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This study was a cooperative effort of the Texas-ACT College Success Research Consortium, a research partnership between ACT and the following Texas four-year postsecondary institutions:

- The University of Texas at Austin
- Texas A&M University at College Station
- Texas A&M University at Commerce
- University of Texas-Pan American

Dual-Credit/Dual-Enrollment Coursework and Long-Term College Success in Texas

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Key Findings

In this study we compare the short- and long-term college outcomes of incoming students who had and had not taken dual-credit/dual-enrollment courses in high school. Data for the study were provided by four member institutions of the Texas-ACT College Success Research Consortium. Primary findings suggest that, compared to students with no dual credit, students entering college with dual credit are generally:[1]

- More likely to be successful in college, including completing a bachelor's degree in a more timely manner
- As likely to earn a grade of B or higher in subsequent courses taken in college

Moreover, among dual-credit students:

- Those entering college with a greater number of dual-credit hours are more likely to progress toward a degree and complete a bachelor's degree in a timely manner, and they do so without accumulating a substantially greater number of credit hours by graduation.
- Their chances of college success do not differ between those who take most of their dual-credit coursework through a two-year institution and those who take most through a four-year institution.

Introduction

As part of the Texas-ACT College Success Research Consortium, ACT collaborates with member institutions on research studies of interest to both parties. This report summarizes the results from a recent Consortium study on the implications of dual credit/dual enrollment[2] for college success. For most of the participating institutions, many of their incoming freshmen enter college with a sizable number of dual-credit hours—that is, college credit hours earned from successful completion of college-level courses taken while in high school that might also apply toward a high school diploma.[3] These dual-credit hours do not include college credits earned by examination, such as credits resulting from Advanced Placement (AP) or International Baccalaureate (IB) courses. According to Texas legislation, districts in the state are to offer students an opportunity to earn a minimum of 12 college credit hours through AP, IB, or dual-credit courses. However, to participate in dual-credit coursework in Texas, students are generally required to meet certain academic and nonacademic eligibility requirements.

Several arguments in support of offering dual-credit programs for high school students have been put forth in the literature. For example, since such programs are usually offered in full or in part at the school and/or state's expense, it has been suggested that such programs save students time and money by allowing students to get an early start on their college education.[4] Moreover, such programs may help make the transition from high school to college easier for students, as well as boost their chances of completing a college degree in a timely manner.[5] Others have suggested that offering dual-credit programs provides students access to a broader range of courses that better prepare them for college-level coursework and increases college awareness, access, and opportunity for students from underrepresented demographic groups.[6]

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Some of the concerns associated with dual-credit programs pertain to the level of rigor and quality of instruction of the courses for preparing students for subsequent success at four-year postsecondary institutions, especially for courses taught at the high school by high school teachers and courses at two-year postsecondary institutions.[7] Another concern identified by member institutions was that students entering with dual credit may be accumulating more hours than are needed because some dual-credit hours do not apply toward college degree requirements. In addition, empirical evidence showing that students benefit from participating in dual-credit programs in terms of long-term college success has been limited.

In this study, participating institutions of the consortium were interested in answering the following research questions:

- Do students who enter college with dual-credit hours actually benefit by being more likely to succeed in college and complete a degree?
- Do students who enter college with more dual-credit hours have greater chances of college success, including graduating in a shorter period of time?
- Do these students tend to graduate from college with greater earned credit hours than are necessary?
- Does the primary source of the dual-credit coursework (as defined by the type of granting institution) make a difference in terms of students' likely success at a four-year institution?
- Are dual-credit courses as effective as traditional courses in preparing students for subsequent college coursework?

