

The AP® Program and Student Outcomes: A Summary of Research

Maureen Ewing

Introduction

The Advanced Placement Program® (AP®) offers high school students the opportunity to take advanced-level course work while still in high school and to demonstrate proficiency by taking the corresponding end-of-course AP Examination. Currently, there are 37 AP Examinations in 22 subject areas, including two new exams offered for the first time during the 2006-07 academic year in Chinese Language and Culture and Japanese Language and Culture. The number of students and schools participating in the AP Program is also expanding. In 2006, more than 1.3 million students took 2.3 million AP Examinations worldwide, which represents an increase of more than 140 percent from 10 years ago in the number of students taking one or more AP Examinations. In addition, the number of schools participating in the AP Program exceeded 15,000 in 2006 with schools offering, on average, eight different AP courses.

Numerous research studies have been conducted to inform various aspects of the AP Program throughout its history. For example, several studies have examined the characteristics of AP teachers and teacher practices (Milewski and Gillie, 2002; Paek, Ponte, Sigel, Braun, and Powers, 2005) and the role of AP teachers in helping minority students succeed in AP courses (Burton, Whitman Burgess, Yepes-Baraya, Cline, and Kim, 2002). Other research has focused on the impact of block scheduling on AP Examination performance (Smith and Camara, 1998), the development of prediction models for identifying students for AP course enrollment (Camara and Millsap, 1998; Ewing, Camara, and Millsap, 2006), and the evaluation of gender differences in performance on AP

Examinations (Breland, Danos, Kahn, Kubota, and Booner, 1994; Buck, Kostin, and Morgan, 2002; Mazzeo, Schmitt, and Bleistein, 1992; Stumpf and Stanley, 1996; Willingham, Cole, Lewis, and Leung, 1997). A substantial amount of research has also been conducted to evaluate the impact of the AP Program on specific student outcomes including college academic performance (Burnham and Hewitt, 1971; Dodd, Fitzpatrick, De Ayala, and Jennings, 2002; Geiser and Santelices, 2004; Klopfenstein and Thomas, 2006; Morgan and Crone, 1993; Morgan and Ramist, 1998; Willingham and Morris, 1986), college completion (Adelman, 1999, 2006; Dougherty, Mellor, and Jian, 2006), and performance on international assessments (Gonzalez, O'Connor, and Miles, 2001). The focus of this research summary is on those studies that have investigated the impact of the AP Program on student outcomes. Studies that have compared AP students to students who participate in other programs that share similar goals such as the International Baccalaureate Program (IB) and dual enrollment programs¹ are also discussed.

When evaluating research that has investigated the impact of the AP Program on student outcomes, it is important to be aware that studies differ in terms of the characteristics or features of the AP experience that are investigated. In general, recent studies have investigated one or more of the following three groups of AP students: (1) students who take an AP Examination and perform well on it, (2) students who take an AP Examination, irrespective of performance on the exam, and (3) students who take an AP course, irrespective of both exam participation and performance. Of the existing AP research, the majority of it has examined students who have either taken an AP Examination or have taken and

¹ Dual enrollment programs are also referred to as dual credit, concurrent enrollment, or joint enrollment.

performed well on an AP Examination. This focus is not surprising given that the AP Examination is a key component of the AP experience and provides a standardized, external measure of proficiency in the subject area. In addition, students must take and perform well on the corresponding AP Examination in order to receive credit or course exemption in college. Far fewer studies have investigated students who have taken the AP course regardless of whether they took the exam or how they performed on the exam if they took it. Nonetheless, this area of research is also important, especially given that participation in AP and other advanced courses is increasingly being considered formally or informally in college admissions decisions. In keeping with these distinctions, the following summary is organized according to the nature of the AP experience that was evaluated; it begins by reviewing research that inspected the validity of AP Examination grades for course placement.

