4% of students who had first-generation college status, and 36.6% were Pell eligible.

Students' completion times were calculated by using their cohort academic year of 2011 and their graduation year, based on their program's length. Associate's degrees were two-years in duration, with students ranging from a 50% (completing a two-year program in one year or 50% completion time) up to a three (completing a two-year degree in six years or 300% times the program length). Certificate degrees ranged from 50% completion time (completing a one-year certificate in six months) up to 600% (completing a one-year certificate in six years). With a standard deviation of 71.820, students on average complete their program within 153.12% of the degree or certificate program length listed in the catalog. As indicated in Appendix B, dual

enrollment credits earned by students in the study ranged from 1-52, with a mean of 10.796, mode of 6, and a standard deviation of 8.1617. As indicated in Appendix C, the average number of dual enrollment credits completion were not drastically different between races.

The vast majority of students completed an associate's degree (81.9%), compared to those completing a certificate without an associate's degree. One third of students graduated with a degree in general studies (36.5%), followed by STEM (22.9%), business (9.9%), Social Science (9.2%), Arts and Humanities (8.9%), Industry and Trades, (4.8%), Health Sciences, (4.4%), and Education (3.1%). Tables 5 and 6 display the descriptive data.

Table 5.

Cohort 2011 Dual Enrolled Student Characteristics

College	Region	Total	Females	Males	Racial Minorities	First Gen	Pell Eligible
A	Urban	30	19	11	8	7	15
B	Urban	106	50	56	12	15	41
C	Rural	85	51	34	7	17	20
D	Urban	70	35	35	8	11	31
E	Rural	8	3	5	2	0	3
Total		292	154	138	37	48	107

Table 6.

Descriptive Statistics

	<i>n</i>	%
Colleges by overall enrollment (largest to smallest); <i>n</i> = number of dual enrollment students		
College A	28	9.6
College B	104	35.5
College C	83	28.3
College D	69	23.5
College E	8	2.7
Geographic Region		
Urban	201	68.6
Rural	91	31.1
Gender		
Female	154	52.6
Male	138	47.1
Race		
American Indian/ Alaskan Native	2	.7
Asians	8	2.7
Black/African Americans	20	6.8
Hispanic/Latino	9	3.1
Two or more races	5	1.7
White	248	84.6
First- Generation Status		
First-Generation	48	16.4
Non-first-generation	244	83.3
Pell Eligibility		
Pell Eligible	107	36.5
Non-Pell Eligible	185	63.1
Degree		
Associate	240	81.9
Certificate	52	17.7
Program		
Arts and Humanities	26	8.9
Business	29	9.9
Education	9	3.1
General Studies	107	36.5
Health Sciences	13	4.4
Social Sciences	27	9.2
STEM	67	22.9
Industry and Trades	14	4.8

Black/African Americans ($n=20$) and Hispanic/Latino ($n=9$) were the two highest represented racial minorities. This study had 37 racial minority students and 259 racial majority or White students. Table 7 displays students' race by college.

Table 7.

Racial Data by College

College	White	Black or African American	Hispanic or Latino	Asian	Native Indian Alaska Native	Two or more races
A	19	2	6	1	0	0
B	86	8	2	7	1	1
C	78	0	1	3	1	2
D	58	8	0	1	0	2
E	6	2	0	0	0	0
Totals	242	20	9	12	2	5

Dual enrollment credits earned by the students in this study ranged from 1 to 52 credits. Students appeared to earn progressively more dual enrollment credits as the community college size increased, except for College A which had a maximum of 30 credits. College A had a small dual enrollment population (30) students, although it was the largest college that participated in this study. The smallest was college was College E which had a total of 20 dual enrollment credits, followed by College D (37), College C (42), and College B (52). Completion times averaged roughly the same or one and one-half times the program length, specifically colleges

A-D averaged 1.49 times the program length, at College D 1.51 times, at College C 1.57 times at College A, and the longest mean for completion times were at College B with 1.62 times the program length. College B had the largest sample size of 106 dual enrollment students who subsequently graduated from a community college. College B's size could have contributed to their large student completion time span from 0.5 to 6 or 600%. College E only had a sample size of 8 but did boast the smallest completion times, averaging 1.25 times the program length. College A students ranged from 1-4 completion times, College B, 0.5-6, College C, 0.5-4, College D, 0.5-3, and College E 0.5-3. Table 8 displays this analysis.

Table 8.