Study Details

Data for the study consisted of more than 36,000 students who enrolled in one of the four participating institutions as first-time entering students in the fall of 2005 or 2006.[8] Subsequent term-by-term enrollment and course-grade data on these students were available through summer 2011. Evaluated in this study were the following college outcomes:

- Retention to the same institution (fall to fall, year 1 to 2, year 2 to 3, year 3 to 4)
- Cumulative college GPA of 3.0 or higher and progress to degree (spring years 1, 2, 3, and 4)[9]
- Bachelor's degree completion (in 4, 5, or 6 years)
- Total credit hours earned by degree completion[10]
- Grades earned in typical first-year college courses

About 42% of incoming students entered college with dual-credit hours; this percentage ranged from 26% to 47% across institutions. Among students entering with dual-credit hours, the typical number of dual-credit hours earned was 12.6 hours (average number ranged from 10.8 to 13.4 hours across institutions); about one-half had 12 or more dual-credit hours (percentage ranged from 47% to 56%). The majority of students entering with 12 or more dual-credit hours transferred in 12 to 24 dual-credit hours (from 80% to 94% of students across institutions). Based on these findings and the minimum number of college credit hours requirement for high school students in Texas, results for students entering with 12 or more hours were compared to those with fewer than 12 hours to evaluate the benefits associated with entering college with more dual-credit hours.

Results for the four institutions are summarized in aggregate in this report. Findings for the individual institutions are in general agreement with those presented here; the magnitudes of group differences, however, vary somewhat across institutions. To account for the multiple comparisons in this study, a significance level of 0.01 was used to evaluate the statistical and practical significance of group differences.

Students entering college with and without dual credit differ on student and school characteristics.

Students entering with dual-credit hours were generally more academically able than students with no dual credit at entry. In particular, dual-credit students had on average higher ACT Composite scores (23.6 vs. 22.8, respectively)[11] and high school percentile ranks (85.1 vs. 73.4). In terms of student demographic characteristics, students with dual credit typically were more likely to be female (59% vs. 51%), White or Asian (77% vs. 64%), and attend a public high school (96% vs. 92%), but they were slightly less likely to be awarded financial aid (51% vs. 53%). Among those attending public high schools, students with dual credit generally had a slightly smaller chance of attending a school that offered AP courses (89% vs. 94%),[12] but a greater chance of attending a school located in a rural area (as compared to one located in a suburban or urban area—25% vs. 11%). The typical number of credit-by-exam (AP/IB/other) hours earned was similar for the two groups (3.6 vs. 3.7).

Many of these same student and school characteristics were also associated with higher college success rates. For example, as ACT Composite score increased, college success rates also increased. Therefore, when evaluating whether dual-credit enrollment in high school was associated with better college outcomes, these student and school characteristics, as well as others, were taken into account.[13]

College success rates were typically higher for students entering college with dual credit.

As illustrated in figure 1, attrition over time was less likely to occur for students who entered college with dual-credit hours than for those who did not. In addition to having higher chances of remaining enrolled at the same institution through year 4, students with dual credit were more likely to earn a cumulative GPA of 3.0 or higher at years 1 and 2, but not at years 3 and 4.[14] This finding could be due in part to differential student attrition over time between the two groups.

Moreover, students with dual credit were more likely than those with no dual credit to make progress toward degree completion, as measured by cumulative credit hours earned. At the end of year 1, 95% of students with dual credit had accumulated a total of 24 or more credit hours, compared to 70% for students with no dual credit. Differences in progress to degree rates between the two groups decreased somewhat over time, but they did persist. By the end of year 4, 71% of students with dual credit had earned 96 or more total credit hours, where only 55% of the no-dual-credit group had done so.

Not only were students with dual credit more likely to progress toward a degree over time, but they also had greater chances of completing a bachelor's degree in four, five, or six years (see figure 2).[15] The five-year degree completion rate for students with dual credit was greater than the six-year rate for students with no dual credit (59% vs. 50%, respectively).