Validity of AP Exam Grades for Course Placement

Students who take an AP Examination may earn college credit or course exemption if they receive satisfactory exam grades. AP Examination grades are reported on a 5-point scale ranging from 1 (no recommendation) to 5 (extremely well qualified). This scale may be interpreted in relation to a student's readiness for placement into higher-level college courses. The American Council on Education recommends that students who earn a grade of 3 or higher on an AP Exam should be awarded credit or placement into higher-level courses. Colleges and universities, however, set their own AP credit policies, and many postsecondary institutions require exam grades of 4 or 5 in order to earn credit or placement. A key research question affecting the validity of AP Exam grades concerns whether students who are exempted from an introductory college course because of successful performance on an AP Examination do as well in subsequent (or higher-level) course work as those students who are not exempted. Several studies have investigated this issue, all of which have generally found positive results for students who were exempted from the introductory course

as a result of successful AP Examination performance (Burnham and Hewitt, 1971; Dodd, Fitzpatrick, De Ayala, and Jennings, 2002; Morgan and Crone, 1993; Morgan and Ramist, 1998). It is important to note that these studies were not attempts to demonstrate that the experience of taking the AP course itself caused or impacted a student's college success, but instead, these studies were designed to investigate whether AP Examination grades were valid indicators of a student's readiness for placement into a course beyond the introductory college course.

Morgan and Ramist (1998) conducted the most extensive study of this kind to date by collecting official transcript data at 21 colleges and universities that varied in terms of location, selectivity, and curriculum emphasis. For 25 AP Examinations, they compared the subsequent course grades of students with AP Exam grades of 3, 4, or 5 who were exempted from the introductory course to the subsequent course grades of all students who took the introductory course (as matriculated college students) before taking the subsequent course. The authors investigated student performance in second-level subsequent courses, as well as third-, fourth-, and even fifth-level courses in some cases. When grades in the second-level subsequent course were investigated, results showed that the majority of students who were exempted from the introductory course because of successful AP Exam grades did at least as well in the subsequent course, if not better than those who took the introductory course. More specifically, results showed that students who earned a 5 on the relevant AP Examination received higher second-level course grades, on average, than students who took the introductory course. Similarly, students who earned a 4 on the relevant AP Examination received higher second-level course grades, on average, in all but four cases (Art History, French Literature, Music Theory, and Macroeconomics), and students who earned a 3 on the relevant AP Examination received higher second-level course grades, on average, in all but eight cases (Art History, Biology, Comparative Government and Politics, European History, Microeconomics, Music Theory, Spanish Literature, and Studio Art General).²

Some colleges and universities included in the Morgan and Ramist (1998) study permitted students to

² Notice that Macroeconomics and French Literature were not included in the list of cases in which students who earned a 3 or better performed worse than the comparison group, but the exams were listed as such for students who earned a 4 or better. With respect to French Literature, the number of students who earned a 3 was too small for analyses to be conducted; thus, no information about this exam group was reported. In the case of Macroeconomics the explanation is less clear, as the finding runs counter to the general pattern that was observed, which was that students who earned higher AP Exam grades tended to do better, on average, in the subsequent course than those earning lower AP Exam grades. Studio Art General was the name of the exam when the study was conducted. There is no direct replacement now.

enroll in courses beyond the second level depending on their AP Examination grades. This practice was especially common for foreign language courses, although it also occurred for other courses including math and science. With respect to foreign language courses, results showed that students with AP Exam grades of 3, 4, or 5 received, on average, higher grades in all foreign language third- and fourth-level courses compared to students who took the lower-level course. The same was true for foreign language fifth-level courses, with the exception of German Language (where only students who earned a 5 on the AP Exam outperformed the comparison group). With respect to math and science, results showed that students with exam grades of 3, 4, or 5 received, on average, higher grades in all math and science third-level courses compared to students who took the lower-level course, with the exception of Physics B (where only students earning a 5 on the exam outperformed the comparison group) and Biology (where only students earning a 4 or a 5 outperformed the comparison group).

