

An Investigation of College Performance of AP and Non-AP Student Groups

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Abstract

This study sought to perform a global assessment of the performance of students in the College Board Advanced Placement (AP) Program compared to non-AP students on a number of college outcome measures. Ten AP Exams and six aggregated AP subject areas were examined in this two-phase study of students in four entering classes (1998-2001) at the University of Texas at Austin. The college outcome measures included first-year credit hours and GPA, subject or subject area credit hours and GPA, overall college credit hours and GPA, and sequent course grade. Results showed that for each of the ten individual AP Exam subjects, AP students who earned credit by exam consistently outperformed non-AP students of similar academic ability in all college outcome measures. For five of the six aggregated AP subject areas, AP students also consistently outperformed the non-AP students of similar academic ability in all college outcome measures. In addition, the average AP Exam grade a student attains in an AP subject area was found to be a good indicator of his or her future performance in college, especially in the particular subject area. These study findings provided support that the rapid expansion of the AP Program in recent years has not diminished the validity of AP Exam grades to predict college success.

An Investigation of College Performance of AP and Non-AP Student Groups

The College Board Advanced Placement (AP) Program offers college-level classes to high school students while they are still enrolled in high school. The courses and exams are developed by Development Committees composed of an equal number of college professors and high school AP teachers with expertise in the subject matter. There are currently 37 different exams including two new exams that will be offered for the first time during the 2006-2007 academic year. All AP Exams except Studio Art consist of a multiple-choice section and a free response section. Scores on the two sections are combined to create a composite score, which in turn is transformed to a 1 to 5 scale for reporting purposes. The American Council on Education recommends that students who earn an AP Exam grade of 3 or higher be considered qualified for placement beyond the entry-level college course or eligible for college credit by exam in the AP subject matter; however, individual colleges and universities set their own AP credit and exemption policies. As a consequence, the policies vary from institution to institution. In general, students who achieve a grade of 3 or higher on an AP Exam typically place out of one or more introductory courses in the AP subject. Students who earn an AP Exam grade of 2 may also qualify for placement out of entry-level college courses or credit by exam for some subject areas depending on the college or university policy. For example, earning an AP Exam grade of 2 on some foreign language exams, such as French and German, can place a student out of an entry-level college course.

Previous research has shown that students who place out of the introductory course on the basis of the AP Exam grade perform as well if not better in the sequent course than students who take the prerequisite course (Casserly, 1986; Dodd, Fitzpatrick, De Ayala, & Jennings, 2002; Koch, Fitzpatrick, Triscari, Mahoney, and Morris, 1988; Morgan & Crone, 1993; Morgan & Ramist, 1998). In addition, Dodd et al. (2002), Koch, et al. (1988), Morgan and Maneckshana, (2000), and Willingham and Morris (1986) found that students who take AP Exams typically earn more hours in the AP subject area than students who do not take the exam. Morgan and Maneckshana (2000) also observed that students who took AP Exams tended to major or minor in the AP subject area or a closely related area. Dodd et al. (2002) found that students who earn credit by exam via the AP Exam also earn higher GPAs in additional courses in the subject area than other student groups.

Several studies have evaluated the effect of student participation in the AP Program using cumulative grade point average (GPA) at different points in time during the college years as an outcome measure. Geisser and Santelices (2004) used second-year GPA as one criterion

measure to evaluate the predictive validity of the number of AP courses, AP Exam grades, as well as other variables. The goal of their research was to determine the utility of AP course participation data in the admissions process. They found that the average AP Exam grade was predictive of second-year GPA, while the number of AP courses taken was not predictive of second-year GPA. Camara and Michaelides (2005), however, questioned whether or not the collinearity among the predictors might account for the results.

Morgan and Maneckshana (2000) also used GPAs collected five years after the student entered 21 different colleges to evaluate the effectiveness of the AP Program in a follow-up study to Morgan and Ramist (1998). Students who earned high AP Exam grades had higher GPAs than those students who earned lower grades on the AP Exam. They also looked at 4- and 5-year graduation rates and found that most of the AP students who took exams graduated in four years. Dougherty, Mellor, and Jian (2005) also found that students who took AP courses and earned grades of 3 or higher on the AP Exam, graduated in five years at a higher rate than AP students who earned grades less than 3 on the AP Exam, AP students who did not take the exam, and students who did not take AP courses or exams. All AP groups also graduated at a higher rate than the non-AP students.

According to the College Board's AP Central website, the number of schools participating in the AP Program increased 12 percent from 1995 to 2004. In 1995, 493,263 students took 767,881 AP Exams. In 2005, over 1.2 million students took 2.1 million AP Exams. Clearly, the program has been growing by leaps and bounds. Over the past ten years, the number of students taking AP Exams has grown 8 to 11 percent each year and the number of exams has increased 9 to 12 percent each year. Due to this rapid growth, some researchers (Hurwitz & Hurwitz, 2003; Klopfenstein, 2004; Lichten, 2000) have questioned whether or not the results found in previous studies still apply to the expanded AP Program.

Clearly, new research was warranted to determine if the results found in earlier studies still held true after this period of growth. Also, previous research needed to be refined to determine whether there are differences in college outcomes among three different "types" of AP students:

1. Students who take AP Exams and score high enough to receive college credit and place out of an entry-level college course;
2. Students who take AP Exams but do not score high enough to receive college credit; and
3. Students who take AP Exams and score high enough to earn course credit, but then elect to take the entry-level course.

These AP groups should also be compared to other non-AP groups of students such as those

who were concurrently enrolled in college classes while still in high school, engaged in other enriched studies such as the International Baccalaureate, and a matched group of non-AP students based on high school academic proficiency.

Accordingly, the present study extends the research conducted by Dodd et al. (2002) by comparing college-level performance of AP students with matched non-AP students and concurrently enrolled students in a larger number of AP subject areas. For four entering classes, the ten most frequently taken AP subject area exams in the state of Texas are investigated. In addition, the current study investigates the aggregation of the AP Exams into subject areas. We use the College Board's classification system to aggregate 30 AP Exams used by UT Austin into six subject areas. Unlike Dodd et al. (2002), the inclusion of a larger number of AP Exams allows for more global assessments of the effect of the AP experience on college performance. Aggregating AP Exam grades into subject areas also offers more global measures of student achievement. In addition to the number of hours taken and grade-point averages (GPAs) earned in each subject area, we analyze college performance outcome measures such as first year grade-point average, number of hours taken during the first year, overall grade-point averages, and overall number of hours taken.

Research Questions

The research questions addressed are grouped into two phases based on the level of aggregation of the AP Exams. The first phase is based on the ten AP Exams we studied in depth. Each of these AP Exams was investigated separately. The second phase addresses the six aggregated subject areas according to the College Board's classification of the AP Exams.

Phase I: Individual AP Exams

1. Are there differences in college outcome measures among AP students who do not earn credit by exam, AP students who earn credit by exam, non-AP students, and students who concurrently enroll in university courses while still in high school?

Phase II: Aggregated Subject Area AP Exams

2. How do the college performances of students who take one or more AP Exams in a subject area compare to the performances of non-AP students and concurrent enrollment students in that specific subject area, first year and overall grade-point averages, and number of hours taken during the first year and overall?
3. What effect does the average AP Exam grade in the subject area have on AP students' college performance in the subject area, first year and overall grade-point average, and number of hours taken during the first year and overall?

4. What effect does the number of AP Exams in the subject area have on AP students' college performance in the subject area, first year and overall grade-point average, and number of hours taken during the first year and overall?
5. Is there an interaction between the number of AP Exams taken and the average AP Exam grade in the subject area that provides more information about the AP students' grade-point average and hours taken in the subject area, first year and overall college grade-point averages, and number of hours taken during the first year and overall?

Design and Methodology

Data Source

Our first task was to identify the most frequently taken AP Exams by the University of Texas at Austin students to ensure sufficient data were available for the study. We examined the University of Texas at Austin (UT) credit by exam records for the 2000-2001 academic year and the most recent College Board reports for the numbers of students who took each AP Exam. We found for the 2000-2001 academic year, UT received 500 or more AP Exam grades in the following 10 subjects: Biology, Calculus AB, Calculus BC, Chemistry, Macroeconomics, English Language and Composition, English Literature and Composition, Government and Politics: United States, History: United States, and Spanish Language. These ten AP Exams also are among the most frequently taken AP Exams in the state of Texas and the US and therefore were selected for this study. Three of the ten AP Exams – Calculus AB, Biology and English Language and Composition – were used in the study by Dodd et al. (2002) and, thus, this study serves as a validation of their findings. Each of the ten AP Exams allows students to place out of at least one UT course. The number of courses students may place out of and the minimum AP Exam grade needed to place out of the courses vary for each subject and academic year. Appendix A summarizes, for each AP Exam, the UT courses students may place out of and the minimum grade required for each academic year examined. In addition, using the College Board's classification system, we aggregated 30 AP Exams into six subject areas. A list of the exams included in each of the six subject areas is provided in Appendix B. The only changes we made to the classification system were to delete those AP Exams that are not used for credit by exam at the University of Texas at Austin.

The data were obtained from the University of Texas at Austin students' records database for the 1998-2001 entering classes. Using four entering classes allowed us to determine whether the results are replicable across years. The entering freshmen class sizes were 5,910, 6,345, 6,467, and 6,219 for the 1998, 1999, 2000, and 2001 academic years, respectively.

Variables obtained from the UT Austin database include grades on all AP Exams, grades on all International Baccalaureate (IB) subject exams, grades and dates of all college courses, overall college GPAs, high school ranks, and admission test scores (SAT[®] and ACT). Transfer credits, date of first semester in college, and high school graduation date were also obtained in order to identify the students who were concurrently enrolled in a college class in each subject while still in high school. From these data, we determined first-year credit hours and GPAs, and the number of credit hours and college GPAs in subjects related to each individual AP Exam. In addition, the average AP subject area grades, total number of AP Exams taken in each subject area, and college GPAs in each subject area were computed. Where possible, we also analyzed grades in the sequent course in those subjects where UT Austin identified the next course.

Data Analyses

The data analyses can be broken into two phases. The first phase focused on the ten individual AP Exams in order to address research question 1, while the second phase looked at the six subject areas to address research questions 2-5.

Phase I: Individual AP Exams

Description of Participants and Samples

The distribution of AP Exam grades in each UT entering class was compared to the distribution of AP Exam grades in the US national sample in the corresponding year. Data for the national sample was obtained from The College Board AP Central website. The bar graphs in Figures 1 to 10 illustrate the comparisons we conducted for one of the four years: 2001. The graphs show that across all ten AP Exams, the AP Exam grade distributions did not differ dramatically between our UT sample and the national sample. Additionally, we compared the mean exam grade for each AP Exam. The differences in means between the UT sample and the national sample ranged from 0.09 to 0.4, which is less than half of a grade on the 5-grade scale. Thus, the mean AP Exam grades in the UT sample also did not differ substantially from the national sample.

An important difference should be noted about the student composition of the national samples and that of our UT samples. Students in each of the national samples are those who took the respective AP Exams in the particular administration year, for example, in 2001. On the other hand, students in the UT sample represent those who are part of the freshmen class in, for example, 2001. These UT students could have taken the AP Exams in any of their high school years. Therefore, some of their AP Exam grades might have been from the 2001 administration; but other exam grades could also have been from an earlier administration. This difference in sample composition, however, should not affect our observations. This is

because we were simply examining whether the distribution of AP Exam grades in our UT samples is consistent with how AP Exam grades are distributed nationwide.

Research question 1 was addressed in this phase of the study by identifying and comparing four groups of students in each of ten AP Exam subjects for each of the four entering classes (1998-2001). The four groups of students were:

- *AP Credit Group*– students who earned credit by exam based on their AP Exam grade and who took at least one college course in the related subject
- *AP No Credit Group*– students who took the AP Exam, did not earn credit by exam via their AP Exam grade, but took at least one college course in the related subject
- *Concurrent Group* - students who did not take the AP Exam and, while still in high school, concurrently enrolled in one of the corresponding college courses that the AP students can receive credit for with the AP Exam, and who took at least one college course in the related subject
- *Non-AP Group* – students who did not take the AP Exam and did not concurrently enroll in any of the corresponding college courses while still in high school, but took at least one college course in the related subject

We also investigated the possibility of creating two additional comparison groups. The first group was students who have taken IB exams in the subject area that correspond to the individual AP Exam subject. All the IB groups, however, were deemed too small to merit meaningful comparisons or matching. Every IB group in each entering class had sample sizes less than 30 and most of them were less than 15. Thus, no IB groups were used in the analyses and each IB student was re-classified into one of the four comparison groups depending on which group criteria the student satisfied.

The second group that we investigated was AP students who scored above the minimum grade in the AP Exam, but elected not to accept the credit by exam and took the introductory subject courses at UT. We will refer to this group as the *AP Did Not Claim CBE group*. With the exception of the *AP Calculus AB* exam, all AP Did Not Claim CBE groups were substantially smaller than the four main comparison groups. For the nine AP Exams, the AP Did Not Claim CBE group sizes were smaller than 35 and the majority of them were smaller than 10. These group sizes were deemed too small to warrant inclusion as a separate comparison group. As a result, the AP Did Not Claim CBE group was only included in the analyses for the AP Calculus AB exam.

Table 1 gives the distribution of students in the various groups for each individual AP Exam and entering class. The *No Course Credit* groups in Table 1 include students *excluded* from the

analysis in each exam subject and entering class. These students were excluded because they failed to meet the inclusion criteria for any of the comparison groups for that particular exam. Specifically, these are students who did not have *any* college course credit hours in the particular subject, regardless of whether or not they took the corresponding AP Exam. We have provided the sizes of the *No Course Credit* groups so that the readers can see the variation in proportions of students that were excluded from the analyses for the various exams and entering classes. For example, the 1998 entering class at UT had a total of 5,910 freshmen. Of these students, 2,733 (or 46%) were excluded from the Biology analysis for having no UT credit hours in biology, while only 189 (or 3%) were excluded from the Calculus AB analysis for not having any UT credit hours in mathematics.

In addition, Table 1 shows that in 2000 and 2001, the Biology analysis did not have sufficient samples sizes to form Concurrent groups. And across all four entering classes, there were no students in the Concurrent groups for Calculus AB analysis. Thus, in these cases, the Concurrent groups were not included in the analyses.

Note that the group sizes shown in Table 1 are those *prior* to any matching or listwise deletion. The matching procedure (described in the next section) generally reduced the sample sizes of the Non-AP groups and listwise deletion by the MANOVA procedure also reduced the sizes of all groups used in the analysis.

Analysis Procedure

The analyses for this phase compared the included groups on up to seven dependent measures. Because the sample size for the Non-AP group was generally much larger than the other groups, it was matched to the AP Credit group in terms of SAT total scores (or ACT scores, if SAT scores are unavailable) and high school ranks. The dependent measures included overall college credit hours taken and GPA, first-year credit hours taken and first-year GPA, credit hours taken in the UT subject courses and subject GPA, and grades in any sequent courses. Of the ten AP Exam subjects analyzed, only four had sequent courses in their respective UT subject course sequence. They were AP Biology (BIO 303) in 1998 and 1999,¹ AP Calculus AB (M 408D), AP Calculus BC (M 408D), and AP English Language and Composition (E 316K).

To accomplish the matching of the Non-AP group to the AP Credit group, we divided the range of high school ranks into five percentile rank categories. The range of SAT total score was divided into eleven equal 100-point increments from 400 to 1,600. The range of ACT score was also divided into eleven intervals that are equivalent to the SAT increments. A student's ACT score (if available) is used only if his/her SAT score is unavailable. Thus, every student in the AP Credit group was assigned to one of the subcategories based on the 5-by-11

classification of high school rank by test score categories. The Non-AP group was then randomly sampled to select an equal number as in each of the subcategories in the AP Credit group. In several instances, an insufficient number of non-AP students were available to be selected for some of the subcategories. Thus, the matched Non-AP groups had smaller sample sizes than the intact AP Credit groups in those cases. Note that matching was only performed on the Non-AP group to the AP Credit group. The AP No Credit and Concurrent groups were not matched to any group and hence stayed intact in the reported analyses.² Reductions in sample sizes for these groups in the various analyses were the result of listwise deletion due to missing data.

For each AP Exam subject within each entering class, the analyses performed included first a one-way multivariate analysis of variance (MANOVA) to detect overall differences in the multivariate means of the dependent variables across the comparison groups. If the MANOVA yielded a statistically significant result, then univariate analysis of variances (ANOVAs) were run on each dependent variable to identify differences in specific dependent variables across the groups. For the dependent variables that resulted in statistically significant ANOVAs, pairwise post-hoc comparisons using the Tukey-Kramer adjustments (Kramer, 1956) were performed on the least-square means (LS-means) to determine which groups differed significantly on the dependent variable. LS-means were used because the sample sizes across the comparison groups were unbalanced. This was the case even after matching the Non-AP group to the AP Credit group because the AP No Credit and Concurrent groups generally had much smaller group sizes. LS-means are predicted population margins; that is, they are estimates of marginal means over a balanced population (SAS OnlineDoc, GLM Procedure, 2003). Thus, they provide fairer comparisons than raw means in unbalanced designs such as the ones in this study.

It should be noted that only six of the seven dependent measures – overall college credit hours and GPA, first-year credit hours and GPA, and college-level subject courses credit hours and GPA – were included in the MANOVAs. Sequent course grades were not included because a substantially smaller subset of students within each AP Exam usually had such grades. If these were included in the MANOVA with the other dependent variables, then listwise deletion of students without sequent course grades would greatly reduce the sample sizes for the analyses. Thus, a separate univariate ANOVA was performed to compare sequent course grades across the groups and, if necessary, post-hoc Tukey-Kramer pairwise comparisons on the LS-means. The significance level used in all MANOVAs, ANOVAs, and post-hoc comparisons was $\alpha = 0.05$.

Phase II: Aggregated AP Subject Area Exams

Description of Participants and Samples

To answer research question 2, we identified three groups of students in each of the six aggregated AP subject areas for each of the four entering classes (1998-2001). The three groups of students were:

- *AP Group* – students who took at least one of the AP Exams in the subject area and took at least one college course in the subject area. For example, if a student took at least one of AP Calculus AB or BC, AP Statistics, AP Computer Science A or AB and took at least one Mathematics subject area course, then he or she was classified into this group for the Mathematics subject area.
- *Concurrent Group* – students who did not take any of the AP Exams in the subject area, but who were concurrently enrolled in at least one of the courses in the subject area for which the corresponding AP Exams granted credit while still in high school.
- *Non-AP Group* – students who did not take any of the AP Exams in the subject area, were not concurrently enrolled in college courses in the subject area, but took at least one college course in the subject area while in college.

Note that unlike in Phase I, we chose not to subdivide students with AP experience into *AP Credit* and *AP No Credit* groups in this phase. A preliminary investigation was conducted to explore the possibility of such a subdivision, but the sample sizes for the AP No Credit groups were found to be far too small in relation to the other comparison groups. At the same time, we did not want to exclude any students with AP experience from our analyses by ignoring the AP No Credit group. Thus, we decided to combine all the students with any AP Exam experience into the same group – the AP group – regardless of whether they received credit by exam because of their AP Exam grades in the subject area.

To address research questions 3 to 5, the students in the AP group were classified into four tiers based on the *average grade* achieved on all individual AP Exams taken in the subject area. If a particular AP Exam was taken more than once, then the highest AP Exam grade attained was used in average grade calculation. The average grade was rounded to an integer number (1–5) for tier assignment. The four tiers were “1 or 2”, “3”, “4”, and “5”. Those with average grades of 1 and 2 were collapsed into a single tier because of the small sample sizes in each tier.

In addition to these average grade tiers, we also categorized the students in the AP group based on the *total number of individual AP Exams* each student had taken in the subject area. Thus, for example, there were categories representing students who took “1”, “2”, and “3 or more” of the individual AP Exams in the Mathematics subject area. The number of categories for each

subject area varied as a function of the number of individual AP Exams in the subject area. In addition, collapsing of categories was usually necessary at the high-end due to small sample sizes for each category. The high-end category was therefore typically “2 or more” exams or “3 or more” exams.