Furthermore, the typical time to bachelor's degree completion for students with dual credit was 57 months, compared to 72 months for students with no dual credit (typical time to degree, in months, was

Figure 1. Students' chances of returning to the same institution by dual-credit status

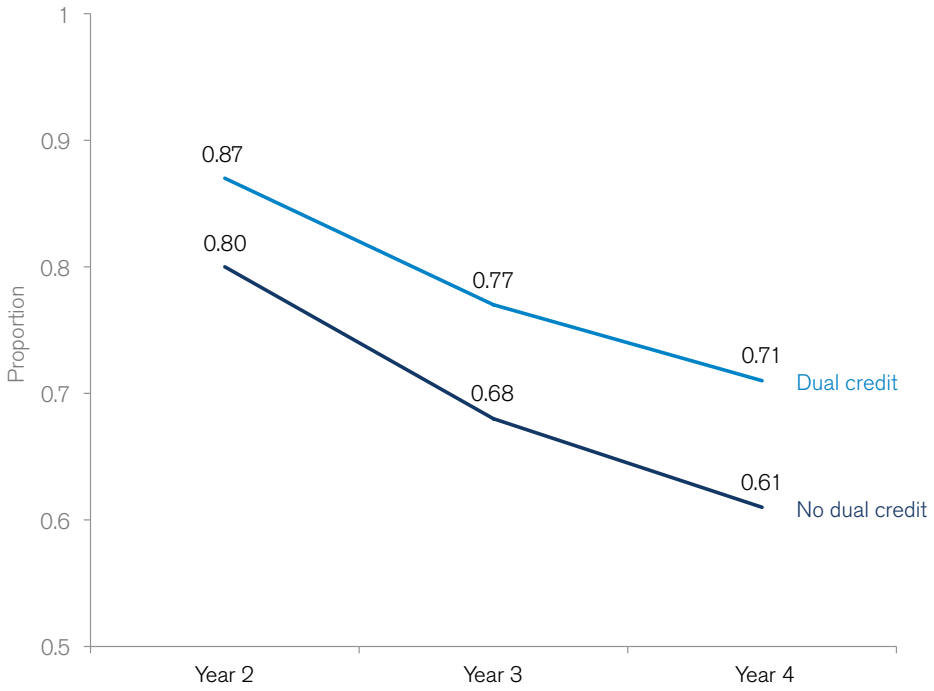
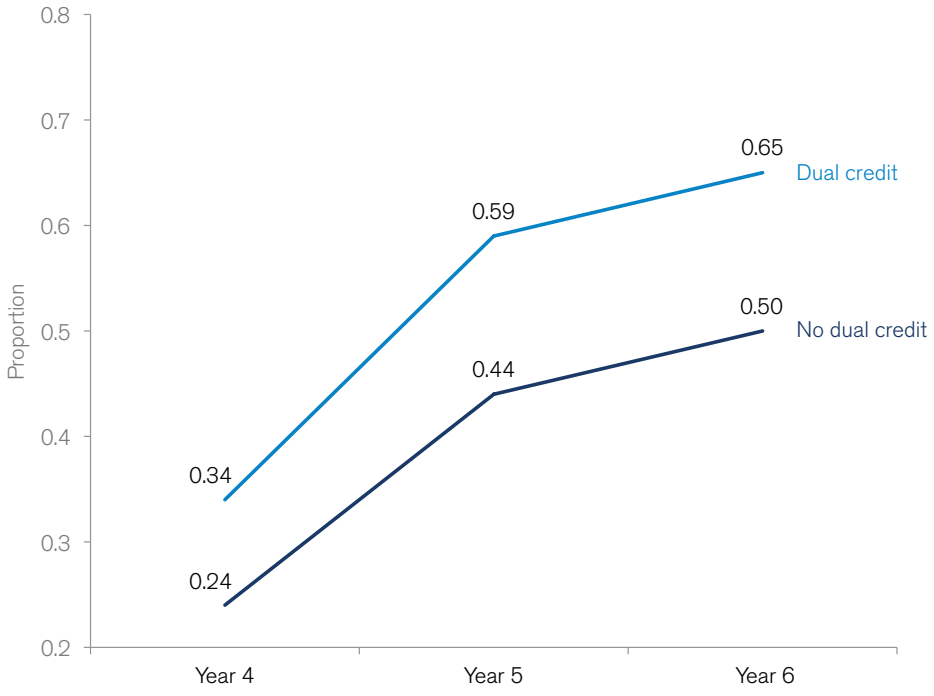


