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College Credit Earned in High School – A Pilot Study for a Construction Management Program

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This pilot study explored Dual Enrollment (DE) and Advanced Placement (AP) credit earned by 130 first-year students into a construction management (CM) degree program at Auburn University. 70% of credits were earned through dual enrollment; 30% of the credits earned were in English Composition, and this credit counted toward the CM degree program. However, for math, history, science, and other social science classes, relatively small percentages of the overall credits earned counted toward the CM degree. These findings suggest that DE and AP credit can be a valuable way for construction management students to advance in their studies. However, some courses may not be accepted by all universities, and some courses may not align with the specific requirements of CM programs. Given the continued rise in DE and AP credit coupled with the high cost of education, it is important for CM programs to explore ways to assist students in utilizing credit earned. This may include expanding the credit offered and providing students with personalized academic advising to help them plan their coursework. By taking these steps, CM programs can help students to make the most of their DE and AP credit.

Key Words: Dual Enrollment, Advanced Placement Credit, Recruitment, Curriculum

Introduction

There is an increasing number of high school students earning college credit through Dual Enrollment (DE), Advanced Placement (AP) classes, or other specialized programs (Field, 2021). DE is a common approach for high schools to offer postsecondary preparation, exposure to college-level expectations, and college credit to students during their last few years of high school (Witkowsky et al., 2020). The term “dual” refers to students being enrolled at the same time in two distinct institutions or at least, academic programs. DE typical refers to high school students enrolled in college courses while they are still in high school. In comparison, AP is a program in North America created by a group called the College Board (*Advanced Placement (AP) - The College Board*, n.d.). It offers university-level curricula and assessment to high school students. Universities then grant course credit to students who obtain qualifying scores on the examinations.

Nationally, there was an 11% increase in DE credit in the year following the pandemic (Knox, 2022). In some states such as Alabama, DE credit has increased 65% since 2015 (*Dual Enrollment Opportunities Increase the Number of High School Students Attending Uuuu's Community Colleges*, 2022). This has a direct impact on how students matriculate through a given curriculum model.

There are several challenges universities face as students arrive on campus with a semester or more of college credit. One of these challenges is a shift in resources including faculty and classroom space. If students arrive starting the second or third semester as opposed to the first semester, resources must be rethought. Universities must be diligent to assure students are not disadvantaged by having already taken college courses as they matriculate through a construction management program that may have a prescribed structure.

Another challenge for universities is how to ensure that students who have earned college credit before arriving on campus are prepared for the rigors of college-level work. AP and DE courses can vary widely in terms of difficulty and quality, so it is important for universities to have a system in place for evaluating the credits students have earned (Hansen et al., 2015; Reed, 2023). Examples of this include placement tests, discussions with academic advisors, and completing additional coursework.

At the same time as the rise in college credit for those starting a university experience has occurred, accreditation requirements for the American Council on Construction Education (ACCE) have changed, effectively removing the prescriptive general studies requirement classes for higher education construction management (CM) programs (Farrow & Rahn, 2016). Construction management programs may need to reexamine curricula given both the ACCE changes as well as the rise in the number of college credits for the typical first-year student. CM programs may be able to offer more specialized courses and programs to better meet the need of students. They may also be able to reduce the overall cost of college by broader acceptance of college credit earned while in high school.

Ultimately, the decision of whether to revisit college curriculum models is a complex one. There are several factors to consider, including the needs of students, the resources available to colleges, and the demands of the job market. However, the increasing number of students earning credit through DE or AP classes is a trend that is having a major impact on college education.

This introductory pilot study seeks to analyze the credits earned in high school for first-year students entering a Southeastern University's CM program. If additional details could be better understood on the local level, the potential for a broader survey of conditions exist. Ultimately, this information could be used to inform decisions about how to best structure and deliver the construction management program, as well as to help students make informed choices about whether to participate in DE or AP classes. Specific questions explored in this research include:

- How many students earned college credit, and what was the distribution of credit through DE or AP courses?
- What college credit earned was the most popular?
- What amount of earned credit is applicable toward the CM curriculum?

Literature Review

The number of college credits earned by high school students through concurrent and DE courses continues to increase (Barshay, 2023). Across U.S. high schools, 88% of schools offer DE, and 34% of high schools students take college courses (Rhine, 2022). DE students numbered more than 1.4 million in Fall 2022, and community colleges indicate 1 in 5 students is in high school. This number exceeds the 1.1 million high school students who took an AP exam in 2022 (Barshay, 2023).