Crossing the average grade tiers with the total number of AP Exams categories gives us a two-way classification system for the AP students. The dimension of this classification system varied for each subject area as a function of the number of average grade tiers and the number of AP Exams categories in each subject area. Most subject areas, for example, had 4 average grade tiers crossed with 3 categories of number of exams resulting in a 4×3-classification system, or 12 AP subgroups, to use in the analyses for research questions 3 to 5. The specific dimensions of the classification system used for each subject area are shown in the tables in the Results section.

Table 2 gives the distribution of students in each of the aggregated AP subject area groups in all entering classes *prior* to matching the Non-AP group students to the AP group students. The number of students excluded from the analysis, represented as the *No Course Credit group*, is also indicated for each subject area. These students were excluded because they never enrolled or were concurrently enrolled in college courses within the particular subject area. Thus, they did not satisfy the inclusion criteria for any of the comparison groups in that AP subject area.

Note that the No Course Credit groups for Mathematics, Sciences, Social Sciences and English subject areas are all relatively small compared to our main comparison groups. This should come as no surprise as most students take at least one course in these subject areas during their college careers either as part of program requirements or out of personal interest. Thus, fewer students were excluded from the analyses of these four subject areas. On the other hand, not as many students take college-level Foreign Languages or Arts courses. Thus, a large proportion of students were excluded from the analyses of these two subject areas. In fact, over 50% of the students were excluded from the Arts subject area analyses in each of the four entering classes.

Furthermore, for the Arts subject area, the number of students in the Concurrent group was minimal: there were less than 10 in each of the four years. Thus, Concurrent groups were not included any of the Arts subject area analyses. Table 2 also shows that the size of the AP groups for the Arts subject area was also very small. The largest AP group across the four entering classes was in 2001 with 173 students; while in 1998, there were only 113 students. Because we further subdivided the AP group into tiers or categories based on the number of AP Exams taken or average AP Exam grade, the resulting sizes of each tier or category for Arts

were far too small to perform any meaningful statistical analysis. Thus, the decision was made not to include the Arts subject area in the AP subgroup analysis.

Analysis Procedure

The dependent measures used for this phase were the same as the ones in Phase I, except for sequent course grade. The measures included overall college credit hours taken and GPA, credit hours taken in the first year and first-year GPA, credit hours taken in the subject area, and subject area GPA.

In terms of analysis, Phase II consisted of two parts for each subject area. The first part, which we will refer to as the Phase II *main analysis*, involved comparisons of the AP Group, a matched Non-AP Group, and the Concurrent group on the dependent measures. The procedure for matching the non-AP group to the AP group was the same as in Phase I. The results from the main analysis are used to answer research question 2. The second analysis, which we will refer to as the Phase II *AP subgroups analysis*, compared the subgroups within the AP Group on the same dependent measures. The results from the AP subgroups analysis are used to answer research questions 3, 4 and 5.

The analyses in Phase II first involved a one-way MANOVA for the main analysis (research question 2) and a two-way MANOVA for the AP subgroup analyses (research questions 3-5) to detect overall differences in the multivariate means of the dependent variables across the comparison groups for each subject area within each entering class. Statistically significant main or interaction effects in the MANOVAs were followed by univariate ANOVAs on each dependent variable. For each statistically significant main or interaction effect in the ANOVAs, pairwise multiple Tukey-Kramer adjusted comparisons were performed on the LS-means. All MANOVAs, ANOVAs, and post-hoc comparisons were conducted with a significance level of $\alpha = 0.05$.

Results

Phase I: Individual AP Exams

MANOVA Results

Table 3 summarizes the one-way MANOVA results for the Phase I analyses. The table includes the Wilks' Lambda, F-statistic and p-value for each of the 40 MANOVAs conducted across ten AP Exam subjects for four entering classes. The table shows that all MANOVAs in the Phase I analyses yielded statistically significant differences in the multivariate means of the comparison groups at $\alpha = 0.05$.

Because the MANOVAs for all AP Exam subjects across all four entering classes were statistically significant, they were each followed up with post-hoc analyses, which included univariate ANOVAs and multiple pairwise Tukey-Kramer comparisons of the LS-means for the three credit hour and three GPA outcome measures. In addition, separate univariate ANOVAs were run on sequent course grades for the four AP Exam subjects that had sequent courses identified by UT. The sample sizes and LS-means used in the analyses are given in Tables 4-13 for the ten individual AP Exams investigated. All statistically significant Tukey-Kramer pairwise comparisons are also identified in each table. The following sections summarize the results for each of the ten individual AP Exams.

AP Biology

Table 4 presents the sample sizes, LS-means, and Tukey-Kramer pairwise comparison results for the AP Biology groups. As noted earlier, the UT Austin biology courses for which an AP student can receive credit by exam changed starting in the 2000-01 academic year. There is no sequent course for the UT biology sequence starting with the 2000 entering class because students earn credit for the entire introductory biology course sequence. Also, the Concurrent groups in 2000 and 2001 were deemed too small for inclusion in the analysis.

In Table 4, we see that the AP Credit group significantly outperformed the AP No Credit group in overall college credit hours and GPA, first-year GPA, subject (biology) credit hours and GPA for all four entering classes, and first-year credit hours in three of the four classes. In addition, compared to the Non-AP group, the AP Credit group had significantly higher LS-means for overall college credit hours and subject credit hours and GPA in all four years, and for first-year credit hours in two of the entering classes. For the two entering classes that had large enough Concurrent groups (1998 and 1999), the AP Credit group had significantly higher biology GPA than the Concurrent group in both years. The Concurrent group, on the other hand, earned significantly more biology credit hours than the Non-AP and AP No Credit groups in both years.

The Non-AP group also outperformed the AP No Credit group on several outcome measures, especially the three GPA dependent measures. The Non-AP students had significantly higher LS-means for first-year and subject GPAs in all four entering classes and for overall GPA in two of the four classes. They also earned significantly more college credit hours overall in two of the four years. The AP No Credit group, however, earned significantly more biology credit hours than the Non-AP group in two of the four years.

Overall, three primary trends were observed in the AP Biology analysis. They included: the AP Credit students performing consistently better than the other three groups, particularly in their

biology GPAs; the Concurrent students earning the most biology credit hours; and the Non-AP students achieving better GPAs in their first year, in biology courses, and overall compared to the AP No Credit group.

AP Calculus AB

Table 5 gives the sample sizes, LS-means, and pairwise comparisons results for the AP Calculus AB groups. In all four entering classes, there were no students in the Concurrent group, thus it was excluded from the analysis. AP Calculus AB, however, was the only AP Exam that had a sufficient number of students in the *AP Did Not Claim CBE* group. Thus, this group was included in the analysis for this AP Exam. Consequently, AP Calculus AB also had four comparison groups.

For AP Calculus AB, the AP Credit group substantially outperformed the AP No Credit group. The LS-means for every outcome measure in all entering classes were significantly higher for the AP Credit group in all but two instances: first-year credit hours in 1999 and 2000. The AP Credit group also performed significantly better than the matched Non-AP group in most comparisons. The AP Credit group had higher LS-means for overall college credit hours and first-year GPA in all four entering classes, for overall college GPA, first-year credit hours, subject (mathematics) credit hours and GPA in three of the four classes, and for sequent course (M 408D) grades in two of the four classes. Thus, for AP Calculus AB, the AP Credit students were generally superior in college performance than those in the AP No Credit and Non-AP groups.

The Non-AP group performed better than the AP No Credit group on the three GPA outcome measures and sequent course grade. It had significantly higher LS-means for first-year GPA, math GPA, and sequent course grade in all four entering classes and for overall GPA in three of the four classes. It also earned significantly more overall college credit hours in two of the four years.

Because AP Calculus AB was the only AP Exam in the Phase I analysis with sufficient sample sizes to include the AP Did Not Claim CBE group, we will take a closer look at its comparisons with the other three groups for this AP Exam. First, compared to the AP Did Not Claim CBE group, the AP Credit group had a significantly higher math GPA in all four comparison years and higher first-year GPA in two of the years. Students in the AP Did Not Claim CBE group, however, earned significantly more math credit hours than the AP Credit students in the two of the four entering classes. This implies that although these two groups of AP students both attained high enough exam grades in AP Calculus AB to earn credit by exam for the UT introductory calculus course (M 408C), those who chose *not* to claim the credit did not perform

as well in their math courses. They did, on the other hand, earn more math credit hours.

Second, compared to the AP No Credit group, the AP Did Not Claim CBE group had significantly more math credit hours, higher sequent course grades in all four comparison years; more overall college credit hours and higher math GPA in three of the four years; and higher first-year GPA in two of the years. Thus, AP Did Not Claim CBE students tended to be more proficient in college performance, especially in math, than AP No Credit students.

Finally, students in the AP Did Not Claim CBE group also had significantly more math credit hours than the Non-AP group in all four entering classes. Therefore, it seems that AP Did Not Claim CBE students consistently earn the most math credit hours in college compared to all other groups studied.

AP Calculus BC

Table 6 presents the sample sizes, LS-means and pairwise comparison results of the AP Calculus BC groups. Like those who took the AP Calculus AB exam, students who received grades of 3 or higher on the AP Calculus BC exam are eligible for credit by exam in the UT introductory differential and integral calculus class (M 408C). Unlike AP Calculus AB students, these AP Calculus BC students can also choose to receive credit by exam in two separate introductory differential and integral calculus courses (M 308K and M 308L). Students in the business school programs often choose this latter route. However, compared to the general UT student population, only a small proportion of students choose to do this. This is why the overall sample sizes of the AP Calculus BC groups are smaller than those of the AP Calculus AB groups. On the other hand, many students did concurrently enroll in M 308K and M 308L while they were still in high school. Thus, there were large enough sample sizes in all four years to include the Concurrent group in the AP Calculus BC analysis.

Two general patterns emerged from the comparison of the AP Calculus BC groups. The first was, once again, the consistently better performance of the AP Credit group. The comparisons of the AP Credit group with the AP No Credit group are similar to what was observed in AP Biology and AP Calculus AB: the AP Credit group significantly outperforming the AP No Credit group in all but a handful of comparisons. In addition, compared to the Non-AP group, the AP Credit group had significantly higher LS-means on all but two pairwise comparisons: overall GPA and first-year credit hours in 2001. And compared to the Concurrent group, AP Credit students had significantly higher math GPA, as well as first-year GPA and credit hours in all four entering classes; and higher overall college GPA in two of the four years.

The second pattern was that the Concurrent group consistently earned the most math credit

hours. Concurrent students had significantly higher LS-means for math credit hours than those in the AP No Credit and Non-AP groups in all four entering classes and those in the AP Credit group in two of the four years.

AP Chemistry

Table 7 presents the descriptive statistics and pairwise comparison results for the AP Chemistry groups. UT students are required to score at least 4 on the AP Chemistry exam to receive credit by exam for two introductory chemistry courses (CH 301 and 302). This credit by exam requirement is one point higher than most other AP Exams, which typically have a minimum AP Exam grade of 3. This likely explains the smaller AP Credit group sizes across all entering classes for AP Chemistry.

The trends observed in the AP Chemistry groups are similar to those just described for the AP Calculus BC groups. First, students in the AP Credit group had consistently higher performance for all outcome measures and entering classes. The AP Credit group significantly outperformed the AP No Credit and Non-AP groups in all but a handful of comparisons. It also had significantly higher LS-means than the Concurrent group for chemistry GPA in all four entering classes and for first-year GPA in three of the four classes. Second, students in the Concurrent group consistently earned the most chemistry credit hours. They had significantly more chemistry credit hours than the AP No Credit and Non-AP students in all four classes.

AP Macroeconomics

Table 8 presents the descriptive statistics and pairwise comparison results for the AP Macroeconomics groups. UT students in 1998-2000 were required to score at least 4 on the AP Macroeconomics exam to receive credit by exam for the introductory Macroeconomics course (ECO 304L). This credit by exam requirement is one point higher than most other AP Exams. This, in part, explains the smaller AP Credit group sizes across all entering classes for AP Macroeconomics. In addition, starting with the 2001 entering class, UT students were required to score a 5 on the AP Macroeconomics exam to receive credit by exam for ECO 304L. This new requirement decreased the size of the AP Credit group even more for 2001 while substantially increasing the size of the AP No Credit group.

Relatively fewer pairwise comparisons of the AP Macroeconomics groups were statistically significant. All the ones that were significant involved the AP Credit group. Specifically, the AP Credit group had significantly higher LS-means than the other three groups in most of the comparisons, with a notable exception being the overall college GPA outcome measure. On the other hand, none of the comparisons between the AP No Credit, Non-AP, and Concurrent groups yielded significant results. Thus, it is clear that for AP Macroeconomics, the college

performance of AP Credit students was substantially better than those in the other groups.

AP English Language and Composition

Table 9 presents the descriptive statistics and pairwise comparison results of the AP English Language and Composition groups. The general trend of the AP Credit group consistently outperforming the other three groups was also evident for this AP Exam. The AP Credit group had significantly higher means in every comparison with the AP No Credit group. It had significantly higher LS-means than the matched Non-AP group for all outcome measures except sequent course (E 316K) grade. The AP Credit group also significantly outperformed the Concurrent group in all outcome measures except subject (English) credit hours in at least two of the four entering classes.

Between the Non-AP and AP No Credit group, comparisons involving the three GPA dependent measures yielded consistent significant findings across the years. The Non-AP group had significantly higher English GPA in all four entering classes, higher first-year GPA in three of the classes, and higher overall college GPA in two of the four classes.

Lastly, as seen in several of the other AP Exams summarized so far, the Concurrent group earned significantly more subject (English) credit hours than the AP No Credit and Non-AP groups in all four entering classes.

AP English Literature and Composition

Table 10 gives the sample sizes, LS-means, and pairwise comparison results for the AP English Literature and Composition groups. The trends observed for this AP Exam subject are similar to what was found for AP English Language and Composition. First, the consistent and better performance of AP Credit students is evident again. The AP Credit group significantly outperformed the AP No Credit and Non-AP group in every outcome measure across all four entering classes. It also significantly outperformed the Concurrent group in first-year credit hours, first-year GPA and English GPA for three of the four years.

Second, the Non-AP group significantly outperformed the AP No Credit group in the three GPA dependent measures. It had significantly higher first-year and English GPAs in all four entering classes and overall college GPA in two of the four classes.

Lastly, the Concurrent group earned significantly more subject credit hours than the other three groups in four years. Thus, Concurrent students consistently earned the most English credit hours during their college careers.

AP Government and Politics: United States

Table 11 presents the sample sizes, LS-means, and pairwise comparison results for the AP Government and Politics: United States groups. Note that to earn credit by exam with their AP Exam grade for the UT American Government course (GOV 310L), students must also take the *UT Austin Test on Texas Government*. Eligibility for credit is based on the grades on both the AP Exam and the UT test.

Similar to the other AP Exams, the consistently higher performance of the AP Credit students also stood out for this AP Exam. The AP Credit group had consistent significantly higher LS-means than the other three groups for all but one outcome measure. This one exception was for subject (government) credit hours, for which very few pairwise comparisons yielded statistically significant results across the four years.

A unique trend observed for this AP Exam subject was the poor performance of the Concurrent group. The Concurrent group had significantly lower LS-means than the Non-AP group for first-year credit hours, first-year GPA and government GPA in two of the four years. It even had significantly lower first-year credit hours than the AP No Credit group for in two of the four entering classes.

AP History: United States

Table 12 gives the descriptive statistics and pairwise comparison results for the AP History: United States groups. Once again, the AP Credit group significantly outperformed the other three groups in all but one outcome measure across the four entering classes. The one exception was for overall college GPA, but even for this outcome measure, the AP Credit group had significantly higher LS-means than the AP No Credit and Concurrent groups in two of the four entering classes. Also, the Concurrent group tended to earn significantly more history credit hours than those in the AP No Credit and Non-AP groups. This result was found for three of the four years.

AP Spanish Language

Table 13 presents the sample sizes, LS-means, and pairwise comparison results for the AP Spanish Language groups. UT students who score a minimum of 2 on the AP Spanish Language exam are eligible to receive credit by exam for at least two of the many introductory Spanish (SPN) courses. This requirement is one point lower than most other AP Exams, which typically have a minimum AP Exam grade of 3. This explains why the AP No Credit groups were substantially smaller than the AP Credit and Non-AP groups for AP Spanish Language across all four entering classes. The Concurrent groups were also a lot smaller. Consequently, the power to detect statistical differences between the two smaller groups – AP No Credit and

Concurrent – and two larger ones – AP Credit and Non-AP – was greatly reduced in our analysis for AP Spanish Language. Even with the lack of statistical power, the AP Credit group still had significantly higher LS-means than the AP No Credit group for subject (Spanish) credit hours in all four years, for subject GPA in three of the four years, and for overall credit hours in two of the four years.

Because of this considerable group size differential, the most meaningful comparisons for AP Spanish Language were those between the AP Credit and Non-AP groups. For these comparisons, the AP Credit group significantly outperformed the matched Non-AP group in most cases. AP Credit students had significantly higher LS-means for overall credit hours, first-year credit hours, Spanish credit hours and Spanish GPA across all four entering classes. Thus, the consistently higher performance of the AP Credit group was evident for this AP Exam as well.

Summary

Three primary trends were observed across the ten AP Exams investigated in Phase I of this study. The first trend was the consistently higher performance of the AP Credit group in most college outcomes measures compared to the other groups. This trend was found in all ten AP Exams investigated. The second trend was how the Concurrent group tended to earn substantially more credit hours in the corresponding subject than the AP No Credit and Non-AP groups, and, in a few instances, even the AP Credit group. This trend was observed in six of the ten AP Exams. The third trend was the better performance of the Non-AP students compared to the AP No Credit group in the GPA dependent measures. This trend was observed in four of the ten AP Exams we analyzed. Table 14 summarizes how the three primary trends were observed across the ten AP Exams.

These trends seem to indicate that the AP No Credit group had the poorest college performance, especially compared to the AP Credit and Non-AP groups. Such a conclusion, however, is somewhat misleading. That the AP No Credit group performed poorer than the AP Credit should come as no surprise. The AP No Credit group consisted of AP students who did not attain high enough AP Exam grades to earn credit by exam for any UT courses in the corresponding subject. Thus, we would have expected the AP No Credit students to be less proficient in college than those who earned credit by exam in the AP Credit group. As for the poorer performance of the AP No Credit group compared to the Non-AP group, we should remember that the non-AP students had been matched by high school and SAT (or ACT) test rank to students in the AP Credit group. Thus, the Non-AP groups used in the various analyses were *not* representative samples of all non-AP students for the respective AP Exams. In fact, as a consequence of matching with the AP Credit group, students in each Non-AP group tended

to be the *more proficient* non-AP students in terms of high school academic achievement. Students in the AP No Credit group were not matched with those in another comparison group, and, by definition of its group membership, tended to be the *less proficient* AP students in high school academic achievement. Thus, it was not surprising to find that the Non-AP group outperformed the AP No Credit group in four of the ten subject areas. One should, therefore, be careful not to over-interpret the comparison results between the AP No Credit and Non-AP groups.

Phase II: Aggregated AP Subject Area Exams

Main Analysis

MANOVA Results

Table 15 summarizes the one-way MANOVA results from the main analysis in Phase II. We see that all 24 MANOVAs, representing six subject areas across four entering classes, yielded statistically significant differences in the multivariate means of the comparison groups at an alpha level of 0.05. Thus, as in Phase I, post-hoc analyses were performed in all cases. The post-hoc analyses included univariate ANOVAs and multiple pairwise Tukey-Kramer comparisons of the LS-means for all six dependent variables. The results for each subject area are described next.

Mathematics Subject Area

Table 16 presents the descriptive statistics and pairwise comparison results for the main analysis in the Mathematics subject area. The Mathematics subject area aggregates five AP Exams: AP Calculus AB, AP Calculus BC, AP Statistics, AP Computer Science A, and AP Computer Science AB. Students who took at least one of these AP Exams were included in the Mathematics AP Group, regardless of their AP Exam grade and whether they received course credit based on the grade. UT courses considered to be college courses in the subject area and used to calculate subject area credit hours and GPA were mathematics (M), statistics (STA) and computer science (CS) courses. Also, several UT departments outside the mathematics department offer entry-level statistics courses. A large number of students enroll in these courses to satisfy program requirements. The courses included EDP 371 in the educational psychology department, SOC 317L in the sociology department, and PSY 418 and PSY 325K offered in the psychology department. Performances in these courses were also taken into account in the analysis for the Mathematics subject area.

