

Dual Credit and Advanced Placement: Do They Help Prepare Students for Success in College?

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This study examines the relationship between students who take dual credit and / or advanced placement (AP) in high school and their college academic performance and first-year retention.

Holding ability indicators constant, students entering college with AP tend to get higher first-year GPA's than those students entering college with dual credit only or than those students entering college with no college credit. However, students who entered with AP or dual credit both returned for their second year at a higher rate than students who entered with no college credit.

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Across the nation, there is an increasing demand for dual credit courses that are taught by high school teachers in the high school for college and high school credit. Proponents of these programs claim positive results (Peterson, Anjewierden, & Corser, 2001). Students benefit by completing college in less time, spending less money, and becoming prepared for the demands of post-secondary education while still in high school (Hanson, 2001). At the same time, colleges realize benefits in the form of a way to recruit students (Hugo, 2001), increase visibility, and gain an important engagement function (AASCU, 2002). However, relatively few studies have examined how well students with dual credit and/or advanced credit do in college—when academic ability is controlled—in contrast to students who enter with no college credit.

Research Design

Three research questions are addressed in this study. When controlling for academic ability:

1. Is there a difference in first-year college grade point average (GPA) between students who had no prior advanced placement (AP) or dual credit in contrast to students who did receive credit in AP or dual-credit courses?
2. Is there a difference in first-year college retention between students who entered college with no college credit in contrast to students who entered college with dual credit or AP credits?
3. Does the source of dual credit courses have any relationship with the first-year college grade point average or first-year retention?

This study was completed at the four-campus University of Missouri System. The UM System enrolls 60,000 students on four campuses: Columbia, Kansas City, Rolla, and St Louis. The study population in this research included 7,913 first-time, full-time degree-seeking students. In addition, to be included in the study the student had to have been a recent high school graduate (within one year of college studies) as well as a Missouri resident. Academic ability measures included ACT Composite score, high school rank, and the completion of Missouri's high school core curriculum. (Missouri's high school core includes four units of English, one unit of fine arts, three units of math, two units of science, and three units of social sciences.)

Linear and logistic regressions were used to examine the relationships of the ability measures to first-year GPA and retention. In both analyses, differences between those students entering with no college credit, only dual credit, only AP, and those with combinations of AP and dual credit were examined. First-year college GPA was used as a measure of the student's performance for the first research question. For the second research question, returning for the second year at the same institution was the measure of success. For this study, dual

credit students are identified as students, while in high school, that take college courses taught by high school teachers at the high school.

Research Question 1—Predicting First-year GPA:

Is there a difference in first-year college GPA between students who had no prior advanced placement AP or dual credit in contrast to students who did receive credit in AP or dual-credit courses?

Based on first-year performances (Table 1), it appears that students coming in with AP only or both AP and Dual credit do better (3.28 and 3.32 GPA, respectively) and earn more hours (43 and 41) than other students by the end of their first year of college work. Students having some dual high school work also appear to do better than those coming in with no previous college work, 2.92 versus 2.70. However, it also appears that those with dual credit come in with higher high school percentile ranks and ACT scores than those without any previous AP or dual credit experience. Therefore, the first research question was to determine if these differences remain if one holds student ability (based on high school rank, ACT test scores, and completion of Missouri's high school core curriculum.

Table 1: Characteristics of First-time College Students, Fall 1999 and Fall 2000

Type of Credit	N	Average:			
		ACT	HS Rank (%)	1st Year GPA*	1st Year SCH
AP Only	505	29.1	84	3.28	43
Dual High School Only	3,135	25.8	82	2.92	42
Both AP and Dual	300	29.3	89	3.32	52
No College Credit	3,973	24.7	73	2.70	30

* Grades in the dual credit courses were not included in the first-year GPA calculation.

Sources: UIDS, institutional data, and CBHE EMSAS files.