Figure 2. Students' chances of completing a bachelor's degree by dual-credit status



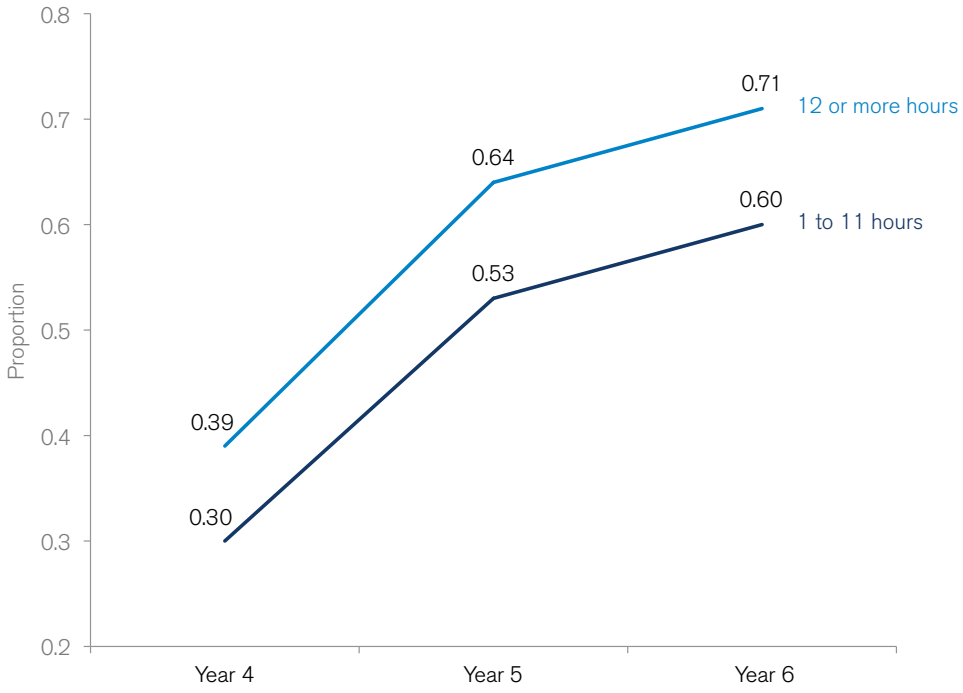
rounded to the end of the relevant term completed).[16] In addition, dual-credit students graduated without earning substantially more credit hours than students with no dual credit: the average number of total credit hours earned by degree completion was only slightly higher for students with dual credit than for students with no dual credit (an additional 3.2 credit hours).[17]

Students entering college with more dual-credit hours were more likely to progress toward a degree and complete a bachelor's degree in a timely manner, without earning substantially more total credit hours by graduation.

Among students entering college with dual credit, those with more (≥ 12) dual-credit hours, compared to students with fewer (< 12) dual-credit hours, were more likely to progress toward a degree over time and complete a bachelor's degree (figure 3). Moreover, students entering with 12 or more dual-credit hours typically completed a bachelor's degree in a shorter period of time than students entering with fewer than 12 dual-credit hours (typical time to degree: 52 months vs. 57 months, respectively). Retention rates and cumulative 3.0 or higher GPA rates over time did not differ between these two groups.

Even though progress-to-degree and degree-completion rates differed between students with more and fewer dual-credit hours, students from both dual-credit groups were more likely than those with no dual credit to progress toward a degree over time and complete a bachelor's degree in four, five, or six years. However, at the time of bachelor's degree completion, it was typically only those who entered with 12 or more dual-credit hours who graduated with a few more total credit hours than students with no dual credit. Specifically, the average number of total credit hours earned by degree completion

Figure 3. Students' chances of bachelor's degree completion by number of dual-credit hours



was 5.5 credit hours higher for students with 12 or more dual-credit hours than for students with no dual credit.

College success rates generally did not differ by primary source of dual credit.