Two general trends can be observed in the results for the Mathematics subject area. First, the AP group significantly outperformed the matched Non-AP group on all outcome measures in all

four entering classes. Second, the size of the Concurrent group was very small relative to the other two groups. Both the AP and Non-AP groups were more than 20 times the size of the Concurrent group. This huge group size differential made most comparisons involving the Concurrent group less meaningful. However, one trend still emerged from these comparisons: students in the Concurrent group earned significantly more subject area credit hours than the other two groups in all four years. They also earned significantly more college credit hours overall than the other two groups in two of the four years.

Sciences Subject Area

Table 17 presents the sample sizes, LS-means, and pairwise comparison results for the main analysis in the Sciences subject area. The Sciences subject area aggregates five AP Exams: AP Biology, AP Chemistry, AP Environmental Science, AP Physics B, and Physics C. Students who took at least one of these AP Exams were included in the Sciences AP group, regardless of their AP Exam grade and whether they received course credit based on the grade. UT courses considered to be college courses in the subject area and used to compute subject area credit hours and GPA were in biology (BIO), chemistry (CH) or physics (PHY).

The results for the Sciences are very similar to that for the Mathematics subject area, showing two main trends. First, the AP group significantly outperformed the matched Non-AP in overall college credit hours, first-year credit hours, subject area credit hours, and subject area GPA across all four entering classes, in first-year GPA for three of the four entering classes, and in overall college GPA for two of the classes. Second, despite its relatively small sample size – less than a tenth of either of the other two groups – the Concurrent group had significantly higher LS-means for subject area credit hours than the AP and Non-AP group in all four entering classes. It also had significantly higher LS-means than the Non-AP group for overall college credit hours in three of the four classes.

Foreign Languages Subject Area

Table 18 gives the descriptive statistics and pairwise comparison results for the main analysis in the Foreign Languages subject area. The Foreign Languages subject area aggregates six AP Exams: AP French Languages, AP French Literature, AP German Language, AP Latin, AP Spanish Language, and AP Spanish Literature. Students who took at least one of these AP Exams were included in the Foreign Languages AP group, regardless of their AP Exam grade and whether they received course credit based on the grade. UT courses in the French (FR), German (GER), Latin (LAT) and Spanish (SPN) departments were considered to be college courses in this subject area and used to calculate subject area credit hours and GPA.

The Concurrent groups for the Foreign Languages were very small – they were all less than 50

in the four entering classes. The sample sizes for the AP and Non-AP groups were fifteen to twenty times that of the Concurrent group. Consequently, most comparisons involving the Concurrent group had limited statistical power and meaningful results were generally not found. Thus, the main trend observed for the Foreign Languages subject area was the consistently better performance of the AP group compared to the matched Non-AP group. The AP group had significantly higher LS-means for every college measure across all four entering classes.

Social Sciences Subject Area

Table 19 presents the sample sizes, LS-means, and pairwise comparison results for the main analysis in the Social Sciences subject area. The Social Sciences subject area aggregates 9 AP Exams: AP European History, AP US History, AP World History, AP Human Geography, AP Comparative Government and Politics, AP US Government and Politics, AP Macroeconomics, AP Microeconomics, and AP Psychology. Students who took at least one of these AP Exams were included in the Social Sciences AP group, regardless of their AP Exam grade and whether they received course credit based on the grade. UT courses in history (HIS), geography (GRG), government (GOV), economics (ECO) and psychology (PSY) were considered to be college courses in the subject area and used to calculate subject area credit hours and GPA.

The Concurrent groups for this subject area were considerably larger than those in the Mathematics, Sciences and Foreign Languages subject areas. The sample sizes for the Concurrent group ranged from 400-500 in 1998 to 600-700 in 2001. These sample sizes were around a third to a quarter of the sizes of the other two groups. Thus, comparisons involving the Concurrent group had more statistical power and were more meaningful for the Social Sciences subject area compared to those for the other subject areas.

The general trend of the AP students outperforming their matched counterparts in the Non-AP group was evident in the Social Sciences subject area, too. The AP group had significantly higher LS-means in every college outcome measure across all four entering classes. In addition, compared to the Concurrent group, the AP group had significantly higher LS-means for first-year credit hours, first-year GPA and subject area GPA in all four entering classes, for overall college credit hours in three of the four classes, and for overall college GPA in two of the classes. Thus, with large enough sample sizes that allow for meaningful comparisons with the Concurrent group, the AP group significantly outperformed the Concurrent group on most outcome measures.

The other trend observed in this subject area is that students in the Concurrent group earned significantly more subject area and overall college credit hours than those in the Non-AP group in all four entering classes. Recall that this is trend similar to what was observed in the

Mathematics and Sciences subject areas.

English Subject Area

Table 20 presents the sample sizes, LS-means, and pairwise comparison results for the main analysis in the English subject area. The English subject area aggregates only two AP Exams: AP English Language and Composition and AP English Literature and Composition. Students who took at least one of these two AP Exams are included in the English AP group, regardless of their AP Exam grade and whether they received course credit based on the grade. UT English (E or RHE) courses were considered to be college courses in the subject area and used to calculate subject area credit hours and GPA.

The sample sizes for the Concurrent group were substantially large for this subject area as well. They were generally about 600-700 in most comparisons, although the Concurrent group sizes for the entering class in 2000 was considerably lower (around 300) for all the outcome measures. Thus, we were able to make more meaningful comparisons with the Concurrent group for the English subject area.

The results in this subject area show the AP group outperforming the other two groups once again. The AP group had significantly higher LS-means than the matched Non-AP group for every outcome measure across all four entering classes. More specifically, they had significantly higher LS-means for first-year credit hours, first-year GPA, and subject area GPA in all four classes and higher overall college GPA in two of the four classes compared to the other groups.

The other consistent trend of the Concurrent group earning more credit hours in the subject area was also observed for English. The Concurrent group had significantly more English credit hours than both the AP and Non-AP groups in all four entering classes. It also had significantly more college credit hours overall than the Non-AP group.

Arts Subject Area

Table 21 presents descriptive statistics and comparison results for the main analysis in the Arts subject area. The Arts subject area aggregates three AP Exams: AP Art History, AP Music Theory, and AP Studio Art. Students who took at least one of these three AP Exams are included in the AP group, regardless of their AP Exam grade and whether they received course credit based on the grade. UT courses in art history (ARH), music (MUS), and visual art (ART) were considered to be college courses in the subject area and used to compute subject area credit hours and GPA.

As noted earlier in the sample descriptions, the Concurrent groups for Arts in all four entering classes were considered too small for inclusion in the analyses. Thus, only the AP and Non-AP groups are compared for this subject area. Even the sample sizes for the AP and matched Non-AP groups are not very large, especially compared to the corresponding group sizes in the other five subject areas. Consequently, we could not draw many statistical conclusions from our results in this subject area.

A very consistent pattern was that the LS-means for the AP group was higher than the corresponding Non-AP group in every single case; however, in most cases these differences were not statistically significant. One notable exception was the results for subject credit hours. For all four entering classes, the AP group had significantly more Arts credit hours than the Non-AP group. The magnitude of this difference was large, and a likely explanation for this is that those who took at least one of the Arts subject area AP Exams during high school were also the ones most keenly interested in Arts. Thus, they pursued their interests and enrolled in more Arts courses at the college-level.

Summary

For the Phase II main analysis, two primary trends were observed across the six subject areas. The first was the consistently better performance of the AP group compared to the other two groups. The AP group outperformed the Non-AP group in every subject area except Arts. It also outperformed the Concurrent group in the two subject areas where the sample size for the Concurrent group was sufficiently large. The second trend was how the Concurrent group tended to earn significantly more credit hours in each subject area than the other two groups. This trend was observed for four of the six subject areas. Table 22 summarizes how these two primary trends were observed across the six AP subject areas.

These trends imply that while the Concurrent students earned considerably more credit hours in each subject area than the AP students; the AP students performed substantially better in all courses – whether overall, during their first year, or in the subject area – than the Concurrent students. The Non-AP students, on the other hand, not only took fewer courses, but also did not perform as well in them compared to those in the other two groups, especially the AP students.

AP Subgroup Analysis

MANOVA Results

Tables 23-25 summarize the MANOVA results from the AP subgroup analyses in Phase II. Because of its small AP group size, the Arts subject area was not included in the series of AP

subgroup analyses.

Table 23 gives MANOVA results for the AP subgroups analyses, where the grouping variable is the rounded average grade that a student attained on the AP Exams in the particular AP subject area. In all subject areas, the categories representing average grades of 1 and 2 were collapsed into a single category named “2 or less” to get comparable category sizes with the other three categories (with average grades of “3”, “4”, and “5”). In Table 23, we see that all 20 MANOVAs, representing 5 subject areas across 4 entering classes, yielded statistically significant main effects for the AP average grade at $\alpha = 0.05$. Thus, as in the Phase I analyses and the Phase II main analyses, post-hoc analyses were performed on each dependent measure to compare the LS-means across the average AP Exam grade categories.

Table 24 gives MANOVA results for the AP subgroups analyses based on the number of AP Exams a student has taken in the subject area. For the Mathematics, Sciences, and Social Sciences subject areas, the independent variable had 3 levels (or tiers), representing students who took “1”, “2”, and “3 or more” AP subject area exams. For the Foreign Languages and English subject area, there were only 2 levels (or tiers) on the grouping variable. Very few students took more than 2 of the AP Exams in the Foreign Languages subject area. Thus, the two Foreign Languages tiers were “1” and “2 or more” exams. The English subject area only had 2 AP Exams. Thus, the tiers were simply “1” and “2” exams. In Table 24, we see that, of the 20 MANOVAs ran, six of them were non-significant at $\alpha = 0.05$. They included all 4 MANOVAs for the English subject area, one for the Sciences subject area in 1999, and one for the Foreign Languages subject area in 1999. Thus, it is quite apparent that, for the English subject area, there is no main effect for the number of AP Exams taken. For the 14 MANOVAs that yielded significant main effects, post-hoc analyses were performed on each dependent measure to compare them across the number of AP Exams tiers.

Table 25 gives MANOVA results for the AP subgroups analyses that investigated interaction effects between the average AP Exam grade and the number of exams taken in each subject area on college outcomes. The Mathematics, Sciences and Social Sciences subject area each employed a 4×3 classification system, resulting in 12 interaction subgroups; while the Foreign Languages and English subject areas used a 4×2 classification system, resulting in 8 interaction subgroups. In Table 25, we see that, of the 20 MANOVAs performed, *only* 4 of them yielded statistically significant F-statistics. They were for Sciences in 1999 and 2000, for Social Sciences in 1998, and for English in 1999. Thus, there did *not* appear to be any interaction effects on the set of dependent measures for most subject areas across the years. Because there was not any consistent pattern found in the MANOVA results for any of the subject areas, *no* post-hoc analyses were run on the dependent measures to compare the interaction subgroups.

The results from the post-hoc analyses of the significant main effects in each subject area are described next.

Mathematics Subject Area

Because all MANOVAs for AP average grade and number of AP Exams yielded significant results, post-hoc analyses were conducted in all cases for the Mathematics subject area.

Average AP Exam Grade

Table 26 shows the results from the comparison of AP Average grade categories. With the exception of two cases, the general pattern in the LS-means of all dependent measures is *the higher the average AP Exam grade category, the higher the LS-means*. The two cases that did not exhibit this pattern are first-year credit hours in 1998 and overall college credit hours in 1999, where the “4” categories had slightly higher LS-means than the corresponding “5” categories. The pairwise comparisons that yielded significant differences consistently across the four years were those between the “5” and “2 or less” categories, the “5” and “3” categories, and the “4” and “2 or less” categories for all dependent measures except first-year credit hours.

Number of AP Exams

Table 27 presents the results from the comparison of the number of AP Exams tiers. Most outcome measures did not exhibit any noticeable patterns of statistical significance for the three tiers across the four entering classes. The one measure that did have somewhat of a pattern was subject area credit hours. It appeared that the more AP Exams students took in high school, the more credit hours they earned in the Mathematics subject area in college.

Sciences Subject Area

All MANOVAs for the Sciences subject area yielded statistical significance except for number of AP Exams in 1999. Thus, descriptive statistics and pairwise comparison results are given for every case but that one.

Average AP Exam Grade

Table 28 shows the results from the comparison of AP Average grade categories. The general pattern of *the higher the average AP Exam grade category, the higher the LS-means* can be observed in the three GPA measures and overall college credit hours. This pattern was not as apparent for first-year and subject area credit hours. The pairwise comparisons that yielded significant differences consistently across the four entering classes were those between the “5” and “2 or less” categories, the “5” and “3” categories, and “4” and “2 or less” categories for the three GPA measures and overall college credit hours. In addition, first-year and subject area GPA had significant differences between the “5” and “4” categories, the “3” and “2 or less”

categories in all but one case: first-year GPA in 1999. With the exception of the 2000 entering classes, *none* of the pairwise comparisons for first-year and subject area credit hours were statistically significant.

Number of AP Exams

Table 29 displays the results from the comparison of the number of AP Exams tiers. Only a handful of the pairwise comparisons were statistically significant and no consistent patterns of significance emerged.

Foreign Languages Subject Area

As with the Sciences subject area, all MANOVAs for the Foreign Languages subject area yielded statistical significance except for number of AP Exams in 1999. So, descriptive statistics and comparison results are given for every analysis but that instance.

Average AP Exam Grade

Table 30 shows the results from the comparison of AP Average grade categories. The general pattern of *the higher the average AP Exam grade category, the higher the LS-means* can be observed in all dependent measures. Most pairwise comparisons, however, did not yield significant differences consistently across the four entering classes. The only dependent measure that did was subject area credit hours, where almost all pairwise comparisons between the AP Exam grade categories were statistically significant.

Number of AP Exams

Table 31 displays the results from the comparison of the number of AP Exams tiers. Recall that for the Foreign Languages subject area, only two tiers were used. However, even with two tiers, only a handful of the pairwise comparisons were statistically significant, and no consistent patterns of significance emerged.

Social Sciences Subject Area

For the Social Sciences subject area, all MANOVAs for AP average grade and number of AP Exams yielded significant results. Thus, post-hoc analyses results are reported for all cases.

Average AP Exam Grade

Table 32 shows the results from the comparison of AP Average grade categories. The general pattern of *the higher the average AP Exam grade category, the higher the LS-means* was quite evident. The pairwise comparisons yielded significant differences across the four entering classes for all dependent measures. In fact, for overall college credit hours, first-year GPA and subject GPA, *every* pairwise comparison was significant. For the other three dependent measures, the pairwise comparisons between the “5” and “2 or less” categories, the “5” and “3”

categories, and “4” and “2 or less” categories were significant across all four years.

Number of AP Exams

Table 33 gives the results from the comparison of the number of AP Exams tiers. There was a consistent pattern of statistical significance observed in the pairwise comparisons for three outcome measures. For subject area GPA, subject area credit hours and overall college credit hours, the “3 or more exams” tier was significantly higher than the “1 exam” tier across all four years. For subject area GPA and subject area credit hours, the “3 or more exams” tier was also significantly higher than the “2 exams” tier for all comparisons except subject area credit hours in 2001. Thus, it appears that for these three outcome measures, students who took more AP Exams had consistently higher LS-means.

English Subject Area

For the English subject area, none of the MANOVAs for the number of AP Exams were statistically significant. Thus, post-hoc results are only reported for average AP Exam grades.

Average AP Exam Grade

Table 34 gives the descriptive statistics and pairwise comparison results. The general pattern of *the higher the average AP Exam grade category, the higher the LS-means* was consistently observed in all dependent measures. Most pairwise comparisons yielded significant differences in all four entering classes. In fact, for first-year GPA and subject GPA, every pairwise comparison was significant. For the other four dependent measures, the pairwise comparisons between the “5” and “2 or less” categories, the “5” and “3” categories, and “4” and “2 or less” categories were significant in all years except for first-year credit hours in 1999 and 2001. In addition, the pairwise comparisons between the “3” and “2 or less” categories were significant in all entering classes for overall GPA.

Summary

Across the five subject areas, one primary trend was observed in the AP subgroup analyses results. That trend was the higher the average AP subject area exam grade, the better the performance on the college outcome measures. This trend was observed to varying degrees in each of the five subject areas. It implies that an AP student’s average performance on the exams in a particular AP subject area may be a good predictor of his or her college performance, particularly in that subject area.

Discussion

The results in the two phases of this study provided some compelling evidence to help address

our five research questions on the effect of AP experience on college performance. For research question 1, we saw from Phase I that AP students who earned credit by exam (the AP Credit group) consistently outperformed students in the other groups across all ten AP Exam investigated. This finding is particularly noteworthy considering that the non-AP students had been matched by high school rank and SAT (or ACT) score category to the AP Credit students. This matching procedure tended to eliminate many of the *less proficient* non-AP students from the analysis; that is, those non-AP students who had lower high school ranks and SAT (or ACT) scores. Yet, the AP Credit students still constantly outperformed the non-AP students on every college outcome measure in all ten AP Exams.

The second trend in Phase I, observed in six of the ten AP Exams, was that the concurrently enrolled students tended to earn the most college credit hours in the related subject. To interpret the practical implication of this trend, we need to also consider the fact that students in the Concurrent group generally performed no differently than the Non-AP and AP No Credit groups, particularly in their subject GPAs. Thus, while the Concurrent students tended to have more subject credit hours, they did not perform any better, on average, in those subject courses than the comparison groups including the AP Credit, the non-AP, and the AP No Credit groups. So, these results imply that while student who concurrently enrolled in college courses during high school could expect to have a substantial gain in *quantity* of college credit hours earned in the particular subject area, they did not necessarily have an advantage in the *quality* of their college performance.

The third trend in our Phase I results was the apparent poor performance of the AP students who did not earn CBE (the AP No Credit group). As we pointed out, the AP No Credit group's poor performance relative to the AP Credit group was not unexpected because it is reasonable to assume that the AP No Credit student were less academically proficient in the AP Exam subject to begin with. This also helps to explain why the AP No Credit students did not perform as well as the Non-AP students. In particular, remember that the Non-AP group was a matched group and was hence *not* a representative sample of *all* non-AP students. They should, in fact, be the more academically proficient non-AP students. Thus, it is not surprising to find the Non-AP group outperformed the AP No Credit group in four of the ten subject areas. To draw meaningful conclusions, however, future studies that match non-AP students to the AP No Credit students should be conducted so that more appropriate comparisons can be made.

For research question 2, we saw from the Phase II main analysis that AP students also outperformed the non-AP students on all college outcome measures. This result was observed consistently in five of the six subjects we investigated. The one exception was in the analysis for the Arts subject area, which, due to its relatively small sample of AP students, lacked

statistical power to detect differences between the comparison groups. Nonetheless, the consistency of this trend shows the global effectiveness of the AP Exam experience across distinct subject areas. The trend of Concurrent students earning the most subject area credit hours was found in four of the six subject area. As in Phase I, the Concurrent students performed no better in these subject area courses (in terms of GPAs) than regular non-AP students and they generally did worse than the AP students. Thus, concurrent enrollment in high school seemed to only lead to a *quantitative* gain in subject area credit hours, but not a *qualitative* advantage in college performance. More research is warranted to shed light on possible reasons for the increased number of hours earned by the concurrently enrolled students relative to the other students groups and yet poorer performance in terms of GPA when compared to the AP group.

For research question 3, we saw from the Phase II AP subgroup analyses that, in general, AP students who attained higher average exam grades in a subject area tended to perform better in college. This trend was observed to varying degrees in each of the five subject areas. This implies that the general performance of students on AP Exams may be a good predictor of college performance, particularly in the related subject area.