Additional studies using data from a single university (Burnham and Hewitt, 1971; Dodd et al., 2002) or system (Morgan and Crone, 1993) have also addressed this same research question. For example, Dodd et al. investigated how students at the University of Texas at Austin who were exempted from introductory courses in English, calculus, or biology because of successful AP Examination grades (called the “AP-exempt group” in the study) performed in relation to non-AP students who took the introductory course at the university. The AP-exempt group was also compared to AP students who took the introductory course because they did not earn satisfactory exam grades according to the university’s AP credit and placement policy. Analyses were conducted separately for four different entering freshman classes. To control for the possibility that AP students might perform better in subsequent college courses because of greater academic preparation in general, the non-AP student group was matched to the AP-exempt group using high school rank and admissions test scores. This matching process resulted in a non-AP comparison group that was of similar academic ability to the AP-exempt group. Results showed that the AP-exempt group received, on average, the same or higher grades in the subsequent course, took as many or more class hours in the subject area, and had the same or higher grades in additional courses in the subject area as compared to the other groups.

AP Examination Participation and Student Outcomes

In addition to investigating the performance in specific higher-level courses of AP students who took and performed well on the exam, research has been conducted to evaluate the influence of AP Exam participation (separate from performance) on other measures of college success. Willingham and Morris (1986) conducted one of the earliest studies of this kind and included both short- and long-term outcome measures of college success. The design of the study involved comparing students enrolled at nine colleges who took one or more AP Examinations to a group of students who did not take any AP Examinations. The two groups were matched in terms of six college admissions measures (e.g., standardized test scores, high school rank, academic honors, etc.). Findings showed that students who took one or more AP Examinations were more likely than students of similar academic ability who did not take any exams to earn at least a B average in their first year, to maintain that average for the duration of their college career, and to graduate with academic honors.

Other research has investigated the course-taking patterns of college students who have taken AP Examinations (Morgan and Maneckshana, 2000). Results showed that students who took AP Examinations in all subject areas except U.S. History, English Language, and English Literature were more likely to take at least one course in the discipline of their exam while in college compared to students who did not take any AP Examinations. In addition, many AP students, especially those who took AP Examinations in Biology, Physics, Calculus, Studio Art, or Spanish Literature, subsequently majored or minored in the subject area of their exams or a closely related field. One area of future research would be to investigate how student interest prior to taking AP Exams influences their subsequent course-taking patterns. Another area of research might investigate the relationship between the availability of AP courses in high schools and the subsequent course-taking patterns of their students in college. For example, do high schools not offering certain AP courses have fewer students subsequently majoring in that area in college?

AP Course Participation and Student Outcomes

Far fewer studies have examined the impact of AP course participation, separate from AP Exam participation and performance, on student outcomes. Two studies conducted by the U.S. Department of Education found that the academic intensity of a student's high school curriculum was highly predictive of college completion (Adelman, 1999, 2006). In both of these studies, the number of AP courses taken by a student was used as one component of the academic curriculum intensity variable. In the more recent study, Adelman (2006) disaggregated the overall academic intensity variable into its various components, and evaluated each component as separate predictors of college completion. The components that were evaluated included the number of AP courses taken (measured by a three-category variable including zero AP courses; one or two AP courses; and three or more AP courses), the amount of science momentum (measured by a variable that combined the highest level of math with the number of credits in core laboratory science courses), and the number of credits in foreign language courses. The results showed that the number of AP courses taken was not a significant predictor of college completion in eight-and-a-half years. The only variable that was a significant predictor was science momentum. Klopfenstein and Thomas (2006) also investigated the effects of AP course-taking on college outcomes, but various shortcomings of the research including possible multicollinearity among the predictors and the definition of retention made it difficult to interpret the results.

