

**Should Your High School Adopt  
Advanced Placement or a Concurrent Enrollment Program?  
An Expected Benefit Approach**

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**Abstract**

This paper provides an explicit framework for evaluating the Expected Benefit to college-bound students of courses offered by Advanced Placement (AP) versus Concurrent Enrollment Programs (CEP), based upon expected value analysis from statistics. District personnel can use this framework to assess the relative merits of these programs, given the characteristics of their students, in deciding which model to implement or maintain. Simulation results reveal that CEP generally provides the higher Expected Benefit for districts where the student clientele who take the course attend private colleges or universities (including public institutions out-of-state) and perform on the AP exam around national norms. AP favors high schools where students who take the course either face inexpensive costs for full-time study at institutions of higher education, or perform exceptionally well on the AP exam.

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## **Should Your High School Adopt Advanced Placement or a Concurrent Enrollment Program? An Expected Benefit Approach**

### **Introduction**

Educators almost universally agree that offering academically challenging high school courses plays a significant role in the development of students. This point certainly pertains to college-bound students, the majority of the clientele in many high schools. Such courses keep these students challenged and help to diminish senioritis. They also give the high school student indications of the rigor expected from college work. In this regard, institutions of higher education place a non-trivial weight on these courses in admissions decisions. Given that the student performs well in such courses, they serve as a signal for student motivation as well as an indicator of college preparedness. High schools can also use such courses to increase their profile for admissions officers at institutes of higher education.

Several models are available as a way to implement challenging college or college-level courses in high school classrooms. In each model, the course is taught by a teacher at the high school who has been trained by the program. These models also offer the potential for the student to acquire credit for the course granted by whatever college or university that she attends.<sup>1</sup>

The most popular model for college-level courses is Advanced Placement (AP). Nationally sanctioned by the College Entrance Board, the student seeks college credit by taking the AP exam offered in the subject. Typically the high school offers a course to prepare the student for the test. The college or university determines credit based upon the student's score on the AP exam. If the student achieves a sufficient score, she gains

credit; otherwise no. The popularity of AP as well as the ability to gather data from high schools on the number of students taking the AP exam has led to publications of “nationwide rankings of high schools” from non-educational outlets (e.g. Mathews 2006).

The Concurrent Enrollment Program (CEP) represents an alternative model. The CEP – also referred to as a dual enrollment program – consists of classes sanctioned by colleges or universities, which are taken by high school students for college credit from the sanctioning institution. Upon completion students can apply to transfer their credits to whatever college or university they choose to attend. In the CEP model, the institution of higher education where the student matriculates uses the course grade to determine whether the student receives credit.

The research question we examine is as follows. Which model should an individual high school choose to offer for its students? Certainly a number of factors enter into this decision. Educational philosophies, quality controls, and operational issues all come into play. In addition, each model requires upfront expenditures from the school district toward training sessions for the teachers.<sup>2</sup> But arguably the ultimate goal in making this choice is to provide the greatest benefit to the students, net of the financial cost they incur for taking such a course.

This paper provides an explicit framework for evaluating and comparing the Expected Benefit to students of AP versus CEP. It centers around the likelihood of receiving college credit for the course and the cost savings involved in doing so. Using expected value analysis from statistics, we put forth a way to determine which model offers the larger expected benefit to students in a given high school. Administrators, teachers, and school boards can use this framework to assess the relative merits of these

programs, given the characteristics of students within their district, in deciding which model to implement or maintain.

Our study also applies this framework with some realistic numerical assumptions to examine the relative merits of the AP versus the CEP model on the basis of Expected Benefit. The CEP is represented by Syracuse University Project Advance<sup>®</sup> (PA). Gehring (2001) reports that PA is the largest program of its kind in the nation. He also states that PA has served as a model for similar programs, including Indiana University, the University of Pittsburgh, and the University of North Carolina at Greensboro. Our simulation puts forth explicit breakeven points for the district in choosing CEP versus AP based upon the cost of tuition for taking the course on a college campus and the probability of a representative student obtaining a sufficient score on the AP exam.