For research question 4, results from the Phase II AP subgroup analyses did not reveal any consistent effects on the college outcome measures related to the number of AP Exams a student took. And finally, for research question 5, we saw from the AP subgroup analyses in Phase II that there does *not* appear to be an interaction effect between the number of AP Exams taken and the AP average grade on the college outcome measures in any of the subject areas we examined.

Summary

The purpose of this study was to extend previous research on the effect of the AP experience on college performance. It aimed to perform a more global assessment by including more AP Exam subjects and subject areas, by repeating the analyses across a number of recent entering classes, and by examining a large number of college outcome measures. Ten AP Exams and six aggregated AP subject areas were included in the analysis across four entering classes (1998-2001) at the University of Texas at Austin. The college outcome measures included first-year credit hours and GPA, subject or subject area credit hours and GPA, overall college credit hours, overall college GPA, and sequent course grade.

For each of the ten individual AP Exam subjects, AP Students who earned credit by exam consistently outperformed non-AP students in all college outcome measures. For the five of the six aggregated AP subject areas, AP students also outperformed the non-AP students consistently in all college outcome measures. Analysis of the AP students also showed that the

average AP Exam grade a student attains in an AP subject area can be a good indicator of his or her future performance at the college-level, especially in the particular subject area. These study findings provided support that the rapid expansion of the AP Program in recent years has not diminished the validity of AP Exam grades to predict college success.

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Footnotes

1. Beginning in the 2000-2001 academic year, entering freshmen could receive credit by exam for the *entire* introductory Biology course sequence at UT Austin. As a result, there was no specified Biology sequent course. The minimum AP Biology exam score to receive credit by exam, however, was raised to 4 (from 3) starting in 2000-2001.
2. Additional Phase I analyses that, for each AP Exam, directly compared the Concurrent group to a matched AP Credit group was also performed on the same set of dependent measures. In general, the direction of these results matched the findings of the unmatched group comparisons that are represented in this report. The results of these additional analyses are available by request from the authors.

Figures

Figure 1: Distribution of AP Biology Exam Grades in 2001

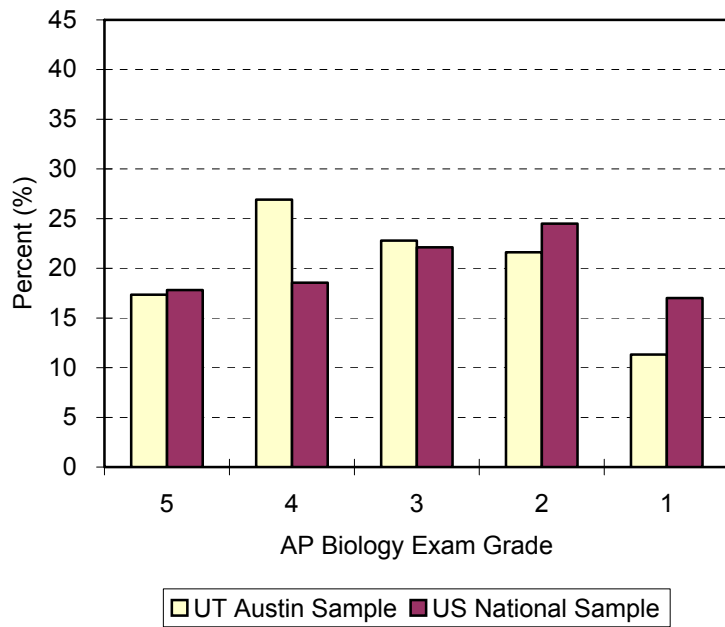


Figure 2: Distribution of AP Calculus AB Exam Grades in 2001

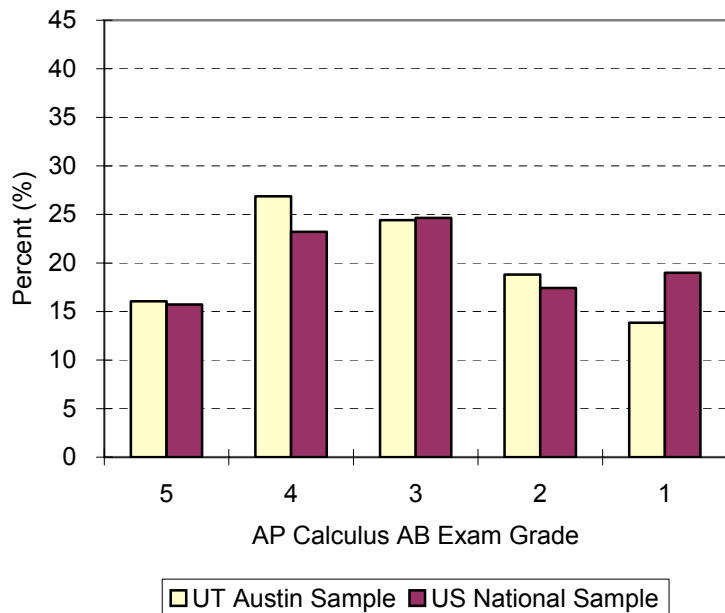


Figure 3: Distribution of AP Calculus BC Exam Grades in 2001

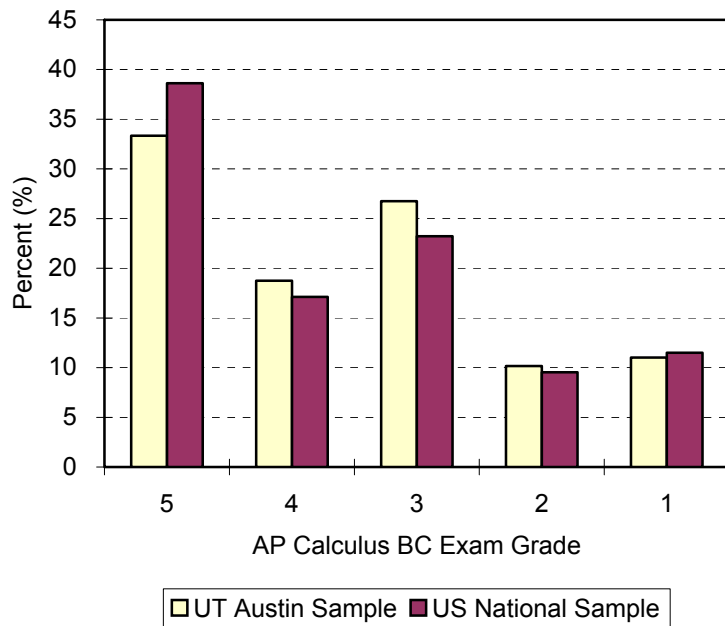


Figure 4: Distribution of AP Chemistry Exam Grades in 2001

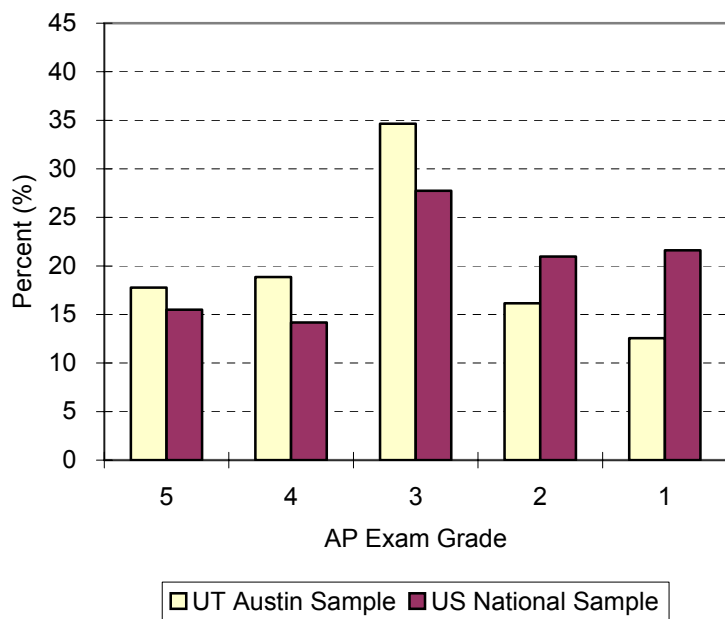


Figure 5: Distribution of AP Macroeconomics Exam Grades in 2001

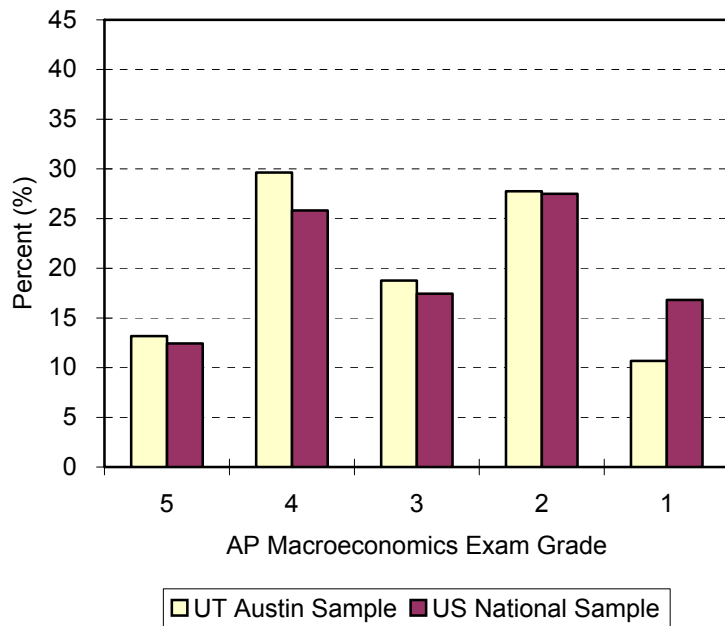


Figure 6: Distribution of AP English Language and Composition Exam Grades in 2001

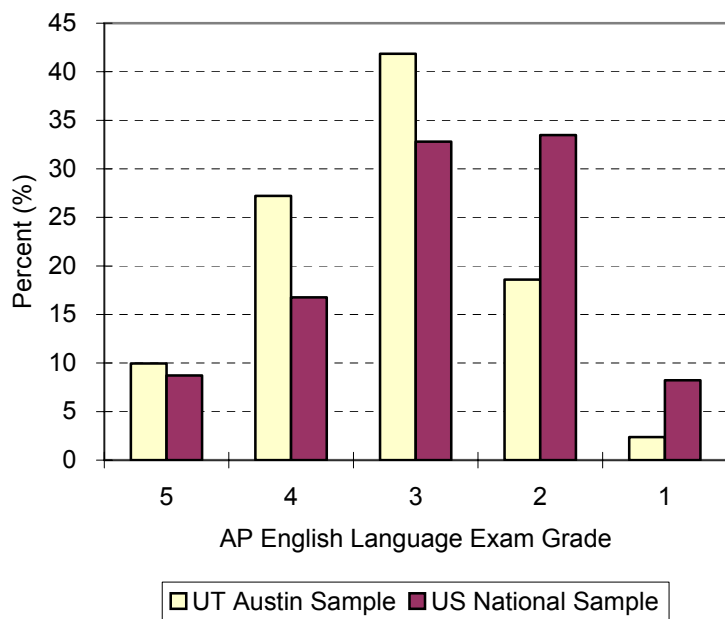


Figure 7: Distribution of AP Literature and Composition Exam Grades in 2001

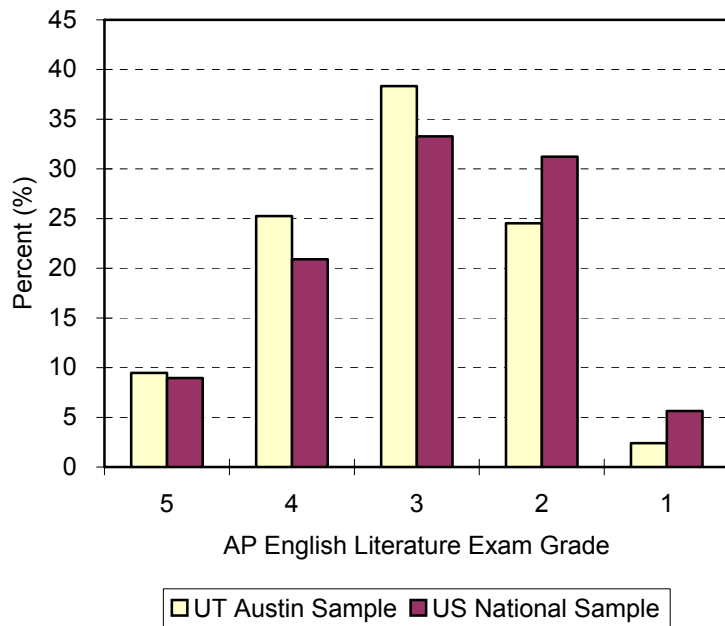


Figure 8: Distribution of AP Government and Politics: United States Exam Grades in 2001

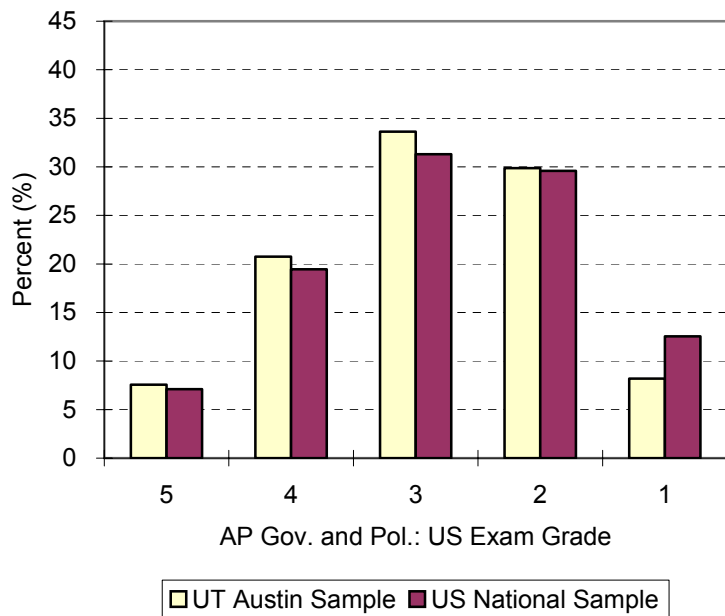


Figure 9: Distribution of AP History: United States Exam Grades in 2001

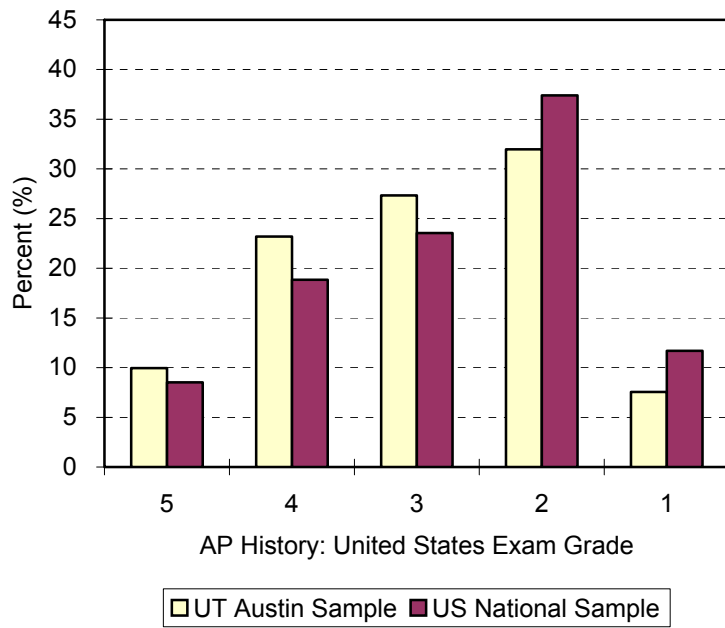
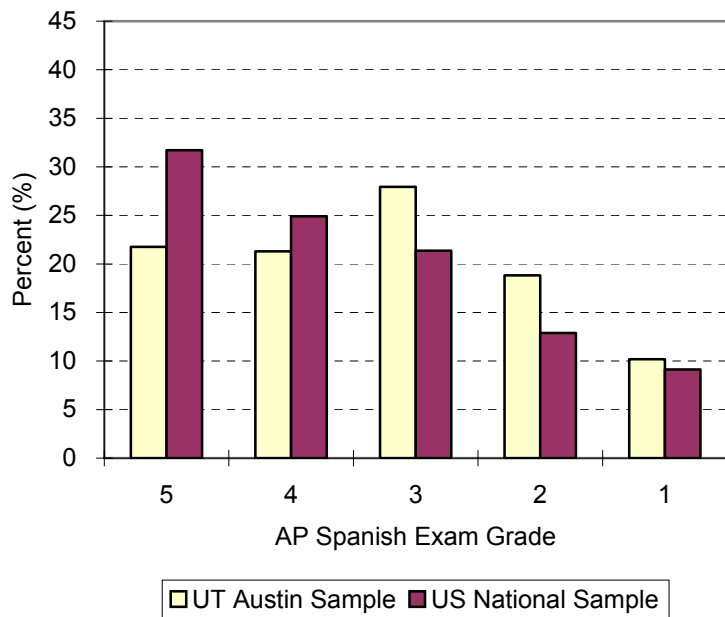


Figure 10: Distribution of AP Spanish Language Exam Grades in 2001



Tables

Table 1: Distribution of Phase I Comparison Groups (prior to matching)

Subject	Group	1998	1999	2000	2001
AP Biology	AP Credit	359	394	231	284
	AP No Credit	108	122	268	287
	Non-AP	2,652	2,922	3,090	2,985
	Concurrent	58	70		
	No Course Credit	2,733	2,837	2,878	2,663
AP Calculus AB	AP Credit	620	726	776	891
	AP No Credit	288	361	437	536
	Non-AP	4,703	4,942	4,922	4,393
	AP Did Not Claim CBE	110	140	155	183
	No Course Credit	189	175	177	216
AP Calculus BC	AP Credit	335	339	447	486
	AP No Credit	106	108	136	146
	Non-AP	5,222	5,634	5,619	5,263
	Concurrent	72	84	87	96
	No Course Credit	161	167	151	193
AP Chemistry	AP Credit	141	143	166	187
	AP No Credit	182	226	259	280
	Non-AP	3,032	3,278	3,273	3,081
	Concurrent	64	66	75	69
	No Course Credit	2,486	2,625	2,687	2,594
AP Macroeconomics	AP Credit	339	301	380	126
	AP No Credit	173	175	248	541
	Non-AP	2,385	2,612	2,504	2,114
	Concurrent	145	165	254	337
	No Course Credit	2,865	3,092	3,079	3,100
AP English Language and Composition	AP Credit	1,361	1,611	1,775	1,907
	AP No Credit	321	412	467	460
	Non-AP	3,246	3,263	2,964	2,511
	Concurrent	737	820	1,027	1,047
	No Course Credit	235	231	211	274
AP English Literature and Composition	AP Credit	1,516	1,718	1,875	1,775
	AP No Credit	415	450	461	667
	Non-AP	3,581	3,777	3,710	3,246
	Concurrent	133	144	175	213
	No Course Credit	250	243	230	298
AP Government and Politics: United States	AP Credit	387	465	484	445
	Non-AP	4,306	4,583	4,412	3,900
	Concurrent	248	297	366	397
	AP No Credit	308	314	459	523
	No Course Credit	661	686	746	954
AP History: United States	AP Credit	423	405	520	551
	AP No Credit	661	805	942	1,016
	Non-AP	4,018	4,230	3,949	3,369
	Concurrent	287	309	490	483
	No Course Credit	519	596	564	795
AP Spanish	AP Credit	457	499	545	551
	AP No Credit	28	28	31	42
	Non-AP	2,359	2,602	2,585	2,326
	Concurrent	22	32	41	44
	No Course Credit	3,043	3,184	3,265	3,255

Table 2: Distribution of Subject Area Groups by Entering Class (before matching)