Cohort 2011 Dual Enrollment Credits and Completion Times

College	Students	Dual Enrollment credits		Completion Times	
		Range	<i>M</i>	Range	<i>M</i>
A	30	3-30	10.7	1.0-4.0	1.57
B	106	3-52	12.6	0.5-6.0	1.62
C	85	3-42	10.1	0.5-4.0	1.51
D	70	1-37	9.1	0.5-3.0	1.49
E	8	6-20	9.0	0.5-2.0	1.25

Multiple Linear Regression Analysis

A regression of time to completion on dual enrollment credits, status as a racial minority, Pell eligibility, gender, region, College (4 dummy variables), program type (7 dummy variables), and degree type (associates vs certificate) accounted for a significant one-third (0.302) of the

variance time in completion, $F(17, 272) = 6.919, p < .000$. Dual enrollment credit was a significant predictor of time to completion ($b = -1.706, p < .001, 95\% \text{ CI } [-2.627, -.785]$). For every additional dual enrollment credit earned, time to completion is reduced by 1.7%. Control variables that were significant predictors at $p < 0.05$, included the two smallest colleges, College D ($p = .012$) and College E ($p = .047$), and degree ($p < .001$). Variables gender ($p = 0.770$), Colleges B ($p = .641$), College C ($p = .079$), first-generation status ($p = .770$), Pell eligibility ($p = .100$), racial minority status ($p = .111$), and all programs were not significant predictors. See Table 9.

Table 9.

Multiple Linear Regression with all Control Variables

	<i>b</i>	<i>p</i>	<i>CI</i>
Colleges with Dummy Variables			
College A vs B	-6.446	.641	-33.615, 20.723
College A vs C	-25.043	.079	-52.982, 2.895
College A vs D	-36.936	.012	-65.729, -8.143
College A vs E	-51.223	.047	-101.748, -.698
Gender			
Female vs Male	2.342	.770	-13.444, 18.129
Race			
Racial majority White (Asians) VS Racial minority Black/African Americans, Hispanic/Latino, American Indian/Alaska Native, Two or more races)	19.600	.111	-4.564, 43.765
First- Generation Status			
First-generation vs non-first- generation	3.112	.770	-17.808, 24.031
Pell Eligibility			
Pell vs non-Pell Eligibility	-14.059	.100	-30.828, 2.710
Dual enrollment credits 1-52	-1.706	.000	-2.627, -.785
Degree			
Associate vs certificate	-88.960	.000	-110.968, -66.951
Programs with Dummy Variables			
General Studies vs Arts and Humanities	-10.495	.462	-38.551, 17.561
General Studies vs Business	-6.549	.625	-32.929, 19.831
General Studies vs Education	-.474	.983	-45.286, 44.339
General Studies vs Health Sciences	-4.684	.802	-41.380, 32.013
General Studies vs Social Sciences	-8.076	.568	-35.868, 19.717
General Studies vs STEM	6.260	.558	-14.747, 27.266
General Studies vs Industry and Trades	16.516	.387	-20.983, 54.1014

* Variables with a significance of .000 are equivalent to $p < 0.001$.

Chapter V

Discussion

In fewer than ten years, the number of dual enrollment students doubled in the United States from 1.16 million in the 2002-2003 academic year to 2.04 million in the 2010-2011 (Taylor, 2015), and the numbers continue to climb annually (Cowan & Goldhaber, 2015). Dual enrollment programs were initially designed for the gifted and talented high school populations, but have now expanded, in an attempt to impact and provide access to as many students as possible (Kilgore & Wagner, 2017). Substantial evidence indicates White and Asian students in the middle to upper classes are more likely to participate in dual enrollment opportunities (An, 2013). The majority of students completing college degrees are students from high-income families, followed by middle and low-income students (Troost, 2016). Many students of color are academically well-qualified and have plans to attain a higher education degree, but finances and other factors hinder their progress.

Taylor (2015) found that dual enrollment programs may be expanding the college completion gap between White students and racial minority students. The current study, focusing on racial minority students who participated in dual enrollment as well as the number of credits they earned, should be of interest to both high school leaders and community college administrators who are instead in closing that gap. Equity has long been a concern for dual enrollment courses since the enrollment numbers do not reflect the diversity found in the United States today; the enrollment of students of color is disproportionately low. When comparing racial minorities and their White counterparts, there is a difference as significant as 15-20% in the completion of college credentials within five years (Fink et al., 2017). Despite the relatively low participation of racial minority students in dual enrollment to date, more studies on

completion times could help emphasize that students of all backgrounds can enroll and be successful in dual enrollment courses (Grubb et al., 2017).

Virginia has robust participation in dual enrollment programs (VCCS, 2016), and the current study can contribute to the success of students of color. Almost half of the students (47%) ages 18-20 years old matriculated from high school into community colleges to start their higher education track making community colleges a significant area of research focus in higher education completion plans (Fink et al., 2017). Although studies indicate racial minority students benefit from participation in dual enrollment courses (An, 2013; Pretlow & Wathington, 2014) very few studies have examined the number of credits earned and completion rates of racial minority students and majority students. Through multiple linear regression, this study investigated if there were significant differences in completion times for racial minority and majority students in the Virginia Community College System (VCCS) for degree or certificate programs based on the number of dual enrollment credits earned before graduating high school while controlling for other variables that might affect completion.

Purpose Statement

The purpose of this study was to examine whether there are significant differences in completion times between racial minority students and racial majority students enrolled in degree or certificate programs based on the number of dual enrollment credits earned before graduation from high school while controlling for other factors that can affect college completion.