We find that the CEP generally provides the higher Expected Benefit for districts where the student clientele who take the course attend private colleges or universities (including public institutions out-of-state) and perform on the AP exam at or around national norms. AP favors high schools where students who take the course either face relatively inexpensive costs for full-time study at institutions of higher education, or perform exceptionally well on the AP exam.

### **Comparing Expected Benefits**

The primary benefit that students receive from either of these models is in achieving college credit from the institution of higher education that they attend. In monetary terms the benefit consists of cost savings, since the cost of the CEP or AP course is typically much less than the tuition for taking the course on-campus. For AP,

the monetary cost consists of a fee to take the exam. In a CEP, students have to pay tuition for the class to the college or university that sanctions the course. Tuition for the CEP course is generally more than the fee for the AP exam.

On the other hand, the CEP tends to carry a higher probability of students obtaining college credit. This advantage stems from the criterion for granting this benefit. For AP, credit is based solely upon the performance on the standardized test. This risky “all-or-nothing” scenario implies that a “bad day” means no college credit despite whatever work they’ve done. Credit for the CEP course comes from the course grade, which reflects a continuous evaluation of a diverse set of performances throughout the semester or academic year.

To increase the probability of obtaining college credit for the CEP course, especially due to the notable heterogeneity in the quality of these courses (e.g. Bailey, Hughes, and Karp 2003), a number of leading CEP institutions have formed the National Alliance of Concurrent Enrollment Partnerships (NACEP). As described in Dutkowsky, Evensky, and Edmonds (2003, 2006), NACEP (<http://www.nacep.org>) accredits institutions which offer CEP that meet explicit quality standards. These standards include requiring that courses offered at the high schools be taught at the sanctioning institutions of higher education, involving college and university faculty to ensure content coverage and teaching quality, having faculty make site visits to the high schools, and providing continued professional development for the teachers. NACEP accreditation seeks to serve as a widely-recognized screen for institutions of higher education to award college recognition in a routine and efficient manner.

We quantify all these arguments into a framework for comparing the expected benefits of AP versus CEP courses. Suppose that a representative college-bound high school senior in a given district is interested in taking such a class. Should the district fill this need by offering an AP or a CEP course?

We begin by defining the following variables:

$r$  = interest rate on a one-year financial instrument;

$P_{AP}$  = probability of student receiving college credit for the AP course;

$P_{CEP}$  = probability of student receiving college credit for the CEP course;

$T_{AP}$  = cost of AP Exam;

$T_{CEP}$  = cost of CEP course;

$T$  = cost of corresponding course for full-time students at the college or university at which the student matriculates.

The framework uses expected value analysis from statistics. For the student, the Expected Benefit of the AP course -- based upon receiving college credit -- is given by:

$$\text{Expected Benefit (AP Course)} = [T/(1 + r) - T_{AP}][P_{AP}] + [-T_{AP}][1 - P_{AP}].$$

The student encounters one of two possible scenarios. If her performance meets the criteria for credit, with probability  $P_{AP}$ , her benefit in current dollars equals the present value of the tuition cost at the college (present value since it will be awarded next year upon entering college), minus the cost of the exam. If her performance does not meet the criteria for recognition, with probability  $1 - P_{AP}$ , she loses the cost of the AP exam.

Using the same reasoning, the Expected Benefit of the CEP course is given by:

$$\textit{Expected Benefit (CEP Course)} = [T/(1 + r) - T_{CEP}][P_{CEP}] + [-T_{CEP}][1 - P_{CEP}].$$

Before proceeding, an important point should be noted. The analysis specifies that the probabilities represent averages for students within a given school district that would be taking such a course, rather than student-specific numbers. Different individuals clearly have different probabilities of performance, given innate abilities and/or background. Further, for the individual student the probability of college credit depends upon the specific institution of higher education where she goes.