Subject Area	Group	1998	1999	2000	2001
Mathematics	AP	1,632	1,880	2,263	2,519
	Concurrent	63	69	85	93
	Non-AP	4,065	4,241	3,978	3,429
	No Course Credit	150	155	141	178
Sciences	AP	1,010	1,228	1,326	1,441
	Concurrent	92	103	91	70
	Non-AP	4,030	4,221	4,207	3,931
	No Course Credit	778	793	843	777
Foreign Languages	AP	636	684	742	767
	Concurrent	34	37	39	45
	Non-AP	3,078	3,323	3,243	2,864
	No Course Credit	2,162	2,301	2,443	2,543
Social Sciences	AP	1,870	2,007	2,437	2,587
	Concurrent	447	510	720	740
	Non-AP	3,460	3,671	3,176	2,715
	No Course Credit	133	157	134	177
English	AP	2,436	2,756	2,941	3,146
	Concurrent	644	682	317	787
	Non-AP	2,607	2,690	3,011	2,036
	No Course Credit	223	217	198	250
Arts	AP	113	126	137	173
	Non-AP	2,532	2,811	2,654	2,295
	No Course Credit	3,263	3,407	3,669	3,747

Table 3: Phase I MANOVA Results

Subject	Year	Wilks' Lambda	F	DF for F	Pr > F
AP Biology	1998	0.803	8.73	(18, 1949)	<0.001
	1999	0.784	10.91	(18, 2181)	<0.001
	2000	0.789	13.33	(12, 1274)	<0.001
	2001	0.786	10.30	(18, 2085)	<0.001
AP Calculus AB	1998	0.880	11.39	(18, 4421)	<0.001
	1999	0.873	14.21	(18, 5199)	<0.001
	2000	0.907	11.14	(18, 5734)	<0.001
	2001	0.882	16.71	(18, 6644)	<0.001
AP Calculus BC	1998	0.801	10.26	(18, 2263)	<0.001
	1999	0.826	8.96	(18, 2300)	<0.001
	2000	0.810	12.69	(18, 2959)	<0.001
	2001	0.789	15.80	(18, 3256)	<0.001
AP Chemistry	1998	0.800	5.72	(18, 1253)	<0.001
	1999	0.764	7.73	(18, 1392)	<0.001
	2000	0.768	8.53	(18, 1573)	<0.001
	2001	0.754	9.95	(18, 1703)	<0.001
AP Macroeconomics	1998	0.896	3.70	(18, 1683)	<0.001
	1999	0.848	5.05	(18, 1517)	<0.001
	2000	0.844	6.94	(18, 2020)	<0.001
	2001	0.861	4.71	(18, 1553)	<0.001
AP English Language and Composition	1998	0.880	19.47	(18, 7569)	<0.001
	1999	0.895	19.99	(18, 8986)	<0.001
	2000	0.871	26.32	(18, 9487)	<0.001
	2001	0.871	25.43	(18, 9111)	<0.001
AP English Literature and Composition	1998	0.856	22.49	(18, 7182)	<0.001
	1999	0.857	24.97	(18, 8045)	<0.001
	2000	0.849	27.11	(18, 8211)	<0.001
	2001	0.857	24.21	(18, 7745)	<0.001
AP Government and Politics: United States	1998	0.828	9.94	(18, 2586)	<0.001
	1999	0.799	13.59	(18, 2968)	<0.001
	2000	0.809	14.97	(18, 3462)	<0.001
	2001	0.779	16.69	(18, 3259)	<0.001
AP History: United States	1998	0.762	17.30	(18, 3086)	<0.001
	1999	0.787	16.24	(18, 3307)	<0.001
	2000	0.814	16.44	(18, 3915)	<0.001
	2001	0.808	17.18	(18, 3955)	<0.001
AP Spanish	1998	0.720	17.19	(18, 2509)	<0.001
	1999	0.690	21.15	(18, 2719)	<0.001
	2000	0.696	23.24	(18, 3067)	<0.001
	2001	0.718	21.41	(18, 3103)	<0.001

Table 4: Phase I Statistics and Pairwise Comparison Results for AP Biology

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP Credit	231	159.12 ^{ab}	253	158.24 ^{ab}	169	161.21 ^{ab}	209	135.46 ^{ab}
	AP No Credit	104	134.09 ^{ad}	121	135.72 ^{ae}	258	133.07 ^{ad}	275	115.11 ^a
	Non-AP	348	146.75 ^{bd}	380	143.66 ^b	220	144.86 ^{bd}	260	122.75 ^b
	Concurrent	16	155.88	27	159.74 ^e				
Overall College GPA	AP Credit	231	3.20 ^a	253	3.32 ^a	169	3.38 ^a	209	3.23 ^a
	AP No Credit	104	2.92 ^a	121	2.90 ^{ad}	258	3.03 ^a	275	2.97 ^{ad}
	Non-AP	348	3.14	380	3.18 ^d	220	3.18	260	3.22 ^d
	Concurrent	16	2.88	27	3.21				
First-Year Credit Hours	AP Credit	231	40.32 ^{abc}	253	39.67 ^{ab}	169	38.72 ^a	209	37.76
	AP No Credit	104	34.23 ^a	121	35.78 ^a	258	35.05 ^a	275	36.97
	Non-AP	348	36.78 ^b	380	35.25 ^b	220	37.23	260	35.84
	Concurrent	16	29.75 ^c	27	35.37				
First-Year GPA	AP Credit	231	3.30 ^a	253	3.41 ^a	169	3.56 ^{ab}	209	3.40 ^a
	AP No Credit	104	2.96 ^{ad}	121	2.95 ^{ad}	258	3.08 ^{ad}	275	3.02 ^{ad}
	Non-AP	348	3.31 ^d	380	3.27 ^d	220	3.35 ^{bd}	260	3.37 ^d
	Concurrent	16	3.02	27	3.08				
Subject Credit Hours	AP Credit	231	18.21 ^{ab}	253	20.92 ^{ab}	169	24.68 ^{ab}	209	20.67 ^{ab}
	AP No Credit	104	12.74 ^{ae}	121	14.04 ^{ae}	258	16.37 ^{ad}	275	13.74 ^{ad}
	Non-AP	348	10.04 ^{bi}	380	10.64 ^{bi}	220	12.44 ^{bd}	260	9.58 ^{bd}
	Concurrent	16	21.88 ^{ei}	27	26.22 ^{ei}				
Subject GPA	AP Credit	231	3.24 ^{abc}	253	3.33 ^{abc}	169	3.54 ^{ab}	209	3.37 ^{ab}
	AP No Credit	104	2.73 ^{ad}	121	2.66 ^{ad}	258	2.77 ^{ad}	275	2.78 ^{ad}
	Non-AP	348	3.03 ^{bd}	380	2.98 ^{bd}	220	3.14 ^{bd}	260	3.14 ^{bd}
	Concurrent	16	2.51 ^c	27	2.86 ^c				
Sequent Course (BIO303) Grade	AP Credit	97	2.99	81	2.70				
	AP No Credit	36	2.72 ^d	20	2.55				
	Non-AP	88	3.24 ^d	68	2.91				
	Concurrent	6	2.50	4	2.00				

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 5: Phase I Statistics and Pairwise Comparison Results for AP Calculus AB

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP Credit	604	148.07 ^{ab}	702	144.87 ^{ab}	752	140.08 ^{ab}	858	121.70 ^{abc}
	AP No Credit	277	134.91 ^{ae}	344	132.04 ^a	419	126.88 ^{ade}	511	103.76 ^{ade}
	Non-AP	583	138.00 ^b	664	134.63 ^b	714	133.54 ^{bd}	813	113.62 ^{bd}
	AP Did Not Claim CBE	110	145.68 ^e	140	137.05	155	136.90 ^e	183	113.13 ^{ce}
Overall College GPA	AP Credit	604	3.18 ^{ab}	702	3.21 ^{abc}	752	3.24 ^{ab}	858	3.08 ^a
	AP No Credit	277	2.88 ^a	344	2.88 ^{ad}	419	2.88 ^{ade}	511	2.86 ^{ad}
	Non-AP	583	3.03 ^b	664	3.05 ^{bd}	714	3.10 ^{bd}	813	3.00 ^d
	AP Did Not Claim CBE	110	3.01	140	2.96 ^c	155	3.16 ^e	183	2.97
First-Year Credit Hours	AP Credit	604	38.09 ^{ab}	702	36.39 ^b	752	36.32	858	36.57 ^{ab}
	AP No Credit	277	34.59 ^a	344	34.94	419	35.20	511	34.77 ^a
	Non-AP	583	36.15 ^b	664	34.78 ^{bf}	714	35.38	813	34.60 ^b
	AP Did Not Claim CBE	110	36.37	140	37.28 ^f	155	36.44	183	35.96
First-Year GPA	AP Credit	604	3.33 ^{ab}	702	3.35 ^{abc}	752	3.35 ^{ab}	858	3.36 ^{abc}
	AP No Credit	277	2.92 ^{ade}	344	2.95 ^{ad}	419	3.02 ^{ade}	511	2.97 ^{ade}
	Non-AP	583	3.14 ^{bd}	664	3.15 ^{bd}	714	3.20 ^{bd}	813	3.20 ^{bd}
	AP Did Not Claim CBE	110	3.24 ^e	140	3.11 ^c	155	3.26 ^e	183	3.18 ^{ce}
Subject Credit Hours	AP Credit	604	15.09 ^{ab}	702	14.21 ^{abc}	752	13.85 ^{ab}	858	13.07 ^{abc}
	AP No Credit	277	11.98 ^{ae}	344	12.61 ^{ae}	419	12.13 ^{ae}	511	11.17 ^{ae}
	Non-AP	583	12.27 ^{bf}	664	11.98 ^{bf}	714	12.35 ^{bf}	813	11.84 ^{bf}
	AP Did Not Claim CBE	110	16.25 ^{ef}	140	16.38 ^{cef}	155	15.55 ^{ef}	183	15.11 ^{cef}
Subject GPA	AP Credit	604	3.41 ^{abc}	702	3.49 ^{abc}	752	3.49 ^{abc}	858	3.46 ^{abc}
	AP No Credit	277	2.82 ^{ade}	344	2.79 ^{ad}	419	2.91 ^{ade}	511	2.76 ^{ade}
	Non-AP	583	3.08 ^{bd}	664	3.04 ^{bd}	714	3.16 ^{bd}	813	3.13 ^{bd}
	AP Did Not Claim CBE	110	3.13 ^{ce}	140	3.00 ^c	155	3.26 ^{ce}	183	3.09 ^{ce}
Sequent Course (M408D) Grade	AP Credit	380	3.04 ^a	410	3.26 ^{abc}	430	3.19 ^{ab}	489	3.05 ^a
	AP No Credit	98	2.54 ^{ade}	144	2.45 ^{ade}	165	2.56 ^{ade}	196	2.45 ^{ade}
	Non-AP	225	2.89 ^d	250	2.93 ^{bd}	269	2.88 ^{bd}	297	3.03 ^d
	AP Did Not Claim CBE	88	3.02 ^e	117	2.84 ^{ce}	127	3.08 ^e	144	2.96 ^e

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 6: Phase I Statistics and Pairwise Comparison Results for AP Calculus BC

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP Credit	332	157.30 ^{ab}	337	154.58 ^{ab}	445	150.13 ^{ab}	485	132.26 ^{ab}
	AP No Credit	105	143.69 ^a	103	143.92 ^a	129	140.08 ^a	145	117.24 ^{ae}
	Non-AP	316	139.41 ^b	324	139.41 ^b	420	135.65 ^{bf}	466	118.00 ^{bf}
	Concurrent	56	149.04	58	145.16	61	153.44 ^f	69	136.81 ^{ef}
Overall College GPA	AP Credit	332	3.32 ^{ab}	337	3.34 ^{abc}	445	3.32 ^{abc}	485	3.14
	AP No Credit	105	3.01 ^a	103	2.95 ^a	129	3.06 ^a	145	3.09
	Non-AP	316	3.03 ^b	324	3.13 ^b	420	3.05 ^b	466	3.07
	Concurrent	56	3.05	58	2.97 ^c	61	3.00 ^c	69	3.06
First-Year Credit Hours	AP Credit	332	39.88 ^{bc}	337	40.34 ^{abc}	445	38.95 ^{bc}	485	37.17 ^c
	AP No Credit	105	39.86 ^e	103	35.47 ^a	129	37.13 ^e	145	37.59 ^e
	Non-AP	316	36.97 ^{bf}	324	35.06 ^b	420	35.43 ^b	466	35.61
	Concurrent	56	31.21 ^{cef}	58	34.97 ^c	61	32.31 ^{ce}	69	33.30 ^{ce}
First-Year GPA	AP Credit	332	3.47 ^{abc}	337	3.50 ^{abc}	445	3.49 ^{abc}	485	3.47 ^{abc}
	AP No Credit	105	3.08 ^{ad}	103	3.19 ^a	129	3.23 ^a	145	3.21 ^a
	Non-AP	316	3.28 ^{bd}	324	3.30 ^b	420	3.22 ^b	466	3.33 ^{bf}
	Concurrent	56	3.12 ^c	58	3.07 ^c	61	3.08 ^c	69	3.03 ^{cf}
Subject Credit Hours	AP Credit	332	17.79 ^{ab}	337	17.88 ^{ab}	445	17.99 ^{bc}	485	16.64 ^{abc}
	AP No Credit	105	14.94 ^{ae}	103	14.48 ^{ae}	129	16.55 ^{de}	145	12.75 ^{ae}
	Non-AP	316	13.03 ^{bf}	324	12.74 ^{bf}	420	12.11 ^{bdf}	466	11.58 ^{bf}
	Concurrent	56	19.88 ^{ef}	58	18.97 ^{ef}	61	21.66 ^{cef}	69	19.64 ^{cef}
Subject GPA	AP Credit	332	3.57 ^{abc}	337	3.62 ^{abc}	445	3.59 ^{abc}	485	3.60 ^{abc}
	AP No Credit	105	3.04 ^a	103	3.18 ^a	129	3.22 ^a	145	3.24 ^{ae}
	Non-AP	316	3.20 ^b	324	3.31 ^{bf}	420	3.21 ^b	466	3.26 ^{bf}
	Concurrent	56	3.09 ^c	58	2.94 ^{cf}	61	3.01 ^c	69	2.94 ^{cef}
Sequent Course (M408D) Grade	AP Credit	203	3.37 ^{ab}	200	3.52 ^{abc}	286	3.44 ^{ab}	294	3.41 ^{ab}
	AP No Credit	62	2.71 ^a	66	2.89 ^a	80	2.85 ^a	84	2.81 ^{ad}
	Non-AP	145	2.96 ^b	137	3.09 ^b	170	3.13 ^b	177	3.16 ^{bd}
	Concurrent	21	2.81	24	2.83 ^c	19	3.05	27	2.93

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 7: Phase I Statistics and Pairwise Comparison Results for AP Chemistry

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP Credit	108	163.15 ^{ab}	113	169.21 ^{ab}	117	164.87 ^{ab}	129	144.76 ^{ab}
	AP No Credit	179	144.16 ^a	219	142.36 ^a	254	134.56 ^a	271	116.36 ^{ac}
	Non-AP	138	143.23 ^b	139	147.90 ^b	161	141.14 ^b	184	122.96 ^{bf}
	Concurrent	28	156.93	30	159.53	33	150.18	27	143.93 ^{cf}
Overall College GPA	AP Credit	108	3.40 ^{ab}	113	3.40 ^a	117	3.41 ^a	129	3.23 ^a
	AP No Credit	179	3.00 ^a	219	3.00 ^a	254	3.07 ^a	271	2.91 ^a
	Non-AP	138	3.02 ^b	139	3.21	161	3.19	184	3.15
	Concurrent	28	3.15	30	3.23	33	3.08	27	3.10
First-Year Credit Hours	AP Credit	108	39.36	113	42.16 ^{ab}	117	39.67 ^{abc}	129	39.54
	AP No Credit	179	37.32	219	35.63 ^a	254	36.77 ^a	271	36.84
	Non-AP	138	37.23	139	36.71 ^b	161	35.73 ^b	184	36.79
	Concurrent	28	34.79	30	36.83	33	34.64 ^c	27	35.26
First-Year GPA	AP Credit	108	3.57 ^{ab}	113	3.60 ^{abc}	117	3.57 ^{abc}	129	3.54 ^{ac}
	AP No Credit	179	3.11 ^a	219	3.16 ^a	254	3.21 ^a	271	3.24 ^a
	Non-AP	138	3.20 ^b	139	3.32 ^b	161	3.24 ^b	184	3.39 ^f
	Concurrent	28	3.21	30	3.20 ^c	33	3.04 ^c	27	2.95 ^{cf}
Subject Credit Hours	AP Credit	108	20.32 ^{ab}	113	21.29 ^{ab}	117	21.21 ^{ab}	129	20.08 ^{abc}
	AP No Credit	179	14.70 ^{adc}	219	14.19 ^{ac}	254	14.08 ^{ac}	271	13.73 ^{ac}
	Non-AP	138	10.29 ^{bdf}	139	11.33 ^{bf}	161	11.17 ^{bf}	184	10.67 ^{bf}
	Concurrent	28	25.82 ^{ef}	30	27.97 ^{ef}	33	25.12 ^{ef}	27	28.41 ^{cef}
Subject GPA	AP Credit	108	3.59 ^{abc}	113	3.69 ^{abc}	117	3.62 ^{abc}	129	3.64 ^{abc}
	AP No Credit	179	2.97 ^a	219	3.01 ^a	254	3.04 ^{ac}	271	3.12 ^a
	Non-AP	138	3.08 ^b	139	3.19 ^b	161	3.01 ^b	184	3.21 ^{bf}
	Concurrent	28	2.77 ^c	30	2.84 ^c	33	2.61 ^{ce}	27	2.75 ^{cf}

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 8: Phase I Statistics and Pairwise Comparison Results for AP Macroeconomics

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP Credit	122	145.66	98	149.39 ^b	131	144.11 ^a	52	139.81 ^{abc}
	AP No Credit	153	138.82	151	142.06	209	134.25 ^a	320	119.90 ^a
	Non-AP	286	139.35	251	138.50 ^b	316	139.97	99	121.18 ^b
	Concurrent	43	141.33	45	144.27	67	134.22	87	120.24 ^c
Overall College GPA	AP Credit	122	3.12	98	3.32 ^a	131	3.25	52	2.99
	AP No Credit	153	2.99	151	3.04 ^a	209	3.08	320	2.88
	Non-AP	286	3.01	251	3.18	316	3.13	99	3.01
	Concurrent	43	2.88	45	2.95	67	3.07	87	2.91
First-Year Credit Hours	AP Credit	122	38.02	98	38.86 ^c	131	38.07 ^{bc}	52	36.79
	AP No Credit	153	36.77	151	36.32	209	36.43	320	36.73 ^c
	Non-AP	286	35.88	251	35.78	316	34.87 ^b	99	34.90
	Concurrent	43	36.60	45	32.24 ^c	67	34.21 ^c	87	33.32 ^c
First-Year GPA	AP Credit	122	3.43 ^{abc}	98	3.53 ^{abc}	131	3.59 ^{abc}	52	3.72 ^{abc}
	AP No Credit	153	3.06 ^{ad}	151	3.15 ^a	209	3.12 ^{ad}	320	3.25 ^a
	Non-AP	286	3.24 ^{bd}	251	3.26 ^b	316	3.27 ^{bd}	99	3.32 ^b
	Concurrent	43	3.09 ^c	45	3.10 ^c	67	3.08 ^c	87	3.16 ^c
Subject Credit Hours	AP Credit	122	10.58 ^{ab}	98	10.22 ^{ab}	131	10.89 ^{ab}	52	10.48 ^{abc}
	AP No Credit	153	6.90 ^a	151	6.10 ^a	209	7.05 ^a	320	6.99 ^a
	Non-AP	286	6.57 ^b	251	6.04 ^b	316	6.70 ^b	99	5.87 ^b
	Concurrent	43	9.56	45	8.60	67	8.30	87	7.63 ^c
Subject GPA	AP Credit	122	3.29 ^a	98	3.46 ^{abc}	131	3.42 ^{abc}	52	3.74 ^{abc}
	AP No Credit	153	2.79 ^a	151	2.88 ^a	209	2.72 ^{ad}	320	3.05 ^a
	Non-AP	286	3.04	251	3.09 ^b	316	3.03 ^{bd}	99	3.03 ^b
	Concurrent	43	2.90	45	2.80 ^c	67	2.58 ^{cf}	87	2.80 ^c