Research Question

Are there significant differences in completion times between racial minority and majority students enrolled in a Virginia Community College System (VCCS) degree or certificate program based on the number of dual enrollment credits earned before graduating high school, controlling for gender, socioeconomic status, rural or urban college location, status as a first-generation college student, and college degree program?

Summary of Findings

Overall dual enrollment students expedited their completion time by 1.706% for every dual enrollment credit completed. Students completed from 1 to 52 dual enrollment credits, with an average of 10.817 credits. If students took the average number of dual enrollment credits of 10.817, students decreased their completion time by 18.45%. Most students in the five colleges participating in the study earned fewer than 20 dual enrollment credits while in high school. Students who earned 52 dual enrollment credits were only eight credits away from earning an associate's degree and could potentially decrease their time in college by 88%.

There was not a significant difference in completion time between the racial majority and racial minority students who dual enrolled ($b = 19.600, p = .111$). The investigator categorized the Asian students along with White students as the racial majority for two reasons; (a) not to artificially boost the racial minority completion times and (b) previous research is focused on Black and Hispanics as the main core of racial minority groups in Virginia, not Asians. Even with this consideration and categorization, the completion times of racial majority dual enrollment students and racial minority dual enrollment students did not differ significantly.

Students completed associate degrees with or without certificates, faster than students who completed one or more certificate degrees without an associate's degree ($b = -88.960$). Since this current study spanned six years, associate degree earners were limited to 300% completion time, within the two-year program, while certificate earners could take up to 600%, with the one-year program length. The difference in program length and the completion time allotted during this study could explain some of the variances. It is notable that many of the students who completed an associate's degree also completed one to three certificates. This study did not collect data on or analyze the variable of part-time or full-time enrollment status, which may be a contributing factor to a student's completion time.

Students from College A had a shorter completion time compared to students from the other colleges in the present study. For the cohort of 2011, College A had the largest overall enrollment of the five colleges, but had only 30 dual enrollment students; College B had 106 dual enrollment students, College C, 85 dual enrollment students, and College D, 70 dual enrollment students. College E was the smallest community college in the study, with only eight dual enrollment students. Four of the five college's dual enrolling students' completion time increased as the college size decreased. The colleges varied in enrollment size and in the number of dual enrollment credits that students earned. Only the smallest colleges, College D and E, had low significance values College A vs. D ($b = -36.936, p = .012$) and College A vs. E ($b = -51.223, p = .047$). College D and E had small sample sizes, and this study would need to be replicated numerous times with larger sample sizes before arriving at any conclusions.

The independent variable of race was found to be not significant, along with following control variables: all programs of study, Pell eligibility, first-generation status, gender, and variables College A vs. B and College A vs. C. The rural and urban geographic region variable

was removed during the multiple linear regression analysis due to possible redundancy, or the variable had no variability. Due to the low enrollment numbers of racial minority students in this study's five participating colleges, further analysis was not conducted on students from individual racial groups.

Findings Related to the Literature

This study found that racial minority students who take dual enrollment credits decrease time to completion in a two-year college, but not at a significantly different rate than racial majority students. The present study concurs with past research indicating that racial minority status is a marginal predictor, or not statistically significant, to time to completion (Fink et al., 2017). Previous research focused on dual enrollment students overall and the effect of dual enrollment on bachelor's degree completion rates at four-year institutions (An, 2013; Speroni, 2011; Taylor, 2015). Only three previous studies have focused on dual enrollment students who completed an associate's degree in community college, all concluding that race has a marginal effect (Speroni, 2011; Struhl & Vargas, 2012, Swanson, 2008). Other previous studies focused on student participation in dual enrollment courses and examined whether participation helped students to be more college ready, with a higher likelihood of completing a college credential. Few studies have focused on the associate's degree from a community college, and even fewer have highlighted completion times for these students. Some students utilize a community college associate's degree as a stepping stone to a bachelor's degree. Community colleges can be placed at a disadvantage when performance-based funding metrics are applied, particularly graduation rates measures. Performance-based funding metrics often fail to account for

community college students who successfully transfer to four-year programs after completing substantial community college coursework.

Current statistics indicate 46% of community college students do not complete any degree within eight years, while 33% complete an associate's degree and 20% earn a bachelor's degree (Grubb et al., 2017). Some studies show a positive correlation between dual enrollment credits with college bachelor degree completion (Grubb et al., 2017). This conclusion is supported by the current study's finding that most community college students decreased their completion time for an associate's degree or certificate by 0.017 years per dual enrollment credit earned.

The current study found that instead of first-generation or Pell-eligibility variables having the greatest influence on completion time, the degree chosen was the greater predictor ($b = -88.960$). When comparing completion times and accounting for degree length, students who opted for an associate's degree complete faster than those who were on a certificate track. Previous research correlated dual enrollment credits earned by racial minorities and low-income status students to an increased likelihood of college degree completion (An, 2013). Other pre-existing characteristics and variables had stronger influences on completion time than racial minority and low-income status (Taylor, 2015). The present study found there was no statistical difference in completion times between racial minority students and racial majority students who earned the same number of dual enrollment credits. The current study also found that whether a student chooses to complete an associate's degree or certificate was a more significant predictor.