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Linear regression was used in order to hold ability indicators constant while examining the relationship between the types of previous college credit and first-year GPA. The results of the regression analysis are shown in Table 2:

Table 2: Results of Linear RegressionModel R^2 = 0.2869

Variable	Parameter Estimate	p> t
Intercept	0.53210	<.0001
ACT	0.03785	<.0001
High School Rank (%)	0.01707	<.0001
AP Only Credit	0.21398	<.0001
Both AP and Dual Credit	0.16833	<.0001

Notes: Fall 1999 and fall 2002 Cohort with valid second semester GPA's

Variables with $p > .0001$: Dual_Credit_Only and HS_Core

Sources: UIDS, student records, and CBHE EMSAS files.

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The multiple regression model was statistically significant and explained roughly 29% of the variance in first-year GPA. The results of this regression indicate that when holding student ability constant, students with AP credit tend to do slightly better (parameter estimate 0.213) than students with both AP and Dual credit (parameter estimate 0.168). Interestingly, those students who entered college with dual credit only do not appear to do significantly better than those who entered college with other types of pre-college work.

Predicting First-year GPA

To better illustrate the results of the regression analysis, a “typical” student with an ACT of 26 and a high school percentile rank of 85 was used to look at the differences between first-year GPA between the various cohorts. The results of this prediction are shown in Table 3:

Table 3: Examples Predicting Second Semester GPA

Student Characteristics held constant: ACT = 26 HS Rank = 85

Examples:	Intercept	ACT Score	HS Rank	AP Only	AP and Dual	Predicted 1st-year GPA
Parameter Estimates	0.5321	0.037848	0.01707	0.21398	0.16833	
Example 1 (no credit)	0.5321	26	85	0	0	2.97
Example 2 (Dual Only)	0.5321	26	85	0	0	2.97
Example 3 (AP Only)	0.5321	26	85	1	0	3.18
Example 4 (Both AP & Dual)	0.5321	26	85	0	1	3.14

Sources: UIDS, student data files, and CBHE EMSAS files.

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Holding entering academic ability constant (ACT = 26, HS Rank = 85), students with AP only have the highest predicted GPA (3.18) followed by students with both AP and dual credit (3.14). Those students entering with no previous college credit and those students entering with dual credit courses only had the same predicted GPA (2.97).

Research Question 2—Predicting Retention:

Does completion of AP, Dual, or both AP and Dual prior to entering college have any relationship on whether or not the student comes back for their second academic year?

There was a distinct difference in terms of the return rate between those with some and those without any AP or dual credit (Table 4). Of those with only AP credit, 87% returned for their second academic year compared to the return rates of those students who entered with both AP and dual credit (90%) or dual credit only (89%). Students who entered with no previous college credit returned at a rate of 76%.

**Table 4: First-year Returns Rates by Type of Credit,
Fall 1999 and Fall 2000**

Type of Credit	N	Number Returning	Percent
AP Only	505	441	87%
Dual High School Only	3,135	2,796	89%
Both AP and Dual	300	269	90%
No College Credit	3,973	3,023	76%

Sources: UIDS, institutional data, and CBHE EMSAS files.
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Additional analysis was made to see if these differences in return rates could be explained in part by differences in student ability. Using the same characteristics to measure student ability as above (ACT score, high school percentile rank, completion of Missouri's high school core), logistic regression was used to predict the student's return for the following fall term as well as to see how each student characteristic(s) contributed or hindered the likelihood of the student returning. These results are presented in Table 5.

**Table 5: Results of Logistic Regression to Predict a
Student's Return the Following Fall Term**

Parameter	Point Estimate	95% Wald Conf. Limits	p > ChiSq
EACT	1.047	1.029 - 1.066	< .0001
HS Rank (%)	1.010	1.007 - 1.014	< .0001
Completed HS Core	1.681	1.266 - 2.232	0.0003
Dual Credit Only	2.224	1.937 - 2.554	< .0001
AP Credit Only	1.566	1.179 - 2.080	0.0020
Both Dual & AP	1.836	1.243 - 2.710	0.0022

Notes: Predicting the student's return for the following fall term.
Sources: UIDS, student data, and CBHE EMSAS data files.
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Likelihood of Returning

The overall logistic regression model was statistically significant and six independent variables contributed to the model: dual credit only (point estimate = +2.2), both dual and AP credit (pe = +1.8), AP credit only (pe = +1.6), completed HS core (pe = +1.7), ACT (pe = +1.05), and HS rank (pe = +1.01). The logistic regression model enabled us to predict 65% cases correctly. Holding academic ability constant, students entering college with only dual credit, only AP credit, or AP and dual credit, had an increased likelihood of returning to college compared to those students who entered with no college credit.