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 9: Phase I Statistics and Pairwise Comparison Results for AP English Language and Composition

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP Credit	924	142.28 ^{ab}	1159	139.46 ^{ab}	1204	139.16 ^{abc}	1246	123.81 ^{abc}
	AP No Credit	271	136.10 ^a	339	132.88 ^a	375	128.31 ^a	370	104.63 ^{ae}
	Non-AP	1098	136.07 ^b	1228	132.06 ^{bi}	1238	126.65 ^{bi}	1141	107.59 ^{bi}
	Concurrent	394	137.39	463	137.30 ⁱ	552	131.79 ^{ci}	478	115.67 ^{cei}
Overall College GPA	AP Credit	924	3.11 ^{ab}	1159	3.18 ^{abc}	1204	3.18 ^{abc}	1246	3.16 ^{abc}
	AP No Credit	271	2.91 ^a	339	2.89 ^{ad}	375	2.94 ^a	370	2.79 ^{ade}
	Non-AP	1098	3.00 ^b	1228	3.01 ^{bd}	1238	2.99 ^b	1141	3.01 ^{bd}
	Concurrent	394	3.01	463	3.02 ^c	552	2.98 ^c	478	3.02 ^{ce}
First-Year Credit Hours	AP Credit	924	38.12 ^{abc}	1159	35.81 ^{bc}	1204	36.19 ^{abc}	1246	35.69 ^{abc}
	AP No Credit	271	34.59 ^{ae}	339	34.43 ^e	375	34.39 ^{ae}	370	33.79 ^a
	Non-AP	1098	34.57 ^{bi}	1228	33.45 ^{bi}	1238	33.69 ^{bi}	1141	34.03 ^{bi}
	Concurrent	394	31.81 ^{cei}	463	31.90 ^{cei}	552	31.84 ^{cei}	478	32.47 ^{ci}
First-Year GPA	AP Credit	924	3.25 ^{abc}	1159	3.24 ^{abc}	1204	3.29 ^{abc}	1246	3.32 ^{abc}
	AP No Credit	271	2.90 ^{ad}	339	2.92 ^{ad}	375	2.99 ^a	370	2.87 ^{ade}
	Non-AP	1098	3.08 ^{bd}	1228	3.06 ^{bd}	1238	3.09 ^b	1141	3.10 ^{bd}
	Concurrent	394	3.00 ^c	463	3.04 ^c	552	3.02 ^c	478	3.11 ^{ce}
Subject Credit Hours	AP Credit	924	11.06 ^{ab}	1159	10.56 ^{ab}	1204	10.39 ^{ab}	1246	9.51 ^{abc}
	AP No Credit	271	8.07 ^{ae}	339	7.81 ^{ae}	375	7.61 ^{ae}	370	7.08 ^{ae}
	Non-AP	1098	8.66 ^{bi}	1228	8.33 ^{bi}	1238	7.82 ^{bi}	1141	7.64 ^{bi}
	Concurrent	394	11.55 ^{ei}	463	11.29 ^{ei}	552	10.80 ^{ei}	478	10.93 ^{cei}
Subject GPA	AP Credit	924	3.54 ^{abc}	1159	3.54 ^{abc}	1204	3.56 ^{abc}	1246	3.63 ^{abc}
	AP No Credit	271	3.16 ^{ad}	339	3.10 ^{ad}	375	3.15 ^{ad}	370	3.12 ^{ad}
	Non-AP	1098	3.32 ^{bdf}	1228	3.34 ^{bdf}	1238	3.32 ^{bdf}	1141	3.35 ^{bdf}
	Concurrent	394	3.06 ^{ci}	463	3.15 ^{ci}	552	3.05 ^{ci}	478	3.22 ^{ci}
Sequent Course (E316K) Grade	AP Credit	241	3.24 ^{ac}	287	3.15 ^a	280	3.19 ^a	313	3.36 ^{abc}
	AP No Credit	168	2.92 ^a	206	2.86 ^{adc}	212	2.95 ^a	210	3.06 ^a
	Non-AP	640	3.08	714	3.10 ^d	763	3.11	602	3.15 ^b
	Concurrent	325	2.99 ^c	388	3.13 ^e	461	3.02	377	3.18 ^c

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 10: Phase I Statistics and Pairwise Comparison Results for AP English Literature and Composition

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP Credit	1019	142.81 ^{ab}	1232	140.67 ^{ab}	1215	138.73 ^{ab}	1122	125.18 ^{ab}
	AP No Credit	354	132.72 ^a	377	129.34 ^a	388	125.75 ^a	518	107.77 ^a
	Non-AP	1143	134.90 ^b	1204	132.67 ^b	1274	128.16 ^b	1074	111.73 ^b
	Concurrent	34	137.32	41	134.29	37	140.22	39	118.56
Overall College GPA	AP Credit	1019	3.11 ^{ab}	1232	3.21 ^{ab}	1215	3.20 ^{ab}	1122	3.19 ^{ab}
	AP No Credit	354	2.90 ^a	377	2.91 ^a	388	2.83 ^{ad}	518	2.88 ^{ad}
	Non-AP	1143	2.99 ^b	1204	2.99 ^b	1274	3.01 ^{bd}	1074	3.02 ^{bd}
	Concurrent	34	3.20	41	2.91	37	3.06	39	2.98
First-Year Credit Hours	AP Credit	1019	37.59 ^{abc}	1232	36.35 ^{abc}	1215	36.30 ^{abc}	1122	35.74 ^{ab}
	AP No Credit	354	33.45 ^a	377	33.47 ^a	388	34.43 ^{ac}	518	34.16 ^a
	Non-AP	1143	34.50 ^b	1204	33.52 ^b	1274	33.60 ^{bt}	1074	33.94 ^b
	Concurrent	34	31.32 ^c	41	31.10 ^c	37	29.27 ^{ct}	39	33.00
First-Year GPA	AP Credit	1019	3.25 ^{ab}	1232	3.29 ^{abc}	1215	3.31 ^{abc}	1122	3.34 ^{abc}
	AP No Credit	354	2.86 ^{ad}	377	2.90 ^{ad}	388	2.92 ^{ad}	518	2.93 ^{ad}
	Non-AP	1143	3.06 ^{bd}	1204	3.05 ^{bd}	1274	3.10 ^{bd}	1074	3.15 ^{bd}
	Concurrent	34	3.15	41	3.00 ^c	37	2.97 ^c	39	3.04 ^c
Subject Credit Hours	AP Credit	1019	11.08 ^{abc}	1232	10.95 ^{abc}	1215	10.76 ^{abc}	1122	10.36 ^{abc}
	AP No Credit	354	8.28 ^{ae}	377	7.77 ^{ae}	388	7.76 ^{ae}	518	7.13 ^{ae}
	Non-AP	1143	8.64 ^{bt}	1204	8.30 ^{bt}	1274	8.17 ^{bt}	1074	8.01 ^{bt}
	Concurrent	34	19.68 ^{ct}	41	15.59 ^{ct}	37	15.08 ^{ct}	39	14.46 ^{ct}
Subject GPA	AP Credit	1019	3.63 ^{ab}	1232	3.63 ^{abc}	1215	3.64 ^{abc}	1122	3.69 ^{abc}
	AP No Credit	354	3.10 ^{ad}	377	3.10 ^{ad}	388	3.00 ^{ad}	518	3.12 ^{ad}
	Non-AP	1143	3.24 ^{bd}	1204	3.24 ^{bd}	1274	3.29 ^{bd}	1074	3.35 ^{bd}
	Concurrent	34	3.35	41	3.09 ^c	37	3.12 ^c	39	3.29 ^c

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 11: Phase I Statistics and Pairwise Comparison Results for AP Government and Politics: United States

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP Credit	309	152.63 ^{ac}	401	148.91 ^{abc}	402	150.70 ^{abc}	356	141.06 ^{abc}
	AP No Credit	256	137.49 ^c	263	136.34 ^c	377	132.83 ^c	417	114.86 ^c
	Non-AP	277	141.54 ^a	301	141.61 ^a	326	137.08 ^a	273	117.16 ^a
	Concurrent	81	145.32	94	140.13 ^b	128	132.97 ^b	118	115.96 ^b
Overall College GPA	AP Credit	309	3.23 ^{abc}	401	3.32 ^{abc}	402	3.31 ^{abc}	356	3.26 ^{abc}
	AP No Credit	256	2.87 ^c	263	2.94 ^c	377	3.03 ^c	417	2.91 ^c
	Non-AP	277	3.03 ^a	301	3.10 ^a	326	3.14 ^a	273	2.97 ^a
	Concurrent	81	2.92 ^b	94	2.94 ^b	128	3.02 ^b	118	2.84 ^b
First-Year Credit Hours	AP Credit	309	38.62 ^{abc}	401	36.93 ^{abc}	402	38.91 ^{abc}	356	38.36 ^{abc}
	AP No Credit	256	35.18 ^c	263	34.83 ^{cl}	377	34.23 ^{cl}	417	33.68 ^c
	Non-AP	277	35.36 ^a	301	34.47 ^{ad}	326	35.31 ^{ad}	273	33.30 ^a
	Concurrent	81	34.12 ^b	94	31.27 ^{bdf}	128	31.53 ^{bdf}	118	32.18 ^b
First-Year GPA	AP Credit	309	3.44 ^{abc}	401	3.46 ^{abc}	402	3.52 ^{abc}	356	3.56 ^{abc}
	AP No Credit	256	2.99 ^{ce}	263	3.01 ^{ce}	377	3.08 ^{ce}	417	3.05 ^{ce}
	Non-AP	277	3.17 ^{ac}	301	3.25 ^{ade}	326	3.31 ^{adc}	273	3.19 ^{ac}
	Concurrent	81	3.06 ^b	94	3.02 ^{bd}	128	3.06 ^{bd}	118	3.08 ^b
Subject Credit Hours	AP Credit	309	8.30	401	8.40 ^a	402	8.29	356	9.09
	AP No Credit	256	8.39	263	7.80	377	8.54	417	7.84 ^f
	Non-AP	277	7.15 ^d	301	7.15 ^a	326	7.91	273	7.80 ^d
	Concurrent	81	9.98 ^d	94	8.14	128	9.02	118	10.09 ^{df}
Subject GPA	AP Credit	309	3.58 ^{abc}	401	3.60 ^{abc}	402	3.61 ^{abc}	356	3.64 ^{abc}
	AP No Credit	256	2.84 ^c	263	2.74 ^{ce}	377	2.89 ^{ce}	417	2.95 ^c
	Non-AP	277	3.00 ^a	301	3.08 ^{ae}	326	3.19 ^{ade}	273	3.05 ^{ad}
	Concurrent	81	2.96 ^b	94	2.94 ^b	128	2.71 ^{bd}	118	2.80 ^{bd}

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 12: Phase I Statistics and Pairwise Comparison Results for AP History: United States

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP Credit	257	153.62 ^{abc}	238	151.03 ^{abc}	291	146.42 ^{abc}	310	135.41 ^{abc}
	AP No Credit	466	138.74 ^a	573	136.57 ^a	621	132.69 ^a	646	113.87 ^a
	Non-AP	321	140.08 ^b	296	141.64 ^b	368	137.91 ^b	367	117.91 ^b
	Concurrent	57	137.11 ^c	71	134.46 ^c	115	135.68 ^c	86	116.41 ^c
Overall College GPA	AP Credit	257	3.16	238	3.24 ^{ac}	291	3.17 ^c	310	3.14
	AP No Credit	466	2.99	573	3.04 ^a	621	3.03	646	3.00
	Non-AP	321	3.00	296	3.14	368	3.09	367	3.06
	Concurrent	57	3.10	71	2.96 ^c	115	2.87 ^c	86	3.04
First-Year Credit Hours	AP Credit	257	40.92 ^{abc}	238	38.11 ^{abc}	291	38.33 ^{abc}	310	36.80 ^{abc}
	AP No Credit	466	35.50 ^a	573	34.49 ^{ae}	621	34.45 ^a	646	34.68 ^a
	Non-AP	321	35.53 ^b	296	34.73 ^{bf}	368	35.44 ^{bf}	367	34.51 ^b
	Concurrent	57	31.82 ^c	71	30.69 ^{cef}	115	32.46 ^{cf}	86	32.45 ^c
First-Year GPA	AP Credit	257	3.40 ^{abc}	238	3.43 ^{abc}	291	3.37 ^{ac}	310	3.44 ^{abc}
	AP No Credit	466	3.04 ^a	573	3.06 ^{ad}	621	3.14 ^{ad}	646	3.11 ^{ad}
	Non-AP	321	3.15 ^b	296	3.26 ^{bd}	368	3.28 ^{df}	367	3.23 ^{bd}
	Concurrent	57	3.09 ^c	71	3.07 ^c	115	2.98 ^{cf}	86	3.13 ^c
Subject Credit Hours	AP Credit	257	13.98 ^{abc}	238	14.23 ^{abc}	291	13.12 ^{ab}	310	12.22 ^{abc}
	AP No Credit	466	7.54 ^{ae}	573	8.06 ^a	621	7.97 ^{ae}	646	7.19 ^{ae}
	Non-AP	321	7.58 ^{bf}	296	8.31 ^b	368	8.08 ^{bf}	367	6.86 ^{bf}
	Concurrent	57	10.16 ^{cef}	71	10.23 ^c	115	13.02 ^{cf}	86	10.14 ^{cef}
Subject GPA	AP Credit	257	3.50 ^{abc}	238	3.52 ^{abc}	291	3.50 ^{abc}	310	3.61 ^{abc}
	AP No Credit	466	2.90 ^a	573	2.88 ^a	621	2.93 ^a	646	3.01 ^a
	Non-AP	321	2.90 ^b	296	2.99 ^b	368	3.03 ^b	367	3.06 ^b
	Concurrent	57	2.96 ^c	71	2.99 ^c	115	2.89 ^c	86	2.94 ^c

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 13: Phase I Statistics and Pairwise Comparison Results for AP Spanish Language

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP Credit	457	149.45 ^{ab}	499	149.30 ^b	543	147.45 ^b	551	132.05 ^{ab}
	AP No Credit	26	130.81 ^a	24	131.96	28	138.07	40	112.30 ^a
	Non-AP	409	138.58 ^b	435	137.68 ^b	506	134.13 ^b	497	116.85 ^b
	Concurrent	5	129.20	13	133.00	19	144.95	20	119.60
Overall College GPA	AP Credit	457	3.13	499	3.17	543	3.24 ^b	551	3.15
	AP No Credit	26	2.88	24	2.82	28	3.17	40	2.94
	Non-AP	409	3.03	435	3.12	506	2.99 ^b	497	3.08
	Concurrent	5	3.20	13	3.26	19	3.28	20	3.12
First-Year Credit Hours	AP Credit	457	39.19 ^b	499	38.32 ^{bc}	543	37.66 ^b	551	37.25 ^b
	AP No Credit	26	34.73	24	34.75	28	33.32	40	34.43
	Non-AP	409	34.90 ^b	435	34.86 ^b	506	35.20 ^b	497	35.13 ^b
	Concurrent	5	28.40	13	28.85 ^c	19	32.42	20	33.60
First-Year GPA	AP Credit	457	3.23 ^b	499	3.26	543	3.25	551	3.29 ^a
	AP No Credit	26	3.02	24	2.94	28	3.34	40	3.01 ^a
	Non-AP	409	3.03 ^b	435	3.15	506	3.16	497	3.20
	Concurrent	5	3.11	13	3.24	19	3.14	20	3.37
Subject Credit Hours	AP Credit	457	23.13 ^{ab}	499	23.73 ^{ab}	543	23.69 ^{ab}	551	21.92 ^{ab}
	AP No Credit	26	17.54 ^a	24	14.33 ^{ac}	28	15.86 ^a	40	15.15 ^a
	Non-AP	409	16.20 ^b	435	16.71 ^{bf}	506	15.39 ^b	497	14.55 ^{bf}
	Concurrent	5	15.00	13	25.69 ^{ef}	19	20.11	20	20.65 ^f
Subject GPA	AP Credit	457	3.89 ^{ab}	499	3.91 ^{abc}	543	3.91 ^{bc}	551	3.91 ^{ab}
	AP No Credit	26	3.46 ^a	24	3.60 ^a	28	3.76 ^d	40	3.59 ^a
	Non-AP	409	3.42 ^b	435	3.44 ^b	506	3.45 ^{bd}	497	3.54 ^b
	Concurrent	5	3.40	13	3.52 ^c	19	3.44 ^c	20	3.79

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 14: Summary of Primary Trends Observed in Phase I

AP Examination	Trend 1	Trend 2	Trend 3
AP Biology	√	√	√
AP Calculus AB	√		√
AP Calculus BC	√	√	
AP Chemistry	√	√	
AP Macroeconomics	√		
AP English Language and Composition	√	√	√
AP English Literature and Composition	√	√	√
AP Government and Politics: United States	√		
AP History: United States	√	√	
AP Spanish Language	√		

Legend:

- Trend 1 = *The AP Credit group significantly outperformed the other groups on most outcome measures*
- Trend 2 = *The Concurrent group earned significantly more subject credit hours than the AP No Credit and Non-AP groups*
- Trend 3 = *The Non-AP group significantly outperformed the AP No Credit group in the GPA dependent measures*

Table 15: Phase II MANOVA Results – Main Analysis

Subject	Year	Wilks' Lambda	F	DF for F	Pr > F
Mathematics	1998	0.883	32.21	(12, 6008)	<0.001
	1999	0.880	36.73	(12, 6670)	<0.001
	2000	0.855	53.44	(12, 7900)	<0.001
	2001	0.860	54.79	(12, 8380)	<0.001
Sciences	1998	0.899	17.61	(12, 3844)	<0.001
	1999	0.910	18.36	(12, 4546)	<0.001
	2000	0.905	21.12	(12, 4976)	<0.001
	2001	0.891	26.26	(12, 5306)	<0.001
Foreign Languages	1998	0.754	30.81	(12, 2444)	<0.001
	1999	0.775	29.40	(12, 2600)	<0.001
	2000	0.766	33.50	(12, 2822)	<0.001
	2001	0.804	28.47	(12, 2962)	<0.001
Social Sciences	1998	0.930	22.81	(12, 7432)	<0.001
	1999	0.941	20.60	(12, 7964)	<0.001
	2000	0.932	28.42	(12, 9580)	<0.001
	2001	0.924	31.67	(12, 9488)	<0.001
English	1998	0.892	35.60	(12, 7260)	<0.001
	1999	0.907	34.16	(12, 8186)	<0.001
	2000	0.917	28.83	(12, 7844)	<0.001
	2001	0.916	29.55	(12, 7936)	<0.001
Arts	1998	0.851	2.39	(12, 342)	0.006
	1999	0.749	11.29	(6, 202)	<0.001
	2000	0.776	4.96	(12, 440)	<0.001
	2001	0.840	8.91	(6, 281)	<0.001

Table 16: Phase II Main Analysis Statistics and Pairwise Comparison Results for the Mathematics Subject Area