Previous research focused on four-year institutions bachelor's degree programs indicated that first-generation college student status (Juszkiewicz, 2015) and program of study were predictors of college completion (Hughes et al., 2012). The data from the current study indicate

a primary predictor for community college completion was degree type, but first-generation college student status was not statistically significant. Both two-year and four-year students decreased completion time as the number of dual enrollment credits earned increased. Future research is required to determine the most relevant predictors of completion for students at four-year institutions and community colleges. This research will help administrators and advisors at each type of institution to better serve their students.

Unexpected Findings

It was expected that increasing the number of dual enrollment credits earned by a Virginia high school racial minority student would decrease the student's community college completion time so that it was equal to that of racial majority students. Decreasing the completion time through dual enrollment courses might help racial minority students narrow the college completion gap with racial majority students. If dual enrollment does decrease completion time, it might also improve the graduation rates among racial minority students in community colleges, when students primarily transfer to after their high school graduation. It was also expected that the controlling for the variables Pell Grant eligibility and program of study (i.e., academic discipline) would be statistically significant, with lower-income students (indicated by Pell Grant eligibility) needing longer completion times, while other variables were not expected to produce statistically significant differences.

The current study, however, found most of the control variables did not have a significant effect on completion time. Neither Pell eligibility nor the program of study produced a statistically significant difference in completion time for students in the present study. Degree

type did produce a statistically significant difference, with students who earned an associate's degree realizing a lower completion time than students who earned a certificate.

Previous literature typically assessed dual enrollment populations without differentiating between races. A few researchers have found that dual enrollment courses have little or no effect on racial minority students' completion times (Taylor, 2015), with one concluding that dual enrollment courses slightly increased completion time to graduate for racial minority students (Grubb et al., 2017). The current study found that within the five Virginia community colleges reviewed there was no statistically significant difference in completion time difference between White and Asian students (racial majority students) and racial minority students.

It was expected that the program of study selected by a student would affect completion time. Previous research indicated students in STEM disciplines had decreased completion times over other programs of study (Hughes et al., 2012). The present study categorized the programs of study into eight programs: Arts & Humanities, Business, Education, General Studies, Health Sciences, Social Sciences, STEM, and Industry and Trades. The present study did not find a statistically significant difference in the completion times of students in any of the programs of study, including STEM students. The current study concluded that completion time was affected by degree type, with associate degree students completing faster than those students who earned a certificate (after taking into consideration each program's normal time to completion). Completion time was affected by degree type or credential earned, but further research regarding this issue is needed.

Implications for Practitioners

Previous research indicates enrollment has a marginally positive impact on decreasing college completion time for students self-reporting as a racial minority (Speroni, 2011; Struhl &

Vargas, 2012, Swanson, 2008). In the current study based on five Virginia community college data sets, both racial majority students and minority students who earned the same number of dual enrollment credits completed their certificates or associate degrees in a similar amount of time. With a significant difference in overall graduation rates between White students and racial minority students (Fink et al., 2017), dual enrollment might be able to decrease the gap by decreasing completion times and possibly increasing community college graduation rates. Both racial minority students and racial majority students who dual enrolled have similar completion times, but in comparison to the general population, tend to dual enroll less frequently.

Community college and high school leaders should work collaboratively to improve the low rate of enrollment of racial minority students in dual enrollment programs to improve their overall graduation numbers. The vast majority of students who sign up for dual enrollment classes are White middle and upper-class students. Help is needed to remove barriers that racial minorities hit before being seated in a dual enrollment course to give students from all backgrounds a boost in graduation numbers and accelerate their completion time. Racial minority students participate in dual enrollment programs at a lower rate than White students, and the findings of the current study may indicate that racial minority students who do not participate in dual enrollment are missing potential benefits.

States should seek ways to improve equality for dual enrollment participants, either through funding or other incentives (ACT, 2015). Accumulating twenty college credits by the end of the first year of college is a strong predictor that a student will earn a college credential (Hoffman, Vargas, & Santos, 2009). Therefore, expanding access to dual enrollment can increase the success of all students. Proponents of dual enrollment feel it creates a stronger path for underrepresented students to prepare for college, as it introduces high school students to

college expectations (Hoffman, Vargas, & Santos, 2009). Thomas, Marken, Gray, and Lewis (2013) found dual enrollment has often been more strongly promoted to high-achieving students who are likely to be successful with little academic or personal support services. Since the participants in dual enrollment programs tend to be high achieving students, regardless of race, the findings of the current study are confirmed.

Many stakeholders seek to assist underrepresented students who are first-generation students or who have low-socioeconomic status. In contrast to previous research, this study found no statistically significant difference in the completion time of dual enrollment racial majority and minority students, those who are first-generation status and those who are not, or Pell eligible and those who are not Pell eligible. Previous research indicates the number of dual enrollment courses could help both racial minority students and racial majority students expedite their completion times with no significant differences. The current study indicates there is no difference in the completion time of racial minority students and racial majority students who participated in dual enrollment.