Point estimates can be interpreted in the following manner. Holding the measures of student ability constant, for example, the odds of a student returning for the fall semester who entered his or her first year with only AP credit would be 56.6% ($1.566 - 1 = 56.6\%$) more likely than a student who began his or her freshman year with no college credit. Alternatively, again holding ability measures constant, students who enter with both dual credit and AP credit would be 83.6% ($1.836 - 1 = 83.6\%$) more likely to return the following fall than those who enter with no college credit.

Research Question 3—GPA based on Source of Dual Credit: Does the source of the dual credit have any impact on academic performance or retention?

To address this research question, students who received their dual credit from more than one type of institution were removed from the analysis. Furthermore, the source of dual credit was divided into four categories: those students who received their dual credit from System Campus A, System Campus B, all other four-year institutions in the state, and all two-year institutions in the state.

Table 6: Characteristics of Students Earning Dual Credit by Type of Institution, Fall 1999 and Fall 2000

Type of Institution	N	Average:			
		ACT	HS Rank (%)	1st Year GPA *	1st Year SCH
Two-Year	323	26.2	85	2.79	42
Four-Year	1,361	26.0	82	2.91	40
System Campuses:					
Campus A	474	25.7	84	2.94	41
Campus B	490	25.0	75	2.90	40

* Grades in the dual credit courses were not included in the first-year GPA calculation.

Source: UIDS, student data system, and CBHE EMSAS files.

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Those getting dual credit at Missouri two-year institutions have a higher average ACT score (26.2) as well as higher high school percentile rank, on average, than students getting dual credit at Missouri four-year institutions or at one of the System campuses. However, those getting all their dual credit at two-year institutions tend to have a lower end of first-year GPA than the others.

In order to determine if the GPA difference was caused by difference in student abilities, linear regression was used. The model was statistically significant and explained 24.8% of the variance in first-year GPA. The majority of the variance in the model was explained by two measures of academic ability: ACT Composite score and high school percentile rank. However, the type of institution from which the dual credit was earned did contribute to the model. Holding academic ability constant, we were interested in knowing whether students who entered with dual credit from Campus A, Campus B, or other four-year colleges would be expected to have a higher end-of-year GPA than those students who entered college with dual credit from two-year colleges (i.e., students receiving dual credit from two-year colleges served as the default). The results of the regression analysis are presented in Table 7.

Table 7: Results of Linear Regression

Model R^2 = 0.2481

Variable	Parameter Estimate	p> t
Intercept	0.21762	0.0308
ACT	0.04736	<.0001
High School Rank (%)	0.01779	<.0001
Two-year Dual Credit	-0.17690	<.0001
Campus B Dual	0.15759	<.0001

Notes: Fall 1999 and fall 2002 Cohort with valid second semester GPA's.

Not significant: Completion of High School Core, Campus A.

Sources: UIDS, student records, and CBHE EMSAS files.

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To better illustrate the magnitude in these differences in end-of-year GPA, let's assume a student has an ACT of 26 and a high school percentile rank of 85, and examine the predicted first-year GPA generated from the regression example, based on the type of institution from which the dual credit was earned. These predicted GPA's are in Table 8:

Table 8: Examples Predicting Second Semester GPA - Dual Credit Students Only

Student Characteristics held constant: ACT = 26 and HS Rank = 85

Examples:	Inter.	ACT Score	HS Rank	Two-Year	Campus B	Predicted 1st-Yr GPA
Parameter Estimate	0.21762	0.04736	0.01779	-0.17690	0.15759	
Example 1: Two-Year Credit	0.21762	26	85	1	0	2.78
Example 2: Four-Year Credit	0.21762	26	85		0	2.96
Example 3 - Campus A	0.21762	26	85		0	2.96
Example 4 - Campus B	0.21762	26	85		1	3.12

Source: UIDS, student data files, and CBHE EMSAS files.