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP	1,609	144.93 ^b	1,824	141.97 ^b	2,212	137.49 ^{ab}	2,447	117.56 ^{ab}
	Concurrent	56	148.98 ^c	57	144.30 ^c	63	155.95 ^{ac}	69	135.32 ^{ac}
	Non-AP	1,351	131.23 ^{bc}	1,466	126.37 ^{bc}	1,690	124.11 ^{bc}	1,691	104.65 ^{bc}
Overall College GPA	AP	1,609	3.11 ^b	1,824	3.11 ^b	2,212	3.14 ^b	2,447	3.02 ^b
	Concurrent	56	3.03	57	3.05	63	3.03	69	3.03
	Non-AP	1,351	2.96 ^b	1,466	2.94 ^b	1,690	2.97 ^b	1,691	2.91 ^b
First-Year Credit Hours	AP	1,609	37.47 ^{ab}	1,824	36.48 ^b	2,212	36.38 ^{ab}	2,447	36.12 ^b
	Concurrent	56	30.77 ^{ac}	57	34.35	63	32.60 ^a	69	33.62
	Non-AP	1,351	34.13 ^{bc}	1,466	33.11 ^b	1,690	33.04 ^b	1,691	33.38 ^b
First-Year GPA	AP	1,609	3.23 ^b	1,824	3.24 ^b	2,212	3.27 ^b	2,447	3.25 ^{ab}
	Concurrent	56	3.12	57	3.15	63	3.10	69	3.02 ^a
	Non-AP	1,351	3.03 ^b	1,466	2.98 ^b	1,690	3.03 ^b	1,691	3.00 ^b
Subject Credit Hours	AP	1,609	15.85 ^{ab}	1,824	15.51 ^{ab}	2,212	15.09 ^{ab}	2,447	14.14 ^{ab}
	Concurrent	56	19.27 ^{ac}	57	18.79 ^{ac}	63	20.35 ^{ac}	69	19.49 ^{ac}
	Non-AP	1,351	11.78 ^{bc}	1,466	11.51 ^{bc}	1,690	10.85 ^{bc}	1,691	10.11 ^{bc}
Subject GPA	AP	1,609	3.21 ^b	1,824	3.24 ^b	2,212	3.28 ^b	2,447	3.24 ^{ab}
	Concurrent	56	3.07	57	3.08	63	3.07	69	2.88 ^a
	Non-AP	1,351	2.89 ^b	1,466	2.84 ^b	1,690	2.88 ^b	1,691	2.81 ^b

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 17: Phase II Main Analysis Statistics and Pairwise Comparison Results for the Science Subject Area

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP	910	148.38 ^b	1,102	146.40 ^b	1,231	141.34 ^b	1,326	121.27 ^{ab}
	Concurrent	66	152.80 ^c	71	141.04	65	147.57 ^c	45	144.49 ^{ac}
	Non-AP	957	136.72 ^{bc}	1,109	133.55 ^b	1,204	128.28 ^{bc}	1,294	108.39 ^{bc}
Overall College GPA	AP	910	3.06	1,102	3.10 ^b	1,231	3.13 ^b	1,326	3.04
	Concurrent	66	3.05	71	2.98	65	2.96	45	3.09
	Non-AP	957	3.06	1,109	3.01 ^b	1,204	3.04 ^b	1,294	2.98
First-Year Credit Hours	AP	910	38.14 ^{ab}	1,102	37.48 ^{ab}	1,231	36.96 ^{ab}	1,326	36.37 ^b
	Concurrent	66	33.83 ^a	71	33.21 ^a	65	33.62 ^a	45	34.93
	Non-AP	957	35.30 ^b	1,109	34.03 ^b	1,204	34.20 ^b	1,294	34.36 ^b
First-Year GPA	AP	910	3.19	1,102	3.24 ^{ab}	1,231	3.24 ^b	1,326	3.25 ^b
	Concurrent	66	3.16	71	2.97 ^a	65	3.08	45	3.03
	Non-AP	957	3.16	1,109	3.11 ^b	1,204	3.15 ^b	1,294	3.14 ^b
Subject Credit Hours	AP	910	28.48 ^{ab}	1,102	28.06 ^{ab}	1,231	27.73 ^{ab}	1,326	25.93 ^{ab}
	Concurrent	66	36.74 ^{ac}	71	36.23 ^{ac}	65	41.97 ^{ac}	45	49.20 ^{ac}
	Non-AP	957	16.92 ^{bc}	1,109	17.36 ^{bc}	1,204	16.78 ^{bc}	1,294	15.40 ^{bc}
Subject GPA	AP	910	3.04 ^b	1,102	3.08 ^{ab}	1,231	3.08 ^{ab}	1,326	3.12 ^{ab}
	Concurrent	66	2.89	71	2.62 ^a	65	2.75 ^a	45	2.74 ^a
	Non-AP	957	2.92 ^b	1,109	2.88 ^b	1,204	2.92 ^b	1,294	2.95 ^b

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 18: Phase II Main Analysis Statistics and Pairwise Comparison Results for the Foreign Languages Subject Area

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP	631	147.94 ^b	679	148.45 ^b	738	146.69 ^b	763	130.98 ^b
	Concurrent	13	135.00	15	136.27	14	138.71	18	119.39
	Non-AP	588	139.68 ^b	617	136.06 ^b	672	131.01 ^b	712	114.69 ^b
Overall College GPA	AP	631	3.14	679	3.18 ^b	738	3.23 ^b	763	3.14
	Concurrent	13	3.44	15	3.05	14	3.27	18	3.14
	Non-AP	588	3.03	617	3.07 ^b	672	3.05 ^b	712	3.09
First-Year Credit Hours	AP	631	38.94 ^{ab}	679	37.81 ^{ab}	738	37.20 ^b	763	37.01 ^b
	Concurrent	13	29.69 ^a	15	28.27 ^a	14	30.71	18	31.33
	Non-AP	588	35.59 ^b	617	33.94 ^b	672	34.28 ^b	712	34.43 ^b
First-Year GPA	AP	631	3.25 ^b	679	3.27 ^b	738	3.27 ^b	763	3.28 ^b
	Concurrent	13	3.37	15	2.93	14	3.22	18	3.27
	Non-AP	588	3.08 ^b	617	3.11 ^b	672	3.12 ^b	712	3.14 ^b
Subject Credit Hours	AP	631	23.29 ^b	679	23.63 ^b	738	23.53 ^{ab}	763	21.63 ^b
	Concurrent	13	21.92	15	22.20	14	16.57 ^a	18	21.56 ^c
	Non-AP	588	16.09 ^b	617	16.76 ^b	672	16.27 ^b	712	14.89 ^{bc}
Subject GPA	AP	631	3.83 ^{ab}	679	3.83 ^{ab}	738	3.85 ^{ab}	763	3.84 ^b
	Concurrent	13	3.40 ^a	15	3.38 ^a	14	3.41 ^a	18	3.66
	Non-AP	588	3.36 ^b	617	3.32 ^b	672	3.40 ^b	712	3.47 ^b

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 19: Phase II Main Analysis Statistics and Pairwise Comparison Results for the Social Sciences Subject Area

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP	1,811	141.69 ^b	1,936	140.29 ^{ab}	2,318	135.88 ^{ab}	2,417	118.34 ^{ab}
	Concurrent	403	138.90 ^c	476	133.81 ^{ac}	645	130.54 ^{ac}	629	113.63 ^{ac}
	Non-AP	1,512	129.79 ^{bc}	1,582	127.03 ^{bc}	1,840	122.21 ^{bc}	1,712	101.94 ^{bc}
Overall College GPA	AP	1,811	3.07 ^b	1,936	3.11 ^{ab}	2,318	3.12 ^{ab}	2,417	3.03 ^b
	Concurrent	403	3.06 ^c	476	2.99 ^a	645	2.99 ^a	629	2.95
	Non-AP	1,512	2.93 ^{bc}	1,582	2.95 ^b	1,840	2.93 ^b	1,712	2.90 ^b
First-Year Credit Hours	AP	1,811	37.22 ^{ab}	1,936	36.09 ^{ab}	2,318	36.01 ^{ab}	2,417	35.94 ^{ab}
	Concurrent	403	32.63 ^a	476	32.68 ^a	645	32.21 ^a	629	32.06 ^{ac}
	Non-AP	1,512	33.42 ^b	1,582	33.26 ^b	1,840	32.73 ^b	1,712	33.07 ^{bc}
First-Year GPA	AP	1,811	3.19 ^{ab}	1,936	3.21 ^{ab}	2,318	3.23 ^{ab}	2,417	3.22 ^{ab}
	Concurrent	403	3.08 ^{ac}	476	3.02 ^a	645	3.05 ^a	629	3.01 ^a
	Non-AP	1,512	2.96 ^{bc}	1,582	2.99 ^b	1,840	2.99 ^b	1,712	3.00 ^b
Subject Credit Hours	AP	1,811	23.49 ^b	1,936	23.11 ^b	2,318	23.06 ^b	2,417	20.82 ^b
	Concurrent	403	23.63 ^c	476	22.06 ^c	645	22.24 ^c	629	21.11 ^c
	Non-AP	1,512	21.11 ^{bc}	1,582	20.58 ^{bc}	1,840	20.41 ^{bc}	1,712	17.69 ^{bc}
Subject GPA	AP	1,811	3.07 ^{ab}	1,936	3.09 ^{ab}	2,318	3.07 ^{ab}	2,417	3.11 ^{ab}
	Concurrent	403	2.91 ^{ac}	476	2.82 ^a	645	2.78 ^a	629	2.83 ^a
	Non-AP	1,512	2.76 ^{bc}	1,582	2.77 ^b	1,840	2.78 ^b	1,712	2.84 ^b

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 20: Phase II Main Analysis Statistics and Pairwise Comparison Results for the English Area

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP	1,780	139.96 ^b	2,086	137.31 ^b	2,089	135.42 ^b	2,155	118.04 ^{ab}
	Concurrent	353	136.38 ^c	387	136.72 ^c	136	131.70 ^c	360	112.19 ^{ac}
	Non-AP	1,507	128.99 ^{bc}	1,631	127.06 ^{bc}	1,713	123.73 ^{bc}	1,466	103.11 ^{bc}
Overall College GPA	AP	1,780	3.05 ^b	2,086	3.11 ^{ab}	2,089	3.10 ^b	2,155	3.07 ^b
	Concurrent	353	3.01 ^c	387	3.00 ^{ac}	136	2.96	360	2.99
	Non-AP	1,507	2.90 ^{bc}	1,631	2.87 ^{bc}	1,713	2.92 ^b	1,466	2.94 ^b
First-Year Credit Hours	AP	1,780	36.61 ^{ab}	2,086	35.25 ^{ab}	2,089	35.59 ^{ab}	2,155	35.09 ^{ab}
	Concurrent	353	31.53 ^{ac}	387	31.57 ^a	136	30.17 ^{ac}	360	31.72 ^{ac}
	Non-AP	1,507	32.95 ^{bc}	1,631	32.59 ^b	1,713	32.64 ^{bc}	1,466	32.98 ^{bc}
First-Year GPA	AP	1,780	3.14 ^{ab}	2,086	3.16 ^{ab}	2,089	3.20 ^{ab}	2,155	3.19 ^{ab}
	Concurrent	353	2.99 ^a	387	3.02 ^{ac}	136	2.93 ^a	360	3.07 ^a
	Non-AP	1,507	2.92 ^b	1,631	2.90 ^{bc}	1,713	3.00 ^b	1,466	3.00 ^b
Subject Credit Hours	AP	1,780	10.18 ^{ab}	2,086	9.98 ^{ab}	2,089	9.75 ^{ab}	2,155	9.02 ^{ab}
	Concurrent	353	11.51 ^{ac}	387	11.13 ^{ac}	136	11.72 ^{ac}	360	10.54 ^{ac}
	Non-AP	1,507	7.90 ^{bc}	1,631	7.74 ^{bc}	1,713	7.79 ^{bc}	1,466	7.20 ^{bc}
Subject GPA	AP	1,780	3.45 ^{ab}	2,086	3.44 ^{ab}	2,089	3.43 ^{ab}	2,155	3.47 ^{ab}
	Concurrent	353	3.04 ^{ac}	387	3.13 ^a	136	3.00 ^{ac}	360	3.16 ^a
	Non-AP	1,507	3.15 ^{bc}	1,631	3.16 ^b	1,713	3.18 ^{bc}	1,466	3.19 ^b

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 21: Phase II Main Analysis Statistics and Pairwise Comparison Results for the Arts Subject Area

Dependent Measure	Group	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	AP	77	138.96	94	145.33 ^a	100	136.97	135	116.79
	Non-AP	101	135.43	115	132.95 ^a	126	131.31	154	122.11
Overall College GPA	AP	77	3.24	94	3.18 ^a	100	3.23	135	3.23
	Non-AP	101	3.17	115	2.88 ^a	126	3.00	154	3.04
First-Year Credit Hours	AP	77	37.64	94	36.28	100	35.61	135	36.18
	Non-AP	101	33.84	115	35.01	126	35.13	154	35.56
First-Year GPA	AP	77	3.19	94	3.21 ^a	100	3.32	135	3.33
	Non-AP	101	3.03	115	2.94 ^a	126	3.13	154	3.24
Subject Credit Hours	AP	77	20.48 ^a	94	25.49 ^a	100	22.34 ^a	135	16.39 ^a
	Non-AP	101	8.39 ^a	115	4.77 ^a	126	5.60 ^a	154	5.08 ^a
Subject GPA	AP	77	3.34	94	3.53 ^a	100	3.61 ^a	135	3.55
	Non-AP	101	3.32	115	3.24 ^a	126	3.35 ^a	154	3.44

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 22: Summary of Primary Trends Observed in Phase II

AP Subject Area	Trend 1	Trend 2
Mathematics	√	√
Sciences	√	√
Foreign Languages	√*	
Social Sciences	√*	√
English	√	√
Arts		

Legend:

- Trend 1 = *The AP group significantly outperformed the Non-AP group on all college outcome measures (* It also significantly outperformed the Concurrent groups with sufficient sample sizes on every outcome measure except subject area credit hours)*
- Trend 2 = *The Concurrent group earned significantly more subject area credit hours than the other two groups*

Table 23: Phase II MANOVA - AP Subgroup Analysis Main Effect: Average AP Grades

Subject	Year	Wilks' Lambda	F	DF for F	Pr > F
Mathematics	1998	0.962	3.48	(18, 4503)	<0.001
	1999	0.956	4.51	(18, 5106)	<0.001
	2000	0.956	5.57	(18, 6203)	<0.001
	2001	0.942	8.09	(18, 6857)	<0.001
Sciences	1998	0.878	6.58	(18, 2523)	<0.001
	1999	0.899	6.52	(18, 3067)	<0.001
	2000	0.857	10.72	(18, 3429)	<0.001
	2001	0.913	6.70	(18, 3697)	<0.001
Foreign Languages	1998	0.888	4.17	(18, 1748)	<0.001
	1999	0.892	4.31	(18, 1879)	<0.001
	2000	0.913	3.72	(18, 2040)	<0.001
	2001	0.832	7.89	(18, 2113)	<0.001
Social Sciences	1998	0.851	16.55	(18, 5072)	<0.001
	1999	0.840	19.22	(18, 5425)	<0.001
	2000	0.828	24.94	(18, 6503)	<0.001
	2001	0.806	29.81	(18, 6775)	<0.001
English	1998	0.839	17.76	(18, 4993)	<0.001
	1999	0.829	22.35	(18, 5858)	<0.001
	2000	0.839	20.82	(18, 5861)	<0.001
	2001	0.830	22.82	(18, 6050)	<0.001

Table 24: Phase II MANOVA - AP Subgroup Analysis Main Effect: Number of AP Exams

Subject	Year	Wilks' Lambda	F	DF for F	Pr > F
Mathematics	1998	0.987	1.77	(12, 3184)	0.048
	1999	0.962	5.95	(12, 3610)	<0.001
	2000	0.949	9.77	(12, 4386)	<0.001
	2001	0.960	8.39	(12, 4848)	<0.001
Sciences	1998	0.970	2.32	(12, 1784)	0.006
	1999	0.982	1.65	(12, 2168)	0.071
	2000	0.978	2.22	(12, 2424)	0.009
	2001	0.971	3.28	(12, 2614)	<0.001
Foreign Languages	1998	0.952	5.24	(6, 618)	<0.001
	1999	0.987	1.50	(6, 664)	0.176
	2000	0.980	2.49	(6, 721)	0.022
	2001	0.953	6.20	(6, 747)	<0.001
Social Sciences	1998	0.980	3.09	(12, 3586)	<0.001
	1999	0.985	2.46	(12, 3836)	0.003
	2000	0.972	5.56	(12, 4598)	<0.001
	2001	0.983	3.44	(12, 4790)	<0.001
English	1998	0.998	0.56	(6, 1765)	0.763
	1999	0.996	1.32	(6, 2071)	0.243
	2000	0.995	1.72	(6, 2072)	0.111
	2001	0.998	0.81	(6, 2139)	0.559

Table 25: Phase II MANOVA – Subgroup Analysis Interaction Effect: Exams x Averages

Subject	Year	Wilks' Lambda	F	DF for F	Pr > F
Mathematics	1998	0.979	0.93	(36, 6994)	0.596
	1999	0.977	1.19	(36, 7929)	0.205
	2000	0.977	1.42	(36, 9633)	0.050
	2001	0.984	1.09	(36, 10647)	0.321
Sciences	1998	0.955	1.15	(36, 3920)	0.251
	1999	0.953	1.46	(36, 4763)	0.037
	2000	0.946	1.89	(36, 5325)	0.001
	2001	0.971	1.09	(36, 5742)	0.331
Foreign Languages	1998	0.969	1.08	(18, 1748)	0.362
	1999	0.967	1.26	(18, 1879)	0.208
	2000	0.978	0.90	(18, 2040)	0.574
	2001	0.976	1.00	(18, 2113)	0.458
Social Sciences	1998	0.970	1.53	(36, 7876)	0.022
	1999	0.975	1.33	(36, 8425)	0.092
	2000	0.980	1.29	(36, 10098)	0.116
	2001	0.980	1.37	(36, 10520)	0.070
English	1998	0.992	0.76	(18, 4993)	0.751
	1999	0.985	1.74	(18, 5858)	0.027
	2000	0.990	1.17	(18, 5861)	0.277
	2001	0.989	1.34	(18, 6050)	0.152

* **Bolded** entries are significant at the $\alpha = 0.05$ level

Table 26: Phase II Subgroup Analysis Results for Average AP Exam Grade in the Mathematics Subject Area

Dependent Measure	Average Grade	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	2 or less	438	116.23 ^{abc}	507	134.38 ^c	653	129.53 ^{bc}	739	107.44 ^{bc}
	3	418	144.09 ^a	472	131.14 ^{dc}	512	133.54 ^e	607	118.88 ^e
	4	434	152.05 ^b	450	147.09 ^d	569	142.68 ^{bf}	656	124.76 ^{bf}
	5	319	151.83 ^c	395	153.16 ^{ce}	478	154.32 ^{cef}	445	137.13 ^{cef}
Overall College GPA	2 or less	438	2.85	507	2.76 ^{bc}	653	2.84 ^{bc}	739	2.91
	3	418	3.00	472	2.98 ^c	512	3.07 ^e	607	3.00
	4	434	3.10	450	3.16 ^b	569	3.21 ^b	656	3.14
	5	319	3.38	395	3.31 ^{cc}	478	3.38 ^{cc}	445	3.21
First-Year Credit Hours	2 or less	438	32.00 ^b	507	34.67 ^c	653	35.37	739	34.85 ^c
	3	418	40.01	472	36.02	512	38.16	607	37.30
	4	434	39.95 ^b	450	38.06	569	37.44	656	37.56
	5	319	36.53	395	39.78 ^c	478	37.60	445	38.45 ^c
First-Year GPA	2 or less	438	2.90 ^c	507	2.80 ^{bc}	653	3.04 ^{bc}	739	3.07 ^{bc}
	3	418	3.11 ^e	472	3.07 ^e	512	3.22 ^e	607	3.15 ^{de}
	4	434	3.34	450	3.29 ^b	569	3.36 ^{bf}	656	3.40 ^{bdf}
	5	319	3.52 ^{ce}	395	3.46 ^{ce}	478	3.55 ^{cef}	445	3.58 ^{cef}
Subject Credit Hours	2 or less	438	12.40 ^{bc}	507	13.81 ^{bc}	653	16.33 ^c	739	13.18 ^{abc}
	3	418	16.86 ^e	472	16.27 ^e	512	17.09 ^e	607	15.72 ^{ac}
	4	434	19.19 ^b	450	17.85 ^{bf}	569	17.99 ^f	656	16.75 ^{bf}
	5	319	21.51 ^{ce}	395	20.73 ^{cef}	478	21.50 ^{cef}	445	18.51 ^{cef}
Subject GPA	2 or less	438	2.75 ^{bc}	507	2.82 ^{bc}	653	3.01 ^{bc}	739	2.92 ^{bc}
	3	418	3.13 ^e	472	3.12 ^e	512	3.20 ^e	607	3.16 ^{de}
	4	434	3.38 ^b	450	3.43 ^b	569	3.42 ^b	656	3.49 ^{bdf}
	5	319	3.58 ^{ce}	395	3.56 ^{ce}	478	3.59 ^{ce}	445	3.69 ^{cef}