Community colleges dominate the landscape for DE courses with over 70% of the market (Barshay, 2023). In many cases, tuition for DE is discounted (often through a combination of state and district contributions), and many students who do DE do so in the halls of their own high school. The most popular classes nationally include English composition and college algebra. DE courses typically only require a passing grade to earn college credit. In contrast, AP credit requires a specific score on an exam.

With such high numbers of high schools offering DE credit, there is concern about course content and whether students are producing college-ready work. At the same time, studies have indicated that students who take DE classes are more likely to graduate high school, enroll in college, and earn a college degree ("Graduation Rates for Dual-Enrolled Students," 2017). Qualitative studies have shown that much of the benefit may be in increased student confidence and study skills.

Research has raised concerns about the rigor of DE coursework (An & Taylor, 2015; Ferguson et al., 2015). One concern has been the qualifications of the faculty and the faculty's approach to teaching younger students (Kim et al., 2003). Few, if any, policies exist to address the eligibility of high school students to pursue college-level work potentially filling DE classrooms with students who are not college-ready (Kim et al., 2003). Research has also explored whether the availability of DE courses is available equally for minority and underrepresented students potentially creating barriers to access (Museus et al., 2007).

High school counselors have cautioned about the increased advisement needs of students enrolled in college-level classes (Shaw, 2019; Witkowsky & Clayton, 2019). Specifically, they have noted the additional communication required between students, high school counselors, and college academic advisors to connect the students' understanding of credits and their application to college curriculums. College academic advising is complicated by students with college credit. Issues of limited availability of classes not yet taken by the student, transferability of credits, and degree program constraints are all major issues.

If the broader education scope is considered, Johnstone's learning productivity theory (1993) supports approaches that support college credit for those in high school. Key benefits include reducing educational inefficiencies through decreased cost and enhanced efficiencies. Johnstone's approach argues that such an approach makes a better use of the senior year of high school, better integrates learning from K-college graduate, and rewards progress toward degree completion based on tangible learning. He further notes the redundancy experienced by students in their last two years of high school and their first two years of college work where much core work occurs. Johnstone's theory essentially says that learning opportunities can be created in high school that satisfy both high school requirements and college core requirements. If successful, the high school diploma value is enhanced, and the transition to college for the student is enhanced.

Method

This study attempts to address the amount, types, and potential impacts of college credit incoming first-year students bring with them to a specific University CM program. The data for this research was collected via information provided by the students during first-year student orientation during Summer 2023. Students also reported AP credit and DE plans through standardly accepted academic practices to the Office of the Registrar for inclusion on their student records. The data for this study was recorded without identifying individual student information. Our sample included 130 first-time freshmen who entered the CM program at Auburn University in Fall 2023.

The research separated DE into two categories. One category was identified by Auburn First which is a DE program operated by zzzz University where the research is based. Other Universities with CM programs offer similar programs including "Bridge to Clemson" (Clemson University) (*Bridge to Clemson*, n.d.) and "Running Start" (University of Washington) (*Running Start*, n.d.). The second category was referred to simply as DE and represents credits students earned while in high school through any other University.

The data was summarized in a spreadsheet that included the type of credit earned (AP, DE, Auburn First), the number of credit hours earned, and the specific class for which the credit was articulated. Data was analyzed to determine the total number of hours for the categories considered as well as the mean values and percentages presented. As an introductory study exploring a single group of incoming CM students, it was important to identify total numbers and averages in each area to identify which elements may call for additional study.

A limitation of this sample is that it only included students who attended Auburn University in a single year. As a preliminary study, no information was gathered about students who were not admitted to the University or students who elected to attend other universities. Therefore, the results of this study may not be generalizable beyond the walls of Auburn University.

Results

How many students earned college credit, and what was the distribution of credit through DE or AP courses?

In Fall 2023, 130 students entered the Auburn University Construction Management degree program. For the entering students, the average high school GPA was 3.98, and the average ACT score was 26. These students were part of an admitted class of 207 students resulting in a yield rate of 63%.