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As shown above, the first example is a student earning their dual credit at a two-year institution. Their predicted first-year GPA is 2.78. Students who earned their dual credit from a four-year institution had a predicted first-year GPA of 2.96, the same as it would be from the same student getting their dual credit from Campus A. A student of similar ability but earning their dual credit from Campus B would be predicted to have a 3.12 first-year GPA.

Using logistic regression, we also looked at whether the source of the dual credit had any bearing on first-year retention. The overall logistic regression model was statistically significant. Furthermore, each of the sources of dual credit (i.e., two-year institutions, four-year institutions, Campus A, and Campus B) was statistically and positively related to the likelihood of returning the following fall. However, based on the model, students were not statistically more or less likely to return to college for their second academic year based on the source of their dual credit (e.g., two-year institution, four-year institution, Campus A, Campus B).

Limitations

Limitations of the study include the following. First, this study was limited to first-time freshmen that enrolled at the University of Missouri. Second, this study examined whether a student had secured college credit prior to enrolling in college and considered the type of credit (e.g., dual credit, advanced placement, etc.). However, it did not consider the grades in those courses or the number of credit hours the student had earned in those courses. Both of these factors could have a relationship with the dependent variables in this study. Third, it may have been more methodologically sound to look at the relationship between entering

student characteristics and first semester GPA (in contrast to the academic year GPA). Further, it may have been more logical to have examined fall semester to spring semester retention (in contrast to second academic year retention). This third limitation is related to the idea that the “treatment” (e.g., taking dual credit or AP courses in high school) should be as close to the “measure” (e.g., first-year GPA, retention) as possible. Fourth, the regression models, although statistically significant, did not explain an overwhelmingly majority of the variance.

Discussion and Further Research

First, when holding academic ability constant, students earning dual credit while in high school do not appear to do significantly better than other students who enter college with no dual credit. At the same time, students who take dual credit do not appear to do worse than students who enter with no previous college credit. Additionally, students entering with dual credit and/or AP were more likely to return to college the second year than other students having earned no dual credit. This finding may be of interest to college recruiters in that it suggests that students who enter with college credit tend to return for their second year. Lastly, the source of the dual credit may make some difference in terms of their academic performance during the first year. Those earning dual credit at a two-year institution tended to get lower first-year GPA's than those earning their dual credit at other institutions. This finding could, however, be a result of other factors. Many of the two-year colleges who offered dual credit in this study tend to have a fairly high concentration of dual credit students in rural settings. Thus, the transition from the rural setting to a four-year university may have also played a role in lower expected first-year GPAs. Having said that, however, the source of dual credit did not make any detectable difference in a student's likelihood of returning for the second year.

Many of the findings in this study mirror the key findings in a study conducted at Saint Louis University (Delicath, 1999). Dual credit hours earned, as well as AP credit earned, were found to be positively correlated with the likelihood of the student returning for the second year. Furthermore, Delicath (1999) found that dual credit and AP credit was positively correlated with time-to-graduation and graduating within five years. In addition to replicating this study in other settings, further research should explore whether students who enter college with advanced standing use this advanced standing to enhance and fortify their college experience. Are these students more likely to get engaged in college? Are they more likely to get involved in educational purposeful activities such as student organizations, research projects with faculty members, studies abroad, leadership opportunities, and so forth? Or, do students who enter college with advanced standing tend to be less engaged in their college experience and pursue activities that may not necessarily enhance their college experience (e.g., spending more hours working, etc.)? Addressing these types of questions would certainly contribute to our understanding of the role that dual credit and related programs have on college students specifically and on colleges and universities in general.

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