Recommendations for Future Research

Though the results of the current study were not significant, the institutions involved or the community college system should regularly update the regression analysis and conduct an ongoing review of the outcomes. Continued examination at the state level will help identify ways to support enhanced completion rates and areas to focus significant state funding. This study used data from five community college service regions in Virginia which yielded 292 dual enrollment students containing a small percentage of racial minorities. This study should be replicated with a larger sample size that includes a higher number of racial minority students.

Variations of the current study could focus on the differences between two-year and four-year institutions as well as compare dual enrollment programs in Virginia to those of other states. Additional studies could emphasize the qualifications for dual enrollment students by state or region and the varying levels of promotion and publicity for dual enrollment programs by state or region.

Assessing Region as a Completion Determination Factor. States or regions with larger racial minority populations or different racial minority groups can provide a backdrop for further research. Research on regional completion rate for degree choices by racial minority status impacts program lengths and can provide direction to community college as they outline future plans of study for their region. Increasing number of students are matriculating from high school directly to community colleges, yet only a handful of studies have focused on associate's degree completion compared to bachelor's degree completion. Research with the target for associate's degree completion would be highly instructive for currently higher education administrators.

Connecting Dual Enrollment Financial Support to Racial Minority Students. While many financial reasons prevent students from taking dual enrollment courses, the reality of limited funding demands further studies to improve racial minority enrollment in dual enrollment courses. If local school districts hope to assist students with limited funds and racial minorities simultaneously, then the advisability of directing current dollars to Advanced Placement over dual enrollment courses needs to be scrutinized. Research on the allocation of regional or district monies and its effect on dual enrollment completion rates could produce cost-effective guidance. Tuition, scholarships, and assistance programs vary by county in Virginia. If racial minority students' completion times are not significantly different from racial majority students when

correlated with the number of dual enrollment credits taken, separating socioeconomic status from racial groups at the community college level could be of interest. Most studies seem to refer only to low, middle and high socioeconomic status, but it is yet to be determined if a particular financial bracket or income threshold within the low socioeconomic group correlates with or without race as a variable.

Advanced Placement and Dual Enrollment Courses. Students seeking to earn college credits during high school have two options, advanced placement courses or dual enrollment courses. Future research could provide information on which option helps racial minorities the most to reduce their completion time and ultimately increase their graduation rates. Collecting data on the number of racial minority students who take advanced placement course, their completion time, programs of study, and degrees or certificates earned compared to those who dual enroll, could help counsel students to which option is the most beneficial for them. If the present student indicates that if racial minority students earn dual enrollment credits they can have a nearly equal completion time as racial majority students, research could compare the completion time benefits of advanced placement courses to dual enrollment courses.

Course Evaluations. Future research on the dual enrollment programs themselves, including instructors' qualifications and teacher access to advancement, procurement of materials, and correspondence between dual enrollment course and community college textbooks are needed. To increase dual enrollment funding there has to be evidence that the courses are taught at the college level. Dual enrollment students should be prepared for the college work that is required of them. These courses should be monitored to ensure that qualified students are entering the program and that the students are progressing in coursework which is challenging.

Quality checks and assessment of coursework should validate that a smooth transition into college occurs and that educational skills and outcomes are achieved (ACT, 2015).

Completion Time and Student Status. The current study did not take into account whether racial minority community college students who previously dual enrolled, held part-time or full-time status. Future studies could examine the prevalence of part-time or full-time status of former dual enrollment students and how that status affects completion of a certificate or degree. Including other variables that surround a student's choice for their part-time or full-time status should be included, such as family life, job status, and other personal obligations, as it will likely affect the student's completion time as well.

Articulation of Dual Enrollment Courses at Four-year Institutions. Since 2006 in Virginia, laws were enacted to improve articulation, transfer and dual enrollment admissions agreements to help high schools and higher education to work collaboratively (Education Commission of the States, 2016). As many dual enrollment students enroll in community colleges, the State Council of Higher Education in Virginia has been working one step ahead and approved a state policy for college to college transfers on July 19, 2016 (SCHEV, 2016). The reason for the policy was the increased number of transfer students between two and four-year schools in Virginia to earn a bachelor's degree and the need for a smooth transition. The policy specifically indicates that the enrollment process needs to be reviewed to determine if underrepresented students are being directed into non-transfer programs, have to endure barriers that hinder a smooth transition from two to four-year schools, and if they are encouraged to obtain higher levels of education (SCHEV, 2016). The policy addresses high school students who were involved in the dual enrollment program and earned an associate's degree before graduating high school. Future research could be conducted on articulation agreements and

students' transitions from two to four-year schools, in particular, dual enrolling racial minority students, and if progress has been made with this policy.