In general, students who received dual credit primarily from two-year institutions were as likely as students with dual credit primarily from four-year institutions to:

- Earn a cumulative GPA of 3.0 or higher at years 1, 2, 3, and 4
- Return to the same institution through year 4
- Progress toward a degree at years 1, 2, 3, and 4
- Complete a bachelor's degree by years 4, 5, or 6

In addition, the average number of total credit hours earned by degree completion did not differ by primary source of dual credit.

Dual-credit courses were generally as effective as traditional courses in preparing students for subsequent coursework.

For 21 different course pairs, students' chances of earning a B or higher grade in a second (subsequent) course were compared between students who took the first course in high school as a dual credit course and those who took the first course during their first two years of college.[18] Only students with a C or higher grade in the first course with no intervening subject-related coursework prior to the second course were included in the comparisons.[19] A majority of the course pairs were in the social sciences and English: fifteen in the social sciences, four in English, and one each in mathematics and science.

For most of the course pairs (19 of the 21), there was no significant difference in students' likelihood of earning a B or higher

grade in the second course between the two groups.[20] For example, the typical chances of earning a B or higher grade in Calculus were 38% for students who took a dual-credit mathematics course in high school (such as College Algebra, Pre-Calculus, Trigonometry, Geometry, or Analytical Geometry), compared to 35% for those who took the prior course during their first two years of college.

Of the 21 course pairs, the mathematics course pair was the only one that involved a course sequence where the first course could be considered a prerequisite course for the second. Other typical first-year English and mathematics course sequence pairs such as English Composition I/II, College Algebra/Pre-Calculus, or Pre-Calculus/Calculus could be evaluated only at the individual institution level.[21] For all such individual comparisons, there was no significant difference in students' chances of earning a B or higher grade in the subsequent course between students who took the first (prerequisite) course in high school for dual credit and those who took it in college.

However, for two course pairs—American History/Political Science and Biology/Chemistry—dual-credit students significantly underperformed in the second course. For these two course pairs, students' chances of earning a B or higher grade in the subsequent course were lower for those who took the first course in high school as a dual-credit course than for those who took the first course sometime during their first two years of college (54% vs. 61% and 49% vs. 63% for the social science and science course pairs, respectively).

Conclusions

Results from this study suggest that students entering college with dual credit are more likely to be successful in college than those who do not, even after controlling for ACT Composite score, total credit by exam hours, and other student and school characteristics related to dual-credit enrollment. In particular, having more dual-credit hours appears to be associated with higher progress to degree and bachelor's degree completion rates. These general conclusions are consistent with the findings of an earlier study by the Texas-ACT College Success Research Consortium that was based on 2002 and 2003 incoming freshmen from four institutions and those of a 2012 study on dual enrollment in Texas conducted by Jobs for the Future.[22]

Results from this study and the earlier consortium study also suggest that students with dual credit provided primarily by two-year institutions are as likely to succeed in college at a four-year institution as students with dual credit primarily provided by four-year institutions.

An area of concern that we were unable to address in our earlier study was whether students with dual credit at entry are graduating from college with excessive numbers of credit hours and therefore incurring unnecessary additional educational costs. Results from this study suggest that students with dual credit at entry are graduating with a few more hours, on average, than students with no dual credit at entry. This result primarily held among students entering college with 12 or more dual-credit hours. The typical adjusted difference between these latter two groups was not excessive: it was less than six total credit hours.

In addition, there was generally insufficient evidence to show that students who take a course in high school for dual credit are more or less likely to earn a B or higher grade in a subsequent course than those who take the first course during their first two years in college. Researchers from two earlier studies came to the same general conclusion that dual-credit courses appear to be as effective as traditional courses in preparing students for subsequent coursework. The first study was a collaborative project between community colleges in Iowa and ACT to compare the college outcomes of dual-enrollment students in Iowa high schools and community colleges to the outcomes of traditional students.[23] The second study, conducted by the Oregon University System Office of Institutional Research and the Oregon Department of Community Colleges and Workforce Development, evaluated dual-credit instruction in the state of Oregon.[24] Similar to our study, the Oregon study observed a few course pairs—specifically, in mathematics (our pairs were in social science and science)—where dual-credit students did not perform as well in a subsequent course. While these findings might be due to sample size issues or false positives resulting from multiple comparisons, they do warrant further investigation.