An individual student can employ this framework for her own personal decision; she decides to take the course if the Expected Benefit is greater than zero. Nonetheless, our study operates from the perspective of the high school in considering which model to implement or maintain. This is the level of analysis at which district leaders must make such decisions. Therefore, here the probabilities represent district-wide averages for the set of students who would consider these courses. These averages are based upon characteristics of the student population such as average aptitudes, demographics, and typical colleges and universities where they would attend.

With this qualifier, we return to the analysis. Having presented the Expected Benefits of the AP and CEP courses, the question is which one generates the greater Expected Benefit. In formal terms, we derive the condition for when the *Expected Benefit (CEP Course)*  $\geq$  *Expected Benefit (AP Course)*.

Substituting the two Expected Benefits into the above inequality and rearranging yields the condition:

$$T \geq \frac{(1+r)(T_{CEP} - T_{AP})}{(P_{CEP} - P_{AP})}$$

This inequality shows that the comparison of Expected Benefits between the CEP and AP courses is non-trivial. The CEP course generally costs more ( $T_{CEP} > T_{AP}$ ), but has a higher probability of credit ( $P_{CEP} > P_{AP}$ ). The condition highlights the value of the tuition savings that the representative student in the district will receive ( $T$ ). *Ceteris paribus*, a higher dollar value in college tuition favors the CEP. The bigger probability of obtaining credit more than compensates for the relatively higher cost. A small dollar value for college credit favors AP. This instance emphasizes the relatively lower cost of AP.

### **Deciding on CEP versus AP: A Simulation**

When the above equation holds with equality, it can be interpreted as a breakeven condition for CEP versus AP, based upon Expected Benefit. We use this condition to simulate how such a decision could be made. In doing so we set the interest rate ( $r$ ) and the costs for both CEP ( $T_{CEP}$ ) and AP ( $T_{AP}$ ) at constant values across school districts. In addition, we assume that the probability of obtaining credit from the CEP course ( $P_{CEP}$ ) is constant across high schools. While the probability of obtaining college credit from the CEP model may vary across districts based upon student clientele, it arguably has much less variance than the probability of credit from AP. The former depends on course-long performance, whereas the latter depends upon only the standardized test.

We perform the simulations by providing benchmark values for the interest rate, cost of the two programs, and probability of obtaining credit from the CEP course. Our exercise is done both for three credit courses (e.g. Macroeconomics) and six credit hour courses (e.g. English Language and Composition). The values are as follows:

$$r = 0.03,$$

$$P_{CEP} = 0.88,$$

$$T_{AP} = \$83,$$

$$T_{CEP} = \$330 \text{ for 3 credit hour course, } \$660 \text{ for 6 credit hour course.}$$

The value for  $r$  represents an interest rate on a one year bank certificate of deposit. The probability of obtaining credit from the CEP course comes from records of PA. The cost of the AP exam is taken from the website (<http://apcentral.collegeboard.com>); the exam carries the same cost for three or six credit hour courses. The tuition for the CEP course equals the \$110 per credit hour charged by PA for the 2006-07 academic year (<http://supa.syr.edu>).

Substituting these numbers into the breakeven condition results in a direct relationship between the amount of tuition charged by the college at which the representative student taking the course in the high school would matriculate ( $T$ ) and the probability of this student obtaining credit based upon the AP exam ( $P_{AP}$ ). Figure 1 displays a plot of the equation for a three credit hour course.

Figure 1 can be used to assess the decision to implement a CEP versus AP. Every point on the curve displays a case where CEP and AP generate identical Expected Benefit. So along the curve a district representative would be indifferent between these options. Points above the curve describe situations where the CEP course produces the higher Expected Benefit. Points below the curve present instances where AP generates the higher Expected Benefit.

### **Simulation Results: CEP versus AP**

### *General Results*

We can infer some general results regarding the Expected Benefit of CEP versus AP based upon the breakeven condition plotted in Figure 1, data on national performance on AP exams, and tuition for full-time students at representative institutions of higher education. Given that the percentage of students that obtain scores of 3 (out of 5) or above on the AP exams is approximately 0.60, several results emerge.