High School Students' Perspective. A qualitative approach could include survey research utilizing input from high school students. Some research has shown that not all high schools students are aware of study options and what courses are available to them (Grubb et al., 2017). While some students choose Advanced Placement courses over dual enrollment, only a handful of studies have linked this choice to possible reasons such as financial barriers or lack of course availability awareness. Also, a quarter of students in one study (Speroni, 2011) had the GPA to enroll in a dual enrollment course, yet they did not elect to enroll despite being eligible. Determining factors that influence their choices to dual enroll or not would augment current knowledge of barriers and perceived benefits, particularly in the racial minority or low socioeconomic status students. Asking students if they received adequate assistance from their counselors or if information sessions were available to parents and students to highlight the benefits of dual enrollment, AP, other course options would provide valuable information to increase awareness.

Concluding Remarks

The purpose of the current study was to examine whether there are significant differences in completion times between racial minority students and racial majority students enrolled in degree or certificate programs who completed dual enrollment credits before graduation from high school while controlling for other factors which can affect college completion. Racial minority students graduate at lower rates and participate less in dual enrollment programs compared to the general population of their service region (Fink et al., 2017). Past studies point

to low-socioeconomic status and first-generation college students as benefiting the most from dual enrollment courses. The current study concluded that among former dual enrollment students the type of degree and its associated program length are more important indicators than race on the student completion time in community colleges. If dual enrollment becomes a common path to help high school students earn college credit and matriculate into college, studying racial minority students at the high school level and how their success translates into college graduation would be of value to higher education administrators. Two studies have indicated (Hofmann & Voloch, 2012; Taylor, 2015) that dual enrollment courses improve students' motivation to complete a college degree; this motivation, and not the dual enrollment credits themselves, may improve graduation rates.

The present study found that dual enrollment courses are associated with an expedited completion time of 1.706% for every dual enrollment credit completed. Students earned from 1 to 52 dual enrollment credits, with an average of 10.817 credits, with a mode of 6 and an average of 10.817. If students completed the average number of dual enrollment credits of 10.817, college completion time would decrease by 18.45%. The current study found no statistically significant difference in the outcome between racial minority students who dual enrolled compared to racial majority students who dual enrolled. Black and Hispanics lag behind White students in college graduation rates. If dual enrollment can help to increase the success of racial minority students, then more resources should be directed to programs which can achieve that educational equality.