Other researchers have also looked at the effect of AP course participation on college outcomes, while at the same time examining the effect of AP Examination performance on student outcomes. For example, Geiser and Santelices (2004) investigated the role of AP course participation and exam performance in predicting college performance using data from the University of California system. Additional predictors of college performance in their models were high school GPA, SAT® scores, SAT Subject Test scores, high school quality, and parental education. Findings indicated that the number of AP courses taken, irrespective of whether the student took the AP Exam, was statistically significant, but contributed very little to the prediction of college grades after taking into account the other predictors in the model. On the other hand, when the study focused solely on the group of students who took the AP Examination, the analyses found that AP Examination performance was among

the strongest predictors of college grades (measured by both second-year GPA and discipline-specific GPAs), and was second in strength only to high school GPA. It is important to note that Camara and Michaelides (2005) criticized some aspects of this research, and felt the study would have been more useful if the collinearity among predictors had been addressed and if variables not used in admissions decisions (i.e., high school quality and parental education) had been excluded from the models.

Dougherty, Mellor, and Jian (2006) also explored the effects of AP course participation and AP Examination performance on college completion. They found that students who earned a 3 or better on one or more AP Examinations in the areas of English, mathematics, science, or social studies were more likely to graduate from college in five years or less compared to non-AP students, even after controlling for prior academic achievement and other student-level (e.g., free or reduced-price lunch status) and school-level demographic characteristics (e.g., percentage of low-income students, district dropout rate). The same was true for students who earned a 1 or 2 on AP Examinations and for students who took an AP course but not the exam, although the size of the effect was smaller. When Dougherty et al. framed the question in terms of a school-level analysis in an attempt to take into account the fact that students select themselves for AP, they found that the best AP-related indicator for predicting the percentage of students who would graduate from college from a particular high school was the percent of students in the school taking and performing well (3 or better) on AP Examinations.

One of the challenges of conducting research on the effect of AP course participation on student outcomes lies in ensuring that the data being analyzed are from AP courses that can reasonably be considered AP. For example, evidence suggests that some schools label a course AP when, in fact, the course does not use college-level textbooks or does not follow the recommended AP Course Description. In some cases, a school may even call a course AP when, in actuality, no such AP course exists. The importance of taking into account this potential confounding factor is illustrated by reviewing results from two research efforts that involved the Trends in International Mathematics and Science Study (TIMSS), formerly known as the Third International Mathematics and Science Study.

In the first study, sponsored by the National Center for Education Statistics (1998), results showed that the students labeled "AP Calculus students" performed slightly above the international average on the TIMSS Advanced Mathematics

test, outperforming only 5 of 15 countries. Students in the study labeled “AP Physics students” fared worse, performing below the international average on the TIMSS Physics test and outperforming students in just one country. However, for this study, schools were responsible for identifying students who were taking or who had taken AP Calculus or AP Physics courses, and there were concerns that this approach may have identified students who were not enrolled in courses that followed the AP Course Description, as well as students who did not complete the entire AP course and/or who did not perform well on the AP Exam. Thus, questions arose regarding how it was determined that such students truly took official AP courses.

To address these concerns, Gonzalez et al. (2001) readministered the TIMSS Advanced Mathematics and Physics tests to students enrolled in AP Calculus and AP Physics courses that were registered with the College Board.³ The performance of these AP students was then compared to the performance of students in 16 countries (including the United States) who took the TIMSS assessments in 1995. They found that students enrolled in AP Calculus, regardless of whether they took the AP Exam, had the highest average performance on the TIMSS Advanced Mathematics test, significantly outperforming students in all other countries except France. AP students who earned a grade of 3 or better on either of the AP Calculus Examinations scored even higher, outperforming students in all other countries including France. Students enrolled in AP Physics courses had similar success, scoring significantly above the international average on the TIMSS Physics test, and performing the same as or significantly better than students in all other countries except Norway and Sweden. Once again, AP students who earned a grade of 3 or better on any of the AP Physics Examinations scored higher, equaling or surpassing the performance of students in all other countries.