The CEP model would be favored – points above the curve – for districts whose students taking the course perform below or around the national percentage on the AP exam and attend colleges or universities that charge relatively high tuition (net of financial aid, in the form of outright grants or tuition discount). In this case the benefit of saving tuition becomes the dominant effect. This benefit rewards the greater probability of obtaining credit from the CEP course, and downplays its relatively higher cost.

Inspection of Figure 1 reveals two characteristics that favor AP, described as points below the curve. AP would be preferred for districts whose student clientele either (1) perform exceptionally well on the AP exam, or (2) attend institutions of higher education with relatively low tuition costs.

In the first case, the curve increases sharply for AP probabilities of 0.75 to 0.80. For districts with this characteristic, the probability of obtaining credit from the AP exam approaches that of the CEP, and therefore highlights the lower cost of the AP model. Here, though, a qualifier is important. A school district might take this finding as a justification to limit such courses to the most elite students. This move would deprive the remaining batch of academically strong, college-bound students from the ability to obtain college credit as well as the other beneficial experiences from taking such courses.<sup>3</sup> The

finding, though, does suggest an alternative strategy for high schools, especially those with large enrollments. The district could offer both the AP and CEP courses for a given subject, with the former targeted toward the elite clientele.

In the second case, Figure 1 shows that AP would be preferred for districts where college tuition for full-time students costs less than approximately \$250, regardless of the probability of obtaining credit from the AP exam. Since the monetary benefit of taking such a course in the high school is small, the situation favors the lower cost of AP. This scenario could reflect two characteristics. One would be districts where students taking this course predominantly matriculate at public colleges or universities within the state where they reside. A second would be districts with students that receive significant financial aid from institutions of higher education, such as those with a substantial percentage of low-income families.

#### *How Can the Individual High School Decide?*

To provide a framework for an individual high school's decision, we pursue the comparison of CEP versus AP with some specific examples. Table 1 reports breakeven points for three and six credit hour courses. These examples use a range of probabilities of obtaining college credit based upon performance on the AP exam, which are then substituted into the breakeven condition for the three credit hour or six credit hour course.

From Table 1, the nationwide probability of scoring at least 3 on the AP exam of approximately 0.60 corresponds to a breakeven point of \$909 for a three credit course and \$2123 for a six credit hour course. Typically, though, for a given district the probability that the student who takes the AP course will obtain college credit will be lower. There are two reasons why this occurs. First, many students taking AP courses

choose not to take the exam, as they don't foresee getting the required score. Second, a number of colleges and universities have raised the standard for credit to a minimum score of 4 or even 5 on the AP exam (see e.g. Chute 2007). These arguments imply that the upper rows of Table 1 are most applicable for the representative school district.

Table 2 reports data on tuition costs for a set of colleges and universities within New York. The institutions are Onondaga Community College; SUNY Binghamton, a state university with different tuition for in-state versus out-of-state residents; LeMoyne College, a private college; and Syracuse University, a private university.

For an individual school district, Tables 1 and 2 can be utilized in the same way as Figure 1. To determine whether CEP or AP generates the higher Expected Benefit, first assign a probability that the typical student who takes the course obtains college credit based upon her AP exam score ( $P_{AP}$ ). Given that value, determine the breakeven point either from Figure 1, Table 1, or the equation itself. Then compare the computed breakeven point to the actual tuition of the institution of higher education that this student would attend. If the actual college or university tuition is greater than the breakeven point, the CEP model is preferred. Actual tuitions below the breakeven point favor AP.

We illustrate this procedure with the colleges and universities in Table 2. If the typical student taking the high school course attends Onondaga Community College, AP is preferred for all probabilities of obtaining credit from the AP exam which are reported in Table 1. For in-state residents attending SUNY colleges and universities, AP wins for values of  $P_{AP}$  of 0.30 and above for the three credit hour course and the entire range of probabilities for the six credit hour course.