We had initially planned to compare students' performance in standard first-year college courses between students who took the courses in high school for dual credit and those who took the courses sometime during their first two years of college. But given that most of the dual-credit coursework was taken at other two- and four-year institutions, there was concern that any differences could be attributed to differences in grading practices among institutions. The Iowa study was able to examine these comparisons because college outcomes were available for the entire state community college system. That study found that while in high school, dual-enrollment students consistently outperformed traditional college students in standard, first-year community college courses. However, the authors point out that much of this difference might be due to underlying differences in the two groups associated with the type of college the students choose to attend after high school and in other noncognitive student characteristics.

One of the main limitations of this study was the small number of participating institutions. Another limitation was the inability to differentiate between transfer and dropout, and their effects on retention and degree completion rates. Unfortunately, information about the quality of the instruction, the course rigor, the site of the dual-credit courses (college campus vs. high school), the mode of delivery (in class vs. online) and the type of instructor teaching the course (college faculty vs. high school faculty) was not available. Research into these other comparisons by different source types would contribute to the literature on the benefits of dual-credit enrollment. It is also worth noting again that Texas students must meet certain eligibility requirements (including academic ones) to enroll in academic dual-credit courses. Results from this study may not apply to other cohorts of students where different eligibility requirements are used. ■

Notes

1 Results statistically controlled for postsecondary institution attended, ACT Composite score, total credit by exam hours, and other student and school characteristics related to dual-credit enrollment (through propensity scores). Total credit by exam hours included College Level Examination Program (CLEP) hours, Advanced Placement (AP) hours, International Baccalaureate (IB) hours, and other credit by exam hours.

2 It is not uncommon for the terms dual credit, dual enrollment, and concurrent enrollment to be used interchangeably. In this study, dual-credit courses included any college-level courses that the student took while in high school, regardless of whether they were a part of any formal agreements. In addition, the course may or may not have applied toward a student's high school diploma. High school credits awarded were not available from the data sources.

3 Successful completion of a course is determined from the grade received in the course.

4 Larry A. Kruger, "An Analysis of the Costs and Savings of the Concurrent Enrollment Program at Salt Lake Community College" (PhD diss., 2000). ProQuest (UMI 9998836); Cheryl P. Rose, "Students Earn Academic Credit for San Jacinto College in High School," *Houston Chronicle*, June 26, 2014.

5 Thomas R. Bailey, Katherine L. Hughes, and Melinda Mechur Karp, *Dual Enrollment Programs: Easing Transitions from High School to College*, CCCR Brief No. 17 (New York: Community College Research Center, March 2003).

6 Nancy Hoffman, "College Credit in High School: Increasing Postsecondary Credential Rates of Underrepresented Students," *Change: The Magazine of Higher Learning* 35, no. 4 (2003): 43–48.

7 Carl Krueger, *Dual Enrollment: Policy Issues Confronting State Policymakers* (Denver: Education Commission of the States, March 2006); Bailey, Hughes, and Karp, *Dual Enrollment Programs*.

8 For one institution, the 2007 entering freshman cohort was also included in the study.

9 Progress to degree was based on cumulative credit-bearing hours earned at the end of each spring term and measured whether the student was making progress toward degree completion. For dropouts and stopouts, the last value for cumulative hours earned was carried forward. End-of-year cumulative hours thresholds were 24, 48, 72, and 96 earned credit hours for years 1, 2, 3, and 4, respectively, approximating bachelor's degree completion in about five years. GPAs were based on only those students who were enrolled for the relevant year.

10 The number of total credit hours earned by degree completion included the cumulative hours earned at the time of degree completion plus any dual-credit hours that were earned at another institution but not accepted by the study institution.

11 SAT Total scores were concorded to ACT Composite scores.

12 School characteristics were obtained from the National Center for Education Statistics (NCES) Common Core of Data (CCD) file or the Market Data Retrieval's contract database for the years relevant to the time period of this study.