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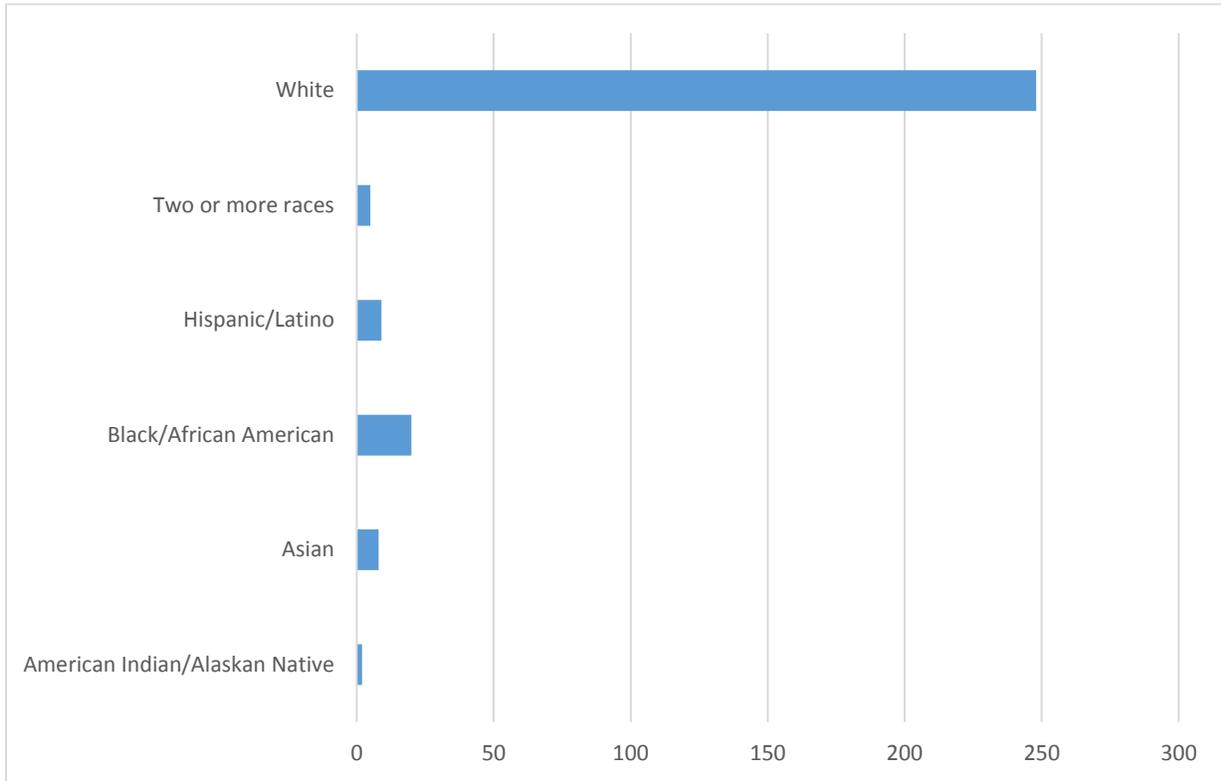
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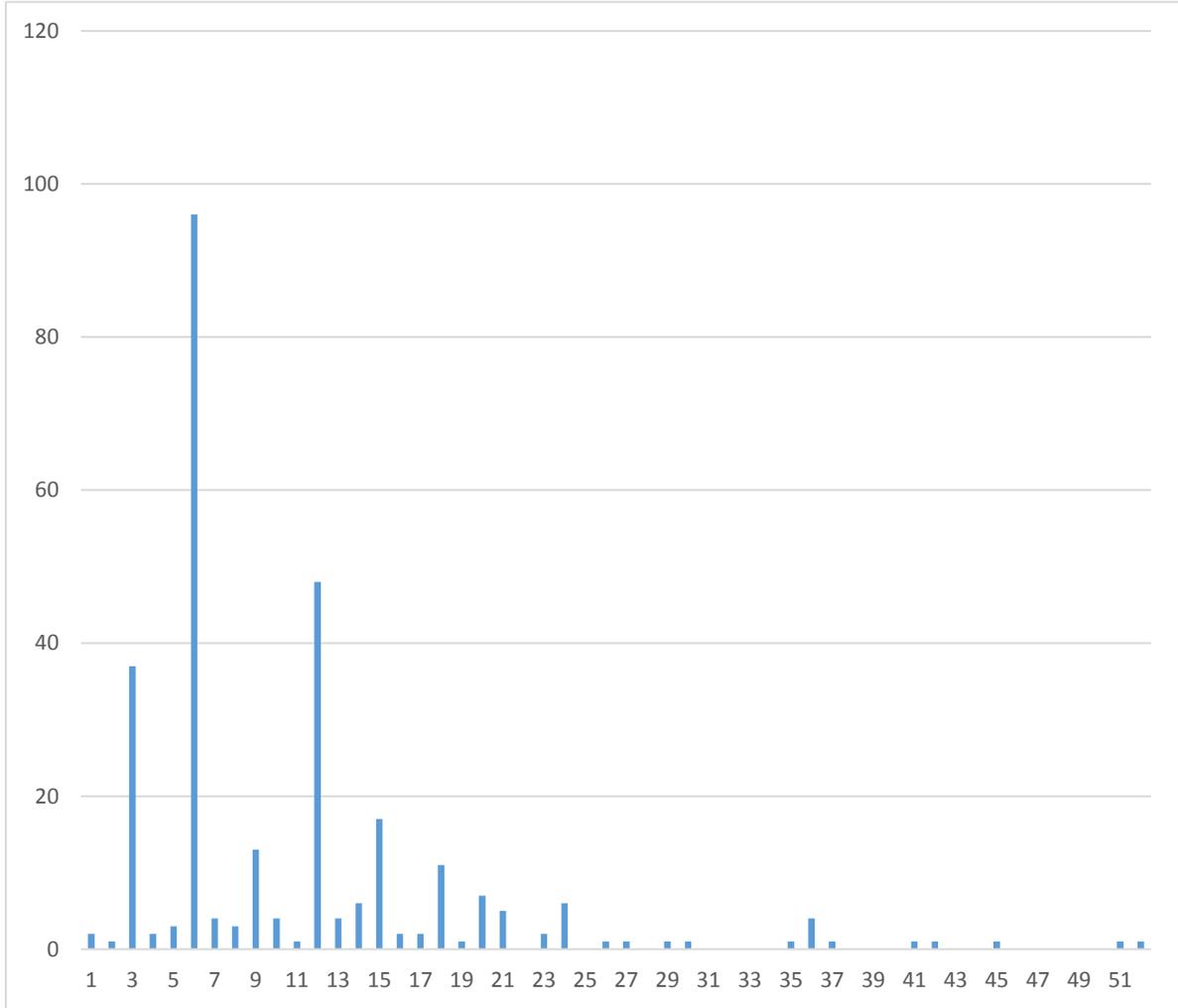
Appendix A