For students attending SUNY from out-of-state, though, the CEP model becomes preferred for probabilities at or below approximately 0.60 for the three credit course and the six credit hour course. For LeMoyne College, the CEP wins for values of  $P_{AP}$  at or below 0.75 for the three credit hour course and 0.70 for the six credit hour course. And for Syracuse University, the CEP is preferred for all probabilities of obtaining credit from the AP course below 0.80.

Two qualifiers apply here. First, direct financial aid will decrease the amounts in Table 2 for the two private institutions. But even with 1/3 taken off the tuition of Syracuse University and LeMoyne College, approximately the average discount for the former institution, the CEP model remains predominant except cases of relatively high probabilities of success on the AP exam. Second, regardless of the tuition costs, AP would be favored for districts in which a significant portion of the students attend Ivy League schools, since Ivies generally don't grant credit for CEP courses. This group of students would tend to perform exceptionally well on the AP exam. For districts with large numbers of college-bound students and a core that matriculate at Ivy League schools, offering both AP and CEP courses in the same subject would be a viable option.

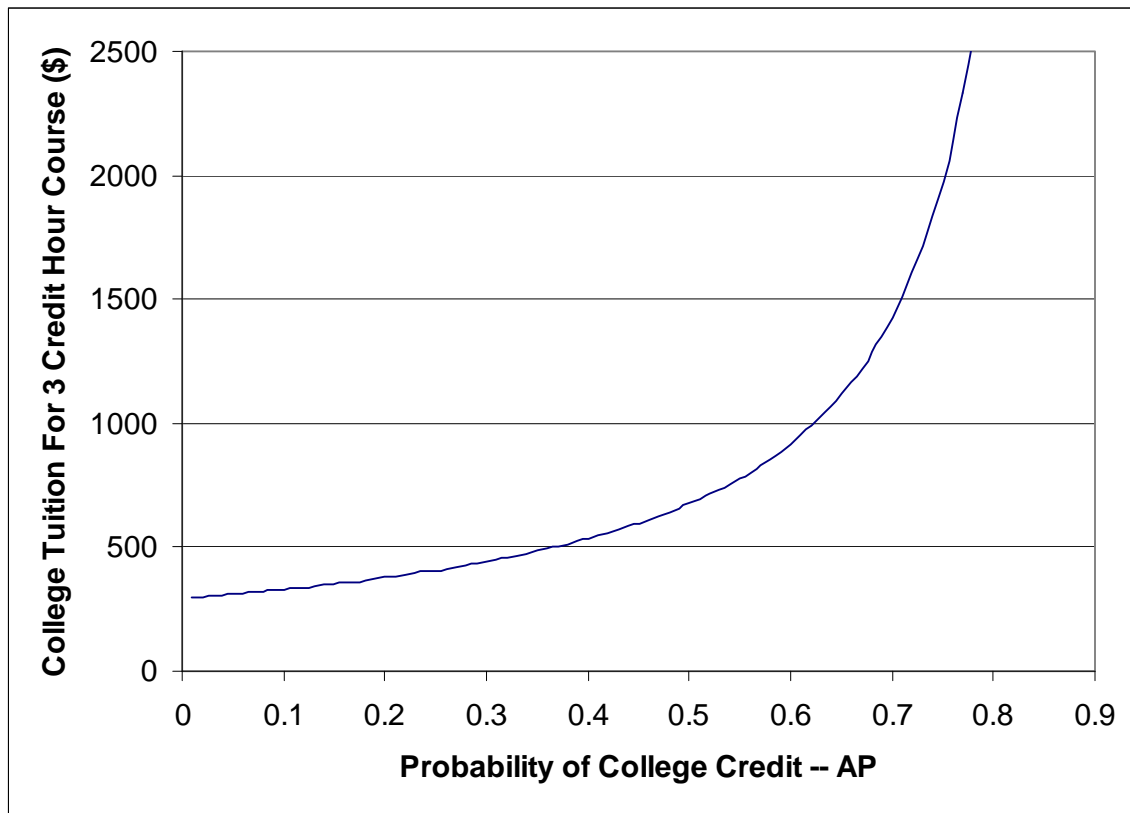
## **Conclusion**

This study proposes a framework for comparing the Expected Benefit to students, in terms of gaining college credit, of a course from a Concurrent Enrollment Program versus Advanced Placement within a given high school. It provides an explicit means of weighing the different probabilities of obtaining college credit from the two models against their respective costs to the students who take such courses. The CEP is generally