13 Most of these student and school characteristics were accounted for in the regression models through adjustment of propensity score (probability) estimates of entering with more (≥ 12) dual-credit hours and of entering with fewer (< 12) dual-credit hours, compared to those with no dual credit at entry. Additional variables in the dual-credit propensity-estimation models included: school-level median household income, percentage of students on free/reduced lunch at public high school attended, and percentage of racial/ethnic minority students at public high school attended.

14 Institution-specific intercepts, dual-credit effects, and propensity scores adjustments were included in the models to estimate overall and institution-specific probabilities. Probabilities for the combined data were evaluated at the typical values for the student characteristics across institutions (i.e., mean of the institutional means). At the end of year 1, the typical chances of earning a cumulative GPA of 3.0 or higher was 53% for students with dual credit as compared to 45% for students with no dual credit. In comparison, the estimated chances at the end of year 4 were 54% and 51%, respectively.

15 Discrete-time survival models were developed to predict degree completion. This approach simultaneously models all time periods (evaluated as fall vs. spring/summer terms), while also accounting for censored observations due to varying amounts of follow-up data (i.e., time span of enrollment). Spring and summer term degree completions were combined together due to the small number of summer term degree completions. For the time-to-degree analyses, the proportional hazards assumption was used for all predictor variables (i.e., there was no interaction between time and the predictor variables).

16 Median time to degree in months was rounded from the nearest term where approximately 50% of the students had completed a degree.

17 A linear model was used that included the data from all four institutions and accounted for postsecondary institution attended, credits earned by exam (CLEP/AP/IB/other), and other student and school characteristics related to dual-credit enrollment.

18 Subsequent course success of earning a B or higher grade was evaluated for typical first-year courses only. For the combined model, only those course pairs that had at least three institutions with sufficient numbers of students (i.e., 25 or more students in each group) were evaluated.

19 Students did not take any other courses in the same subject area between the first and second course. The second course in the pair was taken during the first two years of college for students who took the first course for dual credit. For the no-dual-credit group, the second course was taken by the end of the next academic year following the term of the first course. Students in the no-dual-credit group had not taken dual-credit coursework in any subject area.

20 A logistic regression model was used to determine whether the dual-credit group indicator estimate was significantly different from zero after statistically controlling for the postsecondary institution attended, ACT Composite score, and other student and school characteristics related to dual-credit enrollment. For four out of the five English course pairs, the one mathematics course pair, and two out of the 14 social science course pairs, students' chances of earning a B or higher grade in the second course were estimated to be slightly higher for the dual-credit group than for the no-dual-credit group. For the remaining course pairs, negative differences were observed between the two groups. However, group differences were statistically significant at the 0.01 level for only two of the 21 course pairs.

21 Typical first-year English and mathematics course sequence pairs were not consistently available with sufficient numbers across all institutions due to differences across institutions in the typical dual-credit courses taken and course sequence patterns taken. It was also the case that many dual-credit students completed both courses of these typical course sequences in high school.

22 Julie Noble, Justine Radunzel, and Sue Wheeler, *Examining Student College Readiness, Achievement, Retention, and Success in Texas* (Iowa City, IA: ACT, March 2011); Ben Struhl and Joel Vargas, *Taking College Courses in High School: A Strategy for College Readiness* (Boston: Jobs for the Future, October 2012), http://www.jff.org/sites/default/files/TakingCollegeCourses_101712.pdf.

23 Jill D. Crouse and Jeff Allen, "College Course Grades for Dual Enrollment Students," *Community College Journal of Research and Practice* 38, no. 6 (2014): 1–18, doi: 10.1080/10668926.2011.567168.

24 Tom North and Jonathan Jacobs, *Dual Credit in Oregon 2010 Follow-up: An Analysis of Students Taking Dual Credit in High School in 2007–08 with Subsequent Performance in College* (Eugene, OR: Oregon University System—Office of Institutional Research, September 2010), http://www.ode.state.or.us/teachlearn/subjects/postsecondary/techprep/pdfs/2010-dual-credit-study-6.pdf.