Of the 130 students who matriculated into the construction management degree program, 101 (78%) first-year students earned college credit prior to arriving at Auburn University, distributed across 62 unique courses or areas of concentration. In total, the 101 students earned 1183.4 college credit hours (11.8 credit hours/student average) during their high school years. The range of credits earned by the 101 students varied widely from 3 hours to 71 hours. While the 71 hours might initially strike as an outlier, further investigation revealed it was not alone. Specifically, three students exceeded 30 hours (approximately one year of college) with 33, 56, and 71 hours respectfully. When the specific students were studied in detail, all attended high schools that are essentially combined with junior or community colleges. As this appears to be a developing trend, the three students with above 30 hours were not excluded as outliers in the analysis of the data.

The credits were earned primarily through DE or AP credits. Additional credits were also earned through a pseudo dual-enrollment program at the University where the study was conducted known as

"Auburn First". In addition, English credit was offered for both Literature and Composition classes based on established standardized test scores on national exams. Table 1 shows the college credit earned by type of offering. The average student enters the CM program at Auburn University with 11.7 college credits or approximately 1 semester of college completed.

	Type of Credit Earned			
	Dual Enrollment	**Auburn First**	**Advanced Placement**	**Totals**
Total Credits Earned	704	122	357	1183
Average Credits per Student	7.0	1.2	3.5	11.7
Percent of Total Credits Earned	59%	11%	30%	

Table 1: Credits earned by type for first-year CM students with college credit.

What college credit earned was the most popular?

Table 2 shows the top ten most popular courses where students earned credit while in high school. These ten courses represent 64% of the credit earned by all students. Almost a third of the credit CM students had when they arrived on campus was from English Composition I and II. Math oriented classes, fine arts, and history/government classes also are most popular in terms of credit earned.

The majority of the most earned classes were achieved through DE. Math classes earned seemed to be dominated by AP Credit with no courses taken through Auburn first and only 24.5% of math classes taken through DE. Of the DE math credit, all was earned in pre-calculus algebra and trigonometry.

Class	**Dual Enrollment**	**Auburn First**	**Advanced Placement**	**Total Number of Hours**
English Composition I	138	3	81	222 (18.7%)
English Composition II	111	0	24	135 (11.4%)
Calculus I	0	0	56	56 (4.7%)
Fine Arts	9	42	0	51 (4.3%)
U.S. History I	24	0	21	45 (3.8%)
American Government	18	12	15	45 (3.8%)
Literature	39	0	9	39 (3.3%)
Public Speaking	27	12	0	39 (3.3%)
Finite Math or Pre-calculus	0	0	36	36 (3.0%)
Pre-calculus Algebra & Trigonometry	30	0	0	30 (2.5%)
Microeconomics	9	3	18	30 (2.5%)
World History	12	9	9	30 (2.5%)
Totals	408	81	269	758 (64%)

Table 2: Top ten classes based on hours of credit (% of total credit) earned by high school students.

What amount of earned credit is applicable toward the CM curriculum?

When credits specific to the CM degree program are considered, 734 hours of the 1183 total credit hours earned applied toward the curriculum. This equates to 62% of the credits earned by students that apply to the current degree.

When individual core curriculum focus areas (based on Auburn University) are considered, there was great variation on the percent of credit earned by students applicable to the CM curriculum. Table 4 details the number of students earning various percent ranges of credit applicable to the curriculum. Of the courses that did not count, math, history, science (including biology and chemistry), and other social sciences (psychology, political science, sociology, etc.) were the largest components.

Core Area	Total Hours Taken	Hours Applicable to CM Curriculum (%)
Composition	357	357 (100%)
Literature	39	39 (100%)
Fine Arts	51	51 (100%)
Other Humanities	54	51 (94%)
Math	193	99 (51%)
Science	103	8 (8%)
History	135	69 (51%)
Other Social Science	159	57 (36%)
World Languages	24	0 (0%)
General Business	12	6 (50%)
General Elective	56	0 (0%)

Table 3: Percentage of Credits Earned by Students Applicable to CM Curriculum.

Discussion and Conclusions

English Composition and College Algebra were the dominant courses for DE based on the literature review. The results of this study support the dominance of English Composition with approximately 30% of the college credits earned being in this category. This study was less definitive for defining a second-most topic area instead finding a mix of history, math, general business, public speaking, and literature options.