AP Students Compared to IB and Dual Enrollment Students

Very little is known about how AP students compare to students who participate in other accelerated learning programs

³ A sample of 395 schools was selected for this study from a list of more than 9,000 schools that had offered AP Calculus or AP Physics courses during the 1999–2000 academic year. The schools were selected from this list using a probability level that was proportional to the number of students who earned exam grades of 3, 4, or 5 on any of the AP Calculus or AP Physics Exams in 1999. Of the 395 schools that were sampled, 104 schools agreed to participate, resulting in student-level sample sizes that were close to 4,000 students for the TIMSS Advanced Mathematics test and close to 2,000 students for the TIMSS Physics test.

including IB or dual enrollment programs. The National Research Council recently reviewed components of both the AP and IB programs but was unable to find any systematic studies investigating how IB students perform in upper-level college courses (Gollub, Bertenthal, Labov, and Curtis, 2002). They concluded: “It is therefore unclear to what extent advanced placement in upper-level college courses is merited on the basis of IB Examination scores alone” (p. 195). With respect to dual enrollment, a program in which high school students may enroll in college-level courses and earn both high school and college credit simultaneously, few studies have directly compared AP and dual enrollment in terms of student outcomes. The study conducted by Dodd et al. (2002), which was described earlier, represents an exception. In their study, they also included a dual enrollment comparison group (i.e., students who took the relevant introductory college-level course while still in high school). For English, the results showed that dual enrollment students performed as well as the AP-exempt students with respect to the outcome measures included in that study (i.e., grades in the subsequent course, number of class hours in subject area, and grades in additional courses in the subject area). For mathematics, however, no information could be provided as there was only one dual enrollment student, while for biology, there were no more than six dual enrollment students for a given entering class, which severely limited the generalizability of the results.

Difficulties Studying the Impact of Dual Enrollment

The study conducted by Dodd et al. (2002) can be considered a case study because it used data from one institution (i.e., the University of Texas at Austin). Conducting studies on a larger scale that compare the performance of AP and dual enrollment students in terms of college outcomes can be a challenge because not all postsecondary institutions store the needed data in an accessible manner. One of the greatest challenges lies in identifying dual enrollment students once they enter college. In most cases, dual enrollment credits appear on college transcripts as transfer credits and, because college transcripts do not always document high school graduation dates,

it is difficult to distinguish between dual credits and transfer credits on the basis of the college transcript alone. It is likely that additional data from college applications will be needed, but because these data are typically maintained by the admissions office and transcript data are typically maintained by the registrar's office, coordination between the two offices and resulting privacy issues add complexity to the data collection process. Rather than working directly with postsecondary institutions, it may be necessary to consider alternative ways of conducting dual enrollment studies, perhaps by collaborating with states that have implemented systems to follow students throughout their educational experience.

Continued research in this area is important, especially given the results of a recent survey conducted by the National Center for Education Statistics that showed both AP and dual enrollment programs are highly prevalent in U.S. public high schools (Waits, Setzer, and Lewis, 2005). Specifically, the survey found that 67 percent of public high schools offered at least one AP course during the 2002-03 academic year and 71 percent of schools offered at least one dual enrollment course during the same time period. IB courses were offered by only 2 percent of public high schools. Given the prevalence of acceleration programs, a better understanding of the similarities and differences among them in terms of student- and school-level outcomes may help to improve program delivery and inform policy decisions.

Future Research

The collection of studies synthesized above provides empirical evidence supporting the efficacy of the AP Program. Future research is needed to replicate and extend current understanding of the impact of AP course participation and exam performance on student outcomes. For example, new course placement studies that explore how student-level (e.g., prior achievement) and institutional-level factors (e.g., selectivity of the institution) relate to the performance of AP students in their subsequent college courses are needed. In fact, studies of this kind were recommended by the National Research Council (Gollub et al., 2002). In addition, large-scale studies are needed to further investigate the impact of AP course participation on student outcomes. Starting with the 2007-08 academic year, the AP Program is instituting an AP Course Audit that requires schools seeking to continue labeling courses "AP" to meet course and resource requirements that will ensure a degree of consistent quality in all courses labeled "AP." Future research that evaluates

the impact of AP course participation on student outcomes should, if possible, take into account results from the AP Course Audit process.

Maureen Ewing is an assistant research scientist at the College Board.

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Office of Research and Analysis
The College Board
45 Columbus Avenue
New York, NY 10023-6992
212 713-8000

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