Race of the Dual Enrollment Students



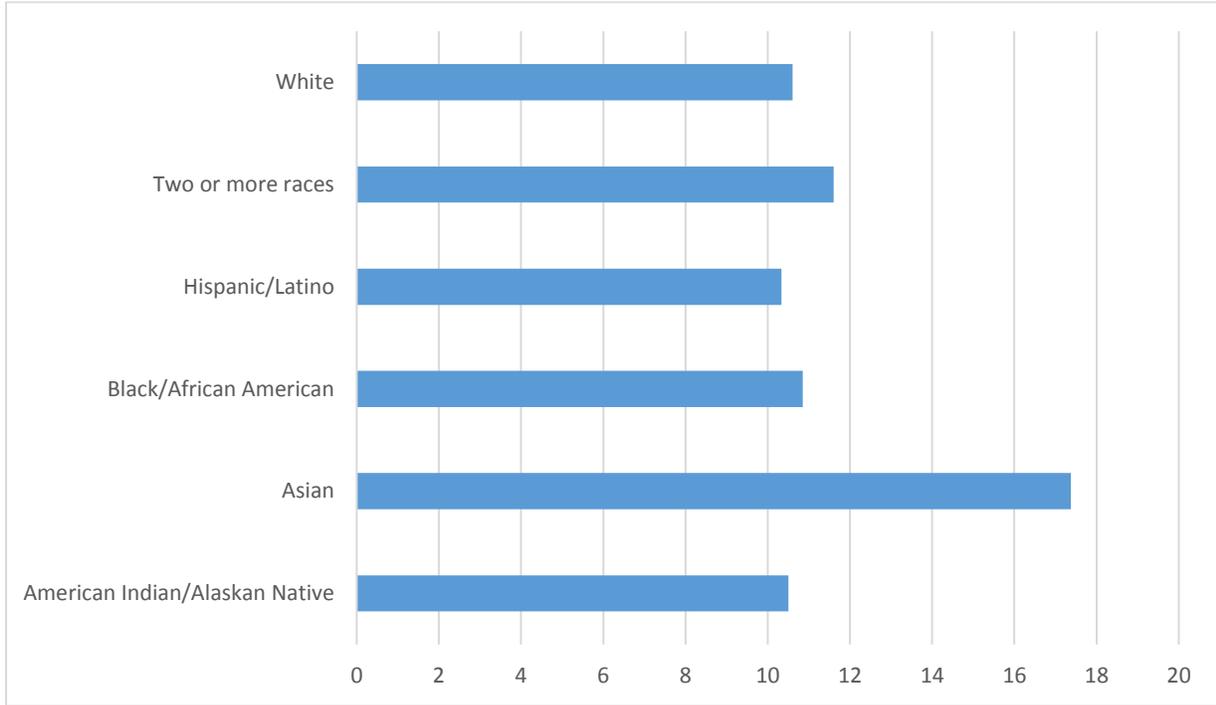
Appendix B

The Number of Participating Students by Dual Enrollment Credits Earned (1-52)



Appendix C

The Average Number of Dual Enrollment Credits Earned by Students' Race



VITA

Elisabeth Gardiner Dingess

EDUCATION

- Ph.D., Community College Leadership, Old Dominion University, 2018
- M.S., Biology, George Mason University, 2008
- B.S., Biology with Chemistry minor, Radford University, 2002

CERTIFICATIONS AND LICENSES

- Virginia Teaching License, expires in 2021
- Certified Veterinarian Assistant

PROFESSIONAL EXPERIENCE

2014 – Current Lord Fairfax Community College Middletown, VA
Science Program Lead

- Organized schedules for over 30 faculty members each semester
- Approve and organize textbook adoptions
- Assist with laboratory safety protocols
- Assist in creating and monitoring new science programs and degree specializations
- Program Assessments
- Assist with transfer agreements with four-year institutions

2009- Current Lord Fairfax Community College Middletown, VA
Biology Professor (previously Instructor, Assistant Professor, and Associate Professor)

- Teach Basic Human Biology, Biology, and Microbiology lecture and laboratories
- Course formats: Face-to-face, hybrid, and online
- Pioneered Biology 101 and 102 online lecture and laboratory courses, and helped write the online lab manuals
- Constructing PowerPoint lectures, lesson planning, utilized Blackboard, conducted labs including cellular studies, dissections, examining bacterial cultures, and genetics

Aug. 2007 – May 2009 George Mason University Fairfax, VA
Adjunct Biology Prof (2008-2009) and Graduate Teaching Assistant (2007-2008)

- Teaching Introductory Biology labs
- Conducted a variety of labs including cellular studies, dissections, enzyme reactions, examining bacterial cultures, and genetics

Aug. 2005 – June 2007 Randolph-Macon Academy Front Royal, VA
High School Science Teacher

- Taught Biology, Environmental Science, and AP Biology
- Attended an AP Biology conference
- Created the first accredited AP biology program at RMA

ADDITIONAL EXPERIENCE

- Veterinarian Assistant, 2003-2005

- Animal Keeper, 2002
- Assistant early learning and development center teacher, 1999-2002

ADDITIONAL TRAINING

- Instructional Design for Online Learning (IDOL) course and Blackboard Training
- Distance class using a PolyCom system training
- Biological and Chemical Safety for BSL1 and BSL2

RESEARCH

Undergraduate Project, Radford University, 2002

- Analyzing Merrimac Mine run-off for iron and calcium residual levels utilizing atomic absorption

Graduate Project, George Mason University, 2008

- Identifying genetic markers for Trumpeter and Tundra swan hybrids utilizing mitochondrial DNA, sex chromosomes, and introns