To accommodate this breadth of pre-college choices, CM programs should embrace flexible core curriculum options when possible. For example, some universities may require a sequence of classes in English, literature, history, science, or mathematics. When appropriate pedagogically, CM programs should consider allowing any of the available sequences or pairs of classes to count so as to provide maximum flexibility for students entering with college credit. By embracing this adaptable approach, CM programs can empower students to leverage their existing credits, optimize their studies, and graduate faster, prepared for the demands of their chosen field. Obviously, this flexibility must be balanced with the skills, knowledge, and abilities students must have to be prepared constructors.

Many CM programs retain elements of previous prescriptive ACCE accreditation requirements that may not meet today's reality. Those prescriptive requirements lead to very structured programs where

one pre-requisite leads to the next pre-requisite over the traditional four-year college timeframe. This rigidity, manifested in pre-requisite sequences that lock students into a traditional four-year path, clashes with the trend that 78% of first-year students are arriving with pre-existing college credit. It is unlikely that CM students of the future will ever graduate through published 4-year curriculum models. Highly structured programs could also limit the advantages students may realize from completing college classes while in high school (reduced college costs, reduced time to graduation, and streamlined pathways toward college graduation). In addition, these rigid structures could jeopardize scholarship eligibility and add financial strain on students that struggle to fill schedules. As CM programs revisit curricula, it is important to adjust the structure of curriculum plans so that they are as flexible as possible for students entering with college credit. Dynamic and responsive approaches are required in curriculum design that ensure a future where education equips, not restricts, its aspiring builders.

DE accounted for approximately 70% of the total credits earned in this study. As noted in the literature review, there is concern about the quality of DE course work (An & Taylor, 2015; Ferguson et al., 2015). Specific issues include the following:

- Uneven institutional standards and measures: These classes are taught by many institutions with a variety of standards and resources.
- Instructor qualifications: The instructor as qualifications and teaching experience can have a big impact on the quality of the course.
- Lack of national assessment: There is no national assessment of DE courses. This means there is no way to compare the quality of DE courses from different institutions.

The CM degree program should understand that there is no assurance that the quality of each DE class is equal. In cases where knowledge gained is deemed critical to the student's success, placement test could be considered, and CM programs may need to work with the larger university to assure these measures are in place. And, as CM programs continue to evaluate learning outcomes specific to construction, they should remain sensitive potential disparities caused influenced by some of the factors above.

If this study is representative of the educational landscape, CM programs need to work with their recruiters and admissions departments to publish curriculum requirements to prospective students. This approach makes it easier for students (and parents) to understand what courses they need to graduate. With curriculum models, students can plan their high school course work and choose DE and AP courses that align with their college goals. Here are some specific ways that recruiters could publish curriculum requirements:

- Create a page on the college website that list all courses required for graduation. This page could also include information about DE and AP courses and how they can be used to meet curriculum requirements. This page could address some of the challenges noted in Table 3 of the results which indicates large percentages of credit not applicable to the CM curriculum: 92% of science classes, 64% of other social science classes, and 49% of math and history classes.
- Train recruiters on how to interpret curriculum requirements and how to help students select DE or AP courses that align with college goals.
- Encourage recruiters to work with students to create a personalized academic plan that maps out their unique circumstances and previous coursework.

The rise in DE and AP courses will impact college advising. CM departments will need to work with their advisors to be more sensitive to DE and AP work. In years past, entering first-year students may have had a single class for college credit essentially giving them a "blank slate" for potential courses in which to enroll. In the evolving situation, students who have a large amount of credit will have less choices for courses in which to enroll. Resource shifts may be required by universities to better align with student needs. This makes the coordination of available classes as well as the creation of personalized academic plans extremely important. CM programs should assure training is in place for advisors to assure that those working with students are best prepared to handle this evolving trend.

CM programs may have the opportunity to partner with community colleges to develop and offer CM-specific DE classes to high school students. Such an approach may expose additional students to potential careers in construction and be an effective recruiting tool for CM programs.

Further studies should consider how students beyond a single program are obtaining and applying DE or AP credits in CM programs. Such a study should also consider how students admitted with college credit are matriculating through CM programs including retention, graduation rates, and time to graduation. Additional studies are also needed around the quality of credit earned especially in areas critical for success in CM programs. Finally, a survey of incoming students on how they make decisions regarding AP or DE classes would help further identify ways in which CM programs could positively impact the experience of future CM students.

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