avored for districts where students who take the course attend private colleges or universities (including public institutions out-of-state) and perform on the AP exam at or around national norms. AP would be preferred for high schools where students taking the course either face relatively inexpensive costs for full-time study at institutions of higher education, or perform exceptionally well on the AP exam.

Clearly, other factors come into play for the high school in making this important decision. One centers on the fundamental educational benefits of the CEP versus AP for the students and their teachers. Dutkowsky, Evensky, and Edmonds (2006) present advantages of the CEP model in this direction. A second issue pertains to the ability of these courses to increase the probability of acceptance into institutions of higher education. Deans of admission that we interviewed indicate that they place the AP, CEP, and IB models as roughly all in the same category, within the myriad number of variables considered for admission. A third factor is the quality of the courses themselves. Here Dutkowsky, Evensky, and Edmonds (2006) find that students from the CEP Economics course outperform the AP/Honors Economics group on the nationally normed Test of Economic Literacy (Walstad and Rebeck 2001a, 2001b).

A fourth factor involves the role these models play in college success. How effective are they in affecting student GPA, retention, or performance in higher level courses in the subject? Advanced Placement (2007) cites two recent studies which they funded that support the effectiveness of AP in this regard. The effectiveness of the CEP in this category, as well as a direct comparison of AP versus CEP, is an important area for future research.



**Figure 1.** Breakeven curve for Concurrent Enrollment Programs (CEP) versus Advanced Placement (AP), based upon Expected Benefits for a three credit hour course. Points above the curve signify that CEP generates a higher Expected Benefit. Points below the curve signify that AP generates a higher Expected Benefit.

Table 1  
Breakeven Points for CEP versus AP,  
Based Upon Probability of Student Obtaining AP Credit

$P_{AP}$	Breakeven Points (\$)	
	3 Credit Course	6 Credit Course
0.20	\$374	\$874
0.25	\$404	\$943
0.30	\$439	\$1025
0.35	\$480	\$1121
0.40	\$530	\$1238
0.45	\$592	\$1382
0.50	\$670	\$1564
0.55	\$771	\$1801
0.60	\$909	\$2123
0.65	\$1106	\$2584
0.70	\$1414	\$3302
0.75	\$1957	\$4572
0.80	\$3180	\$7428

Notes to Table 1. Breakeven points come from the equation comparing Expected Benefits of CEP and AP. Actual college tuition for full-time students which are above the breakeven point favors the CEP. College tuition for full-time students which are below the breakeven point favor AP.

Table 2 – Tuition Costs for Academic Year 2006-07

College or University	3 Credit Course	6 Credit Course
Onondaga Community College	\$321	\$642
SUNY Binghamton: In-State Residents	\$435	\$870
SUNY Binghamton: Out-of-State Residents	\$1061	\$2122
LeMoyne College	\$2186	\$4372
Syracuse University	\$2882	\$5764

Notes to Table 2. Tuition costs come from the schools' websites. Data in the Table are computed based upon annual tuition and a class schedule of 30 credit hours for the academic year.

## ENDNOTES

1. In this study we focus on colleges and universities granting credit for the course taken in the high school. They might decide instead to give recognition, in the form of credit, exemption, or placement in a higher-level course.
2. The International Baccalaureate (IB) program is another model. But unlike AP or CEP, IB requires an annual expenditure of \$8850 for the high school in order to offer their courses (see <http://www.ibo.org>).
3. For example, Syracuse University Economics through PA is open, subject to teacher approval, to students who have achieved minimum grades of 85 in the American History course and on the American History Regents exam.

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