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 27: Phase II Subgroup Analysis Results for Number of AP Exams Taken in the Mathematics Subject Area

Dependent Measure	Number of Exams	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	1	1,368	145.44	1,464	141.89	1,762	137.45	1,825	117.89 ^b
	2	214	144.42	320	145.10	374	140.18	501	119.81
	3 or more	27	133.29	40	137.34	76	142.42	121	128.47 ^b
Overall College GPA	1	1,368	3.13	1,464	3.13	1,762	3.16	1,825	3.04
	2	214	3.08	320	3.11	374	3.15	501	2.97
	3 or more	27	3.04	40	2.92	76	3.06	121	3.18
First-Year Credit Hours	1	1,368	37.52	1,464	36.17	1,762	36.22	1,825	35.91 ^b
	2	214	37.10	320	37.66	374	37.19	501	36.70
	3 or more	27	36.74	40	37.56	76	38.03	121	38.51 ^b
First-Year GPA	1	1,368	3.26	1,464	3.27 ^b	1,762	3.28	1,825	3.30
	2	214	3.18	320	3.25 ^c	374	3.28	501	3.22
	3 or more	27	3.21	40	2.94 ^{bc}	76	3.32	121	3.39
Subject Credit Hours	1	1,368	15.65 ^a	1,464	14.95 ^{ab}	1,762	14.38 ^{ab}	1,825	13.53 ^{ab}
	2	214	17.76 ^a	320	17.82 ^a	374	17.77 ^{ac}	501	16.20 ^{ac}
	3 or more	27	19.05	40	18.73 ^b	76	22.52 ^{bc}	121	18.39 ^{bc}
Subject GPA	1	1,368	3.24	1,464	3.26	1,762	3.31	1,825	3.29
	2	214	3.22	320	3.34	374	3.29	501	3.24
	3 or more	27	3.17	40	3.11	76	3.33	121	3.41

* Means with matching superscript letters within each bear and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 28: Phase II Subgroup Analysis Results for Average AP Exam Grade in the Sciences Subject Area

Dependent Measure	Average Grade	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	2 or less	265	142.51 ^{bc}	346	137.54 ^c	424	124.17 ^{abc}	446	102.65 ^{abc}
	3	241	151.78 ^e	283	143.00 ^e	365	140.50 ^{ade}	364	124.11 ^{ae}
	4	229	160.27 ^b	255	149.55 ^f	218	156.16 ^{bd}	282	130.83 ^{bf}
	5	175	166.68 ^{ce}	218	163.92 ^{cef}	224	162.47 ^{ce}	234	144.55 ^{cef}
Overall College GPA	2 or less	265	2.84 ^{bc}	346	2.74 ^{bc}	424	2.76 ^{abc}	446	2.79 ^c
	3	241	3.03 ^e	283	3.08 ^e	365	3.07 ^{ae}	364	2.99 ^e
	4	229	3.26 ^b	255	3.14 ^b	218	3.25 ^b	282	3.20
	5	175	3.38 ^{ce}	218	3.38 ^{cc}	224	3.43 ^{ce}	234	3.26 ^{ce}
First-Year Credit Hours	2 or less	265	39.27	346	35.93	424	35.04 ^{bc}	446	35.29
	3	241	41.25	283	37.39	365	37.45	364	38.60
	4	229	41.57	255	40.55	218	39.43 ^b	282	36.68
	5	175	38.44	218	40.32	224	39.71 ^c	234	37.65
First-Year GPA	2 or less	265	2.88 ^{abc}	346	2.95 ^{bc}	424	2.96 ^{abc}	446	2.81 ^{abc}
	3	241	3.21 ^{ae}	283	3.15 ^e	365	3.22 ^{ae}	364	3.30 ^{ae}
	4	229	3.40 ^b	255	3.34 ^{bf}	218	3.32 ^{bf}	282	3.40 ^{bf}
	5	175	3.51 ^{ce}	218	3.61 ^{cef}	224	3.62 ^{cef}	234	3.59 ^{cef}
Subject Credit Hours	2 or less	265	25.68	346	24.86	424	20.62 ^{bc}	446	26.70
	3	241	28.83	283	27.56	365	28.05 ^d	364	28.00
	4	229	34.66	255	33.10	218	36.86 ^{bd}	282	33.89
	5	175	34.38	218	34.93	224	35.52 ^c	234	32.94
Subject GPA	2 or less	265	2.51 ^{abc}	346	2.53 ^{abc}	424	2.67 ^{abc}	446	2.68 ^{abc}
	3	241	3.01 ^{ade}	283	3.01 ^{ade}	365	3.06 ^{ae}	364	3.18 ^{ae}
	4	229	3.31 ^{bdf}	255	3.34 ^{bdf}	218	3.26 ^{bf}	282	3.35 ^{bf}
	5	175	3.75 ^{cef}	218	3.75 ^{cef}	224	3.76 ^{cef}	234	3.74 ^{cef}

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 29: Phase II Subgroup Analysis Results for Number of AP Exams Taken in the Sciences Subject Area

Dependent Measure	Number of Exams	1998		2000		2001	
		N	Mean	N	Mean	N	Mean
Overall College Credit Hours	1	716	147.22 ^b	1,008	143.14	1,045	121.99
	2	239	151.16 ^c	220	143.69	283	125.76
	3 or more	55	167.56 ^{bc}	97	150.65	113	128.86
Overall College GPA	1	716	3.06	1,009	3.19 ^b	1,045	3.08
	2	239	3.13	220	3.21 ^c	283	3.07
	3 or more	55	3.20	97	2.98 ^{bc}	113	3.04
First-Year Credit Hours	1	716	37.82 ^b	1,009	37.31	1,045	36.01
	2	239	38.98 ^c	220	37.93	283	37.25
	3 or more	55	43.60 ^{bc}	97	38.49	113	37.89
First-Year GPA	1	716	3.19	1,006	3.30	1,045	3.29
	2	238	3.26	220	3.32	280	3.35
	3 or more	55	3.30	97	3.21	111	3.18
Subject Credit Hours	1	633	28.64	1,009	29.73	1,045	25.37 ^{ab}
	2	225	29.26	220	29.91	283	30.03 ^a
	3 or more	52	34.77	97	31.14	113	35.74 ^b
Subject GPA	1	633	3.03	930	3.14	960	3.16
	2	225	3.17	206	3.22	267	3.27
	3 or more	52	3.24	95	3.21	99	3.28

* Means with matching superscript letters within each bear and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 30: Phase II Subgroup Analysis Results for Average AP Exam Grade in the Foreign Languages Subject Area

Dependent Measure	Average Grade	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	2 or less	194	141.53	179	136.60	186	133.22 ^c	231	127.23
	3	206	146.77	214	156.73	253	149.94	234	129.24 ^d
	4	123	158.21	159	158.59	166	152.85	161	142.95 ^d
	5	108	158.52	127	158.32	133	161.90 ^c	137	135.46
Overall College GPA	2 or less	194	3.19	179	3.17	186	2.97	231	3.25
	3	206	3.16	214	3.21	253	3.15	234	3.15
	4	123	3.03	159	3.22	166	3.19	161	3.27
	5	108	3.18	127	3.32	133	3.41	137	3.23
First-Year Credit Hours	2 or less	194	36.20	179	33.92	186	34.91	231	36.92
	3	206	40.49	214	38.46	253	39.92	234	38.72
	4	123	40.59	159	39.49	166	39.00	161	37.76
	5	108	38.37	127	39.65	133	41.70	137	39.49
First-Year GPA	2 or less	194	3.22	179	3.13	186	3.14	231	3.24
	3	206	3.29	214	3.36	253	3.24	234	3.22
	4	123	3.26	159	3.33	166	3.38	161	3.33
	5	108	3.32	127	3.43	133	3.43	137	3.38
Subject Credit Hours	2 or less	194	20.49 ^{bc}	179	15.01 ^{abc}	186	20.82 ^{bc}	231	16.85 ^{abc}
	3	206	23.64 ^{de}	214	24.44 ^{ac}	253	23.10 ^{de}	234	21.53 ^{ade}
	4	123	29.73 ^{bd†}	159	27.80 ^{bt}	166	28.22 ^{bd}	161	29.91 ^{bd}
	5	108	34.12 ^{ce†}	127	33.89 ^{ce†}	133	31.33 ^{ce}	137	29.45 ^{ce}
Subject GPA	2 or less	194	3.72	179	3.71	186	3.57 ^{abc}	231	3.67 ^{abc}
	3	206	3.89	214	3.88	253	3.89 ^a	234	3.92 ^a
	4	123	3.85	159	3.88	166	3.89 ^b	161	3.88 ^b
	5	108	3.90	127	3.93	133	3.93 ^c	137	3.96 ^c

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 31: Phase II Subgroup Analysis Results for Number of AP Exams Taken in the Foreign Languages Subject Area

Dependent Measure	Number of Eaams	1998		2000		2001	
		N	Mean	N	Mean	N	Mean
Overall College Credit Hours	1	562	148.05	654	147.00	655	130.42
	2 or more	69	154.46	84	151.94	108	137.02
Overall College GPA	1	562	3.15	654	3.23	655	3.09 ^a
	2 or more	69	3.13	84	3.12	108	3.36 ^a
First-Year Credit Hours	1	562	39.36	654	36.72 ^a	655	36.66 ^a
	2 or more	69	38.46	84	41.04 ^a	108	39.79 ^a
First-Year GPA	1	562	3.26	654	3.24	655	3.29
	2 or more	69	3.29	84	3.36	108	3.30
Subject Credit Hours	1	562	23.08 ^a	654	23.69 ^a	655	21.68 ^a
	2 or more	69	30.90 ^a	84	28.04 ^a	108	27.19 ^a
Subject GPA	1	562	3.84	654	3.85	655	3.86
	2 or more	69	3.84	84	3.79	108	3.85

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 32: Phase II Subgroup Analysis Results for Average AP Exam Grade in the Social Sciences Subject Area

Dependent Measure	Average Grade	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	2 or less	581	132.47 ^{abc}	580	132.59 ^{abc}	806	128.82 ^{abc}	877	105.55 ^{abc}
	3	523	140.60 ^{adc}	642	138.49 ^{ade}	702	134.76 ^{ade}	734	117.88 ^{ade}
	4	534	146.35 ^{bdf}	528	146.17 ^{bdf}	609	141.99 ^{bdf}	587	129.62 ^{bdf}
	5	173	161.31 ^{cef}	186	155.77 ^{cef}	201	156.09 ^{cef}	219	140.08 ^{cef}
Overall College GPA	2 or less	581	2.91 ^{abc}	580	2.86 ^{abc}	806	2.95 ^{abc}	877	2.89 ^{abc}
	3	523	3.10 ^{ae}	642	3.14 ^{ae}	702	3.14 ^{ade}	734	3.04 ^{ae}
	4	534	3.10 ^{bf}	528	3.24 ^{bf}	609	3.26 ^{bd}	587	3.14 ^b
	5	173	3.44 ^{cef}	186	3.44 ^{cef}	201	3.34 ^{ce}	219	3.24 ^{ce}
First-Year Credit Hours	2 or less	581	35.35 ^{abc}	580	35.10 ^c	806	34.07 ^{abc}	877	34.16 ^{abc}
	3	523	37.47 ^{ae}	642	36.12 ^e	702	36.07 ^{ad}	734	36.38 ^{ad}
	4	534	38.59 ^b	528	36.86	609	38.23 ^{bd}	587	37.76 ^{bd}
	5	173	40.75 ^{ce}	186	38.58 ^{ce}	201	37.70 ^c	219	36.71 ^c
First-Year GPA	2 or less	581	2.90 ^{abc}	580	2.90 ^{abc}	806	2.96 ^{abc}	877	2.91 ^{abc}
	3	523	3.20 ^{adc}	642	3.20 ^{ade}	702	3.28 ^{ade}	734	3.24 ^{ade}
	4	534	3.35 ^{bdf}	528	3.41 ^{bdf}	609	3.41 ^{bdf}	587	3.45 ^{bdf}
	5	173	3.65 ^{cef}	186	3.66 ^{cef}	201	3.66 ^{cef}	219	3.70 ^{cef}
Subject Credit Hours	2 or less	581	21.58 ^{bc}	580	21.23 ^{bc}	806	21.63 ^{bc}	877	18.41 ^{abc}
	3	523	23.38 ^e	642	22.66 ^{de}	702	22.17 ^{de}	734	20.49 ^{ade}
	4	534	25.29 ^b	528	24.80 ^{bd}	609	25.38 ^{bd}	587	23.18 ^{bd}
	5	173	26.77 ^{ce}	186	27.46 ^{ce}	201	26.88 ^{ce}	219	25.46 ^{ce}
Subject GPA	2 or less	581	2.68 ^{abc}	580	2.69 ^{abc}	806	2.69 ^{abc}	877	2.77 ^{abc}
	3	523	3.10 ^{adc}	642	3.06 ^{ade}	702	3.11 ^{ade}	734	3.13 ^{ade}
	4	534	3.26 ^{bdf}	528	3.34 ^{bdf}	609	3.34 ^{bdf}	587	3.38 ^{bdf}
	5	173	3.63 ^{cef}	186	3.69 ^{cef}	201	3.63 ^{cef}	219	3.72 ^{cef}

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Table 33: Phase II Subgroup Analysis Results for Number of AP Exams Taken in the Social Sciences Subject Area

Dependent Measure	Number of Eaams	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	1	940	141.96 ^b	1,002	141.46 ^b	1,107	135.60 ^b	1,049	119.57 ^b
	2	482	145.20	546	141.51	624	138.76 ^c	724	122.23 ^c
	3 or more	389	148.39 ^b	388	146.81 ^b	587	146.88 ^{bc}	644	128.05 ^{bc}
Overall College GPA	1	940	3.16	1,002	3.14	1,107	3.12 ^b	1,049	3.07
	2	482	3.11	546	3.16	624	3.13 ^c	724	3.09
	3 or more	389	3.14	388	3.21	587	3.27 ^{bc}	644	3.07
First-Year Credit Hours	1	940	37.11 ^b	1,002	36.48	1,107	35.18 ^{ab}	1,049	35.77
	2	482	37.88	546	35.91	624	37.09 ^a	724	36.20
	3 or more	389	39.12 ^b	388	37.61	587	37.28 ^b	644	36.79
First-Year GPA	1	940	3.23 ^b	1,002	3.29	1,107	3.24 ^b	1,049	3.31
	2	482	3.24 ^c	546	3.24 ^c	624	3.32 ^c	724	3.31
	3 or more	389	3.35 ^{bc}	388	3.36 ^c	587	3.41 ^{bc}	644	3.36
Subject Credit Hours	1	940	23.00 ^b	1,002	23.12 ^b	1,107	22.68 ^b	1,049	20.44 ^b
	2	482	23.68 ^c	546	23.06 ^c	624	23.73 ^c	724	21.98
	3 or more	389	26.07 ^{bc}	388	25.93 ^{bc}	587	25.63 ^{bc}	644	23.24 ^b
Subject GPA	1	940	3.12 ^b	1,002	3.16 ^b	1,107	3.10 ^b	1,049	3.19 ^b
	2	482	3.12 ^c	546	3.14 ^c	624	3.16 ^c	724	3.22 ^c
	3 or more	389	3.28 ^{bc}	388	3.29 ^{bc}	587	3.33 ^{bc}	644	3.35 ^{bc}

* Means with matching superscript letters within each bear and dependent measure are significantlb different at the $\alpha = 0.05$ level

Table 34: Phase II Subgroup Analysis Results for Average AP Exam Grade in the English Subject Area

Dependent Measure	Average Grade	1998		1999		2000		2001	
		N	Mean	N	Mean	N	Mean	N	Mean
Overall College Credit Hours	2 or less	388	133.09 ^{bc}	422	131.22 ^{bc}	449	126.55 ^{abc}	513	104.76 ^{abc}
	3	617	137.24 ^e	683	134.35 ^{de}	690	132.35 ^{ade}	687	117.17 ^{ae}
	4	512	141.79 ^{bf}	633	139.60 ^{bd}	629	138.38 ^{bdf}	602	120.57 ^{bf}
	5	263	151.76 ^{cef}	348	144.74 ^{ce}	321	148.90 ^{cef}	353	131.66 ^{cef}
Overall College GPA	2 or less	388	2.88 ^{abc}	422	2.86 ^{abc}	449	2.86 ^{abc}	513	2.81 ^{abc}
	3	617	3.03 ^{ae}	683	3.08 ^{ade}	690	3.09 ^{ae}	687	3.04 ^{ae}
	4	512	3.08 ^b	633	3.20 ^{bd}	629	3.14 ^{bf}	602	3.13 ^{bf}
	5	263	3.24 ^{ce}	348	3.24 ^{ce}	321	3.37 ^{cef}	353	3.43 ^{cef}
First-Year Credit Hours	2 or less	388	33.59 ^{bc}	422	33.34 ^{bc}	449	34.30 ^{bc}	513	33.91 ^b
	3	617	35.40 ^{de}	683	34.69 ^d	690	34.71 ^e	687	34.53 ^d
	4	512	38.39 ^{bd}	633	36.45 ^{bd}	629	36.23 ^b	602	36.38 ^{bd}
	5	263	39.70 ^{ce}	348	36.06 ^c	321	37.69 ^{ce}	353	35.57 ^{ce}
First-Year GPA	2 or less	388	2.85 ^{abc}	422	2.85 ^{abc}	449	2.90 ^{abc}	513	2.85 ^{abc}
	3	617	3.07 ^{ade}	683	3.09 ^{ade}	690	3.15 ^{ade}	687	3.16 ^{ade}
	4	512	3.25 ^{bdf}	633	3.29 ^{bdf}	629	3.29 ^{bdf}	602	3.28 ^{bdf}
	5	263	3.48 ^{cef}	348	3.43 ^{cef}	321	3.55 ^{cef}	353	3.54 ^{cef}
Subject Credit Hours	2 or less	388	8.15 ^{bc}	422	7.68 ^{abc}	449	7.67 ^{abc}	513	6.98 ^{abc}
	3	617	9.50 ^{de}	683	9.31 ^{ade}	690	9.43 ^{ae}	687	8.54 ^{ade}
	4	512	10.89 ^{bdf}	633	10.75 ^{bd}	629	10.17 ^{bf}	602	9.74 ^{bdf}
	5	263	13.46 ^{cef}	348	11.74 ^{ce}	321	12.36 ^{cef}	353	11.61 ^{cef}
Subject GPA	2 or less	388	3.07 ^{abc}	422	2.99 ^{abc}	449	2.98 ^{abc}	513	3.05 ^{abc}
	3	617	3.40 ^{ade}	683	3.37 ^{ade}	690	3.37 ^{ade}	687	3.44 ^{ade}
	4	512	3.55 ^{bdf}	633	3.57 ^{bdf}	629	3.58 ^{bdf}	602	3.58 ^{bdf}
	5	263	3.86 ^{cef}	348	3.84 ^{cef}	321	3.87 ^{cef}	353	3.90 ^{cef}

* Means with matching superscript letters within each year and dependent measure are significantly different at the $\alpha = 0.05$ level

Appendices

Appendix A: UT Austin Courses Eligible for Credit by Exam (CBE)

AP Examination	Academic Years	UT Austin Courses Eligible for CBE	Minimum AP Exam Grade**
Biology	1998-2000	BIO 302, 303, 304	3
	2000-2002	BIO 211, 212, 213, 214	4
Calculus AB	1998-2002	M 408C	3
Calculus BC	1998-2002	M 408C, 308K, 308L	3
Chemistry	1998-2002	CH 301, 302	4
Macroeconomics	1999-2001	ECO 304L	4
	2001-2002	ECO 304L	5
English Language and Composition	1998-2000	E 306	3
	2000-2002	RHE 306	4
English Literature and Composition	1998-2002	E 316K	3
Government and Politics: United States	1998-2002	GOV 310L	*
History: United States	1998-2002	HIS 315K, 315L	4
Spanish Language	1998-2002	SPN 506, 507, 312K, 312L, 319, 327	2

* Eligibility for credit in GOV 310