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Is Dual Enrollment a Predictor of Academic Success?

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Abstract

As almost all institutions of higher education continue to face enrollment issues, they must consider evidence-based strategies to sustain and increase recruitment, matriculation, retention, and graduation. Policy makers and educational administrators expect that dual enrollment provides institutions of higher education an opportunity to invest early in student success by encouraging students to pursue postsecondary education while decreasing cost and time to graduation. However, findings across multiple studies suggest that dual enrollment does not necessarily always increase a student's chance for positive post-secondary school outcomes. This study analyzed data from a R1 southern flagship institution to determine if dual enrollment was a predictor for college graduation. Use of descriptive statistics, ANOVA, and stepwise logistic regression determined that dual enrollment alone did not increase the probability of graduation. Variables impacting graduation and dual enrollment characteristics are discussed and recommendations provided for institutions.

1 Introduction

College campuses across the United States continue to grapple with issues of enrollment, matriculation, and graduation. Despite focus on increasing access to students who have historically been on the margins or completely left out of the higher education sphere, limited gains have been made in college enrollment and graduation. In 2020, the na-tional college enrollment rate for all students was 40%, a number which has held rela-tively steady over the past decade when compared with its rate in 2010 at 41% (1). For nearly all race and ethnicity groups, enrollment rates either held or declined, except for Hispanics which saw a four percent increase in enrollment over the decade (1). The Covid-19 pandemic, which caused a global shutdown in nearly all sectors at its height (2), is presumed to have been a predominant factor in continued enrollment drops, with approximately 1.32 million less undergraduates enrolled in Fall 2022 compared to fall 2019 (3). For students who enrolled and matriculated, institutions continue to face concerns of retention and graduation, with the national six-year college completion rate sitting at only 62.3% (4).

Researchers with the National Student Clearinghouse Research Center (4), who track the national college completion rates for students, have seen minimal improvements from the previous cohort to the current cohort. The national 6-year college completion rate has stalled, with only a .1% increase in graduation rates from the fall 2015 cohort to the fall 2016 cohort (4). Although the six-year completion rate increased in over half the states, the gains were markedly small with only five states increasing one percentage point or more when compared to the previous year. The gender gap continues to grow and is the largest gap since 2008, with females 7.1 percentage

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points more likely than males to graduate college (4). Understanding the underlying factors that create barriers to student graduation is imperative if institutions intend to address these concerns.

Dual Enrollment programs have tried to address these issues of enrollment, matric-ulation, and graduation for institutions of higher education. A dual enrollment program allows a high school student to take college courses while still enrolled in high school and is touted to have positive impacts such as earning college credit early as well as giving students an opportunity to familiarize themselves with the college environment. Over one million high school students took college courses in the 2010-2011 academic year, which represents about 10% of all high school students. Enrollment in these programs has continued to grow over time, with a 67% increase from 2002-2003 (5). With varying policies and standards for dual enrollment across the states, can dual enrollment be considered a key predictor for college graduation? If it is not, what other factors should administrators focus on in order to better serve their students?

2 Literature Review

Proponents of dual enrollment have postulated that dual enrollment is associated with reduced college costs (6) (7) (8) and positive student adjustment on campus, including increased academic confidence, independence, and self-sufficiency. Students are able to learn more about the campus environment and take advantage of campus resources during dual enrollment, which then in turn can increase the likelihood of resource utilization when they enroll as a post-secondary student (5). For students who attend under resourced high schools, dual enrollment offers an opportunity to increase the academic rigor of their high school curriculum (6) (7) (8) (9), as well as expand opportunities and course electives (6) (7) (10). Outcomes for low achieving students are especially highlighted in the literature as to the positive impact dual enrollment can have, assisting students in meeting high standards and reducing the likelihood of remedial coursework in college (6) (7) (8) (9).

In a study conducted by the City University of New York (CUNY), researchers found that students who had participated in dual enrollment with CUNY had a .16 higher first semester GPA and were 5 percentage points more likely to be retained to the third semester (11). Young, Joyner, and Slate (12) found that there were significant differences in first year grade point averages for students who participated in dual enrollment, with participants demonstrating significantly higher first year grade point averages. In a separate study, Swanson (13) found that students who participated in dual enrollment were more likely to enter college immediately following high school and persist to their second year. Those who demonstrated academic momentum by earning credit early and entering college immediately following high school were also more likely to attain a bachelor's or advanced degree than their non-dual enrollment counterparts. Dual enrollment was found to positively impact continuity, with students with dual enrollment backgrounds having a 1.67 times higher continuity rate through the end of the second year (13). However, this same study demonstrates the limitations of dual enrollment.

In Swanson's study (13), dual enrollment alone was not enough to increase the chances of completing the bachelor's degree or decrease the time to bachelor's degree completion (4.56 years or less). Continuity rather than the credit number was the most significant indicator of bachelor's degree attainment in this study. Cross tabulations showed that the non-dual enrollment group had a higher percentage of bachelor's degrees earned than those who participated in dual enrollment. Only when other variables were controlled within the statistical model were positive significant impacts found in relation to dual enrollment and bachelor's degree attainment. An-

other study highlighted an unintended consequence of dual enrollment: undermatch (14) which occurs when a student selects an institution of higher education that is below their academic credential level (15).

Although select previous research has highlighted the positive impacts that institutions gain from reenrolling their dual enrollment students as undergraduates (11) (12), the impact for students choosing to stay at their dual enrollment institution can be negative. One study found that dual enrollment students who reenroll at their two-year dual enrollment institution are 29.4 percentage points more likely to undermatch than dual enrollment students who select a different school post-graduation. For a dual enrollment participant who first attends a 2-year institution after high school before transferring to a 4-year institution, there is more than a 25 percentage point decrease on their ability to graduate on time. Overall, there was a statistically significant interaction between undermatching and staying at the original institution of dual enrollment for both 2 and 4 year colleges (14), indicating that undermatch should be a genuine concern for dual enrollment participants.

There is growing research that argues dual enrollment has limited to no impact on academic success metrics. Speroni found that dual enrollment did not significantly increase the likelihood of enrolling in a two-year or four-year college, obtaining an associate or bachelor's degree, or obtaining the degree within five years from the cohort's expected college start date (16). Bailey and Karp (17) argued that previous studies who have touted positive impacts did not necessarily utilize rigorous methodology, control for necessary external factors, or take into consideration variables such as previous academic performance, which casts a shadow of doubt on positive claims of dual enrollment.

3 Purpose of Study

The United States Department of Education has recently identified dual enrollment as a significant mandated data point to collect through institutional surveys within IPEDS, the integrated postsecondary education data system. This survey, which collects data from all institutions of higher education that participate in federal student aid programs, will begin collecting data on dual enrollment outcomes in the 2023-2024 academic year, suggesting that this is an area for both institutional researchers and administrators to pay close attention to. While prior dual enrollment studies used metrics such as semester and cumulative grade point average, credits completed, and time to graduation to measure the impact of dual enrollment on student success, other predictors were left out, such as variables related to academic success in early college. This gap in the literature, along with IPED's newest requirement, laid the groundwork for the current study.

The purpose of this study was to explore the impact of dual enrollment on student academic achievement. The research questions were: 1) What are the characteristics of students with dual enrollment records in relation to first year grade point average, first math course grade, freshmen seminar grade, first English course, number of repeated entry level STEM or English courses, and number of credit hours earned by the end of the sophomore year? 2) What are the characteristics of students without dual enrollment records in relation to first year grade point average, first math course grade, freshmen seminar grade, first English course, number of repeated entry level STEM or English courses, and number of credit hours earned by the end of the sophomore year? 3) What difference is there, if any, between dual enrollment participants and non-dual enrollment participants' likelihood of graduation? 4) What difference is there, if any, between dual enrollment participants and non-dual enrollment participants' time to graduation?

This study was grounded in Tinto's Theory of Student Departure, which posits that a student's integration into the academic and social systems of a college is the most significant predictor of continued matriculation and eventual graduation (18). This theory supports the argument for dual enrollment programs, postulating that characteristics such as family and educational background and experiences ultimately influence a student's decision to stay enrolled in college. Based on this theoretical framework, the authors expected to find significant benefits for students with dual enrollment records.

4 Methodology

This study utilized data from a large R1 public institution with an enrollment greater than 15,000 students. The population for the study was comprised of 5,104 first-time, full-time, and degree-seeking students who began their study in fall 2016, which is the original cohort used for IPEDS Graduation Rate Survey in Winter 2023. Students were tracked between the Fall 2016 and Summer 2022 semesters. In order to address previous gaps in research, this study broadened metrics of academic success by including variables related to early college success. Fourteen explanatory variables were originally identified as potentially impacting the dependent variable: SAT or ACT Scores, Dual Enrollment: Number of semesters taking college courses in high school period; dual enrollment course GPA; gender; Pell grant status; first-generation status; first-year GPA; grade of the first English course; grade of the first Math course; whether the first English course was pathway English or above; whether the first math course was pathway math or calculus/statistics; whether repeating English composition as well as entry level biology, chemistry, physics courses; grade of Freshmen Seminar (College 101); and credit hours earned by the end of sophomore year. Descriptive statistics were calculated for each of these fourteen variables.

Stepwise logistic regression was used to determine which factors impacted students' graduation within six years. Fourteen variables were used in the stepwise model relating to performance prior to college, demographics, and academic performance in college. After the stepwise logistic regression determined which variables impacted graduation, these variables were concatenated into a single variable named Index (see Table B). By applying Index and SurveySelect, a sample was generated of 390 students total, with an equal number of students in the case group (195 dual enrollment participants) and the control group (195 non-dual enrollment participants). A separate stepwise logistics regression was then conducted to generate the estimated probability of graduation for each student. This data was merged with the sample dataset of 390 students. An ANOVA analysis was completed to compare the estimated probability of gradation of the control and case groups.

5 Results

Research question one explored the characteristics of students with dual enrollment records. For this group, which was comprised of 304 students, 63.2% were female, 81.9% were not Pell grant recipients, and the majority did not identify as first-generation students (81.6%). Calculus was identified as the majority's first math course (46.7%) followed by statistics [24.7%), pathway math (19.7%) and computer science or philosophy (8.9%). English 101 was the first English course taken by 69.4% of dual enrollment participants, followed by English 102 (16.8%) and students who indicated taking courses higher than English 102 (13.8%). The majority of students did not need to repeat an English composition or entry level STEM (80.3%). Those who com-

pleted a freshmen seminar scored an A (71.4%) or B (3.3%); the remaining 25.3% did not participate in a freshman seminar.

Research question two explored the characteristics of students with no dual enrollment records. For this group, which was comprised of 4,801 students, 53.5% were women, 85.1% did not receive Pell grants, and 83.3% did not identify as being first generation. Calculus was the prominent first math course (48.9%), followed by statistics (28.8%), pathway math (14.2%) and computer science or philosophy (7.2%). The majority of students did not need to repeat an English composition or entry level STEM course (82.1%). Out of the group, the majority (69%) of students completed a freshman seminar with a grade of A, 4.8% completed the seminar with a B, while the remaining students who chose to enroll earned final grades of C, D, or F (less than 2% combined). Out of the sample, 24.2% did not attend a freshmen seminar and therefore earned no grade.

For research question three, which explored the impact of dual enrollment on the probability of graduation, the ANOVA analysis found that dual enrollment did not increase the probability of graduation. The stepwise logistic regression found a positive impact towards graduation for the following variables: credit hours earned by the end of the sophomore year, the grade of the first math course after entering the university, the first math course taken at the institution, and the grade of the first English course. Factors that were found to have a negative impact on graduation included dual enrollment status, Pell grant recipient status, and whether the student retook any entry level English or STEM courses (see Table B).

Table 1: ANOVA Analysis Probability of Graduation

Source	DF	Sum of	Mean	F Value	Pr > F
Model	1	0.00	0.00	0	0.9928
Error	388	25.60	0.07		
Corrected Total	389	25.60			

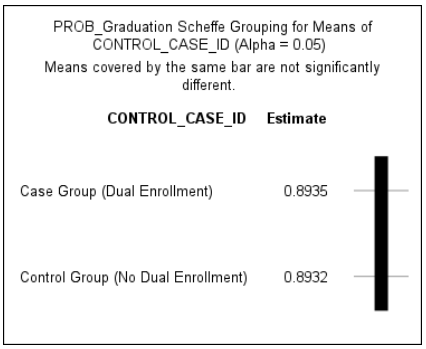

Figure 1: ANOVA Analysis Probability of Graduation

Table 2: Analysis of Maximum Likelihood Estimates

Analysis of Maximum Likelihood Estimates					
Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr> Chi Sq
Intercept	1	-10.1253	0.8542	140.5116	<.0001
Credit hours earned by the end of sophomore year	1	0.1388	0.0049	801.0457	<.0001
GPA by the end of freshman year	1	0.8234	0.1526	29.1192	<.0001
Whether the student retook any entry level English or STEM courses	1	-0.4480	0.1022	19.2053	<.0001
Pell grant recipient	1	-0.6342	0.1728	13.4648	0.0002
SAT Score	1	0.0016	0.0006	7.0399	0.0080
Grade of the first math course after entering the university	1	0.0395	0.0174	5.1689	0.0230
Whether the first math course is statistics/calculus or above vs below	1	0.1528	0.0715	4.5704	0.0325

For research question four, which explored the impact of dual enrollment on time to graduation, the ANOVA found that there was a significant difference between students with and without dual enrollment records. Students with dual enrollment records saved 30.39 days or .31 of a semester. The ANOVA analysis found a significant difference in time to degree completion between the groups. The difference of means for time of completing degree between dual enrollment and without: {3.4769 (year) - 3.3937(year)} *365.25 =30.39 (days) or 11.08-10.77 = 0.31 (semester). Students with dual enrollment saved approximately 30 days.

Table 3: ANOVA Analysis Time to Graduation

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	1.54	1.54	24.23	<.0001
Error	394	25.11	0.06		
Corrected Total	395	26.65			

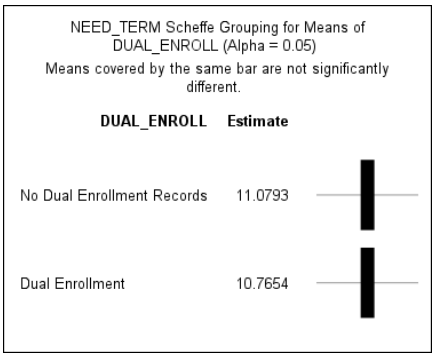

Figure 2: ANOVA Analysis Time to Graduation

6 Discussion

The results for this study found multiple positive characteristics of those students who participated in dual enrollment, but did not demonstrate significant differences after controlling for differences between groups. The majority of dual enrollment students took calculus as their first math course (46.7%) followed by statistics (24.7%), pathway math (19.7%) and computer science or philosophy (8.9%). This is fairly similar to the percentage of non-dual enrollment students, whose majority first class was also calculus (48.9%), followed by statistics (28.8%), pathway math (14.2%) and computer science or philosophy (7.2%). For both groups of students, the majority of students did not need to repeat an English composition or entry level STEM course, with those with no dual enrollment records placing slightly higher (82.1%) than those who participated in dual enrollment (80.3%). The majority of students who participated in dual enrollment and completed a freshmen seminar scored an A (71.4%), only slightly higher than those who did not participate in dual enrollment (68.8%).

The ANOVA demonstrated a significant difference in time to graduation between groups, with dual enrollment students saving an average of 30 days. Although this finding supports previous findings and the theoretical underpinning, the number of days saved is less than a standard semester and likely makes no real difference in the students' time in school or cost savings. Compared with students' academic performance as well as credit hours earned by the end of sophomore year, dual enrollment did not make any significant difference on the probability of graduation. This may be because courses taken during dual enrollment may not necessarily support the students' academic study at college; students may have selected general interest courses rather than general education or major requirements. In this study, the majority of students participating in dual enrollment took humanity or social sciences courses (57.5%) in comparison to pathway math (2.6%) and English (22.7%). Other studies have shown that the types of courses taken prior to college enrollment can impact success metrics, such as enrolling and completing college algebra during dual enrollment (16).

Other factors that were not taken into consideration but could have impacted the efficacy of dual enrollment include the modality and location of dual enrollment such as whether the course took place on a college campus, online, or at the student's high school, which previous studies have shown can have a significant impact (19) (5). The Community College Research Center found that students who participated in dual enrollment on their high school campus were less likely to enroll in a college/university, pursue an undergraduate degree, and earn a bachelor's degree in comparison to their dual enrollment peers who took courses on a community college campus (18). The types of courses as well as the dual enrollment program characteristics may account for why dual enrollment alone did not increase the likelihood of graduation when compared to other variables that may have been more standardized, such as credit hours earned by the end of the sophomore year, the grade of the first math course, and the grade of the first English course.

7 Recommendations

Students' college academic performance and college preparation from high school were the strongest predictors that contributed the heaviest weight to students' academic success, such as persistence in sophomore year and eventually graduation, rather than dual enrollment. Institutions of Higher Education should explore these other academic predictors identified in this study

rather than relying on dual enrollment data alone. Additionally, administrators should be aware of potential detriments to matriculation and graduation such as pell grant recipient status and the number of course retakes, particularly in English and STEM disciplines. By using these as potential indicators of academic success, interventions and additional resources can be provided to students to help support matriculation and eventual graduation. High school counselors should encourage college bound students to build a more solid foundation of English, Sciences, and Mathematics since these subjects are common general education requirements at both two-year and four-year colleges. Additional courses in other subject areas may be encouraged if the student has the time and energy. Since one of the major purposes of attending college is to improve quality of life, high school students should find a balance among their interests, college mandatory requirements, and the reality of the outside world.

This study only examined students who participated in dual enrollment programs associated with the state's flagship institution; students who may have participated in other state's dual enrollment programs or community college dual enrollment programs were not included. Further studies should consider a comparison between these groups to see if any significant differences exist between the dual enrollment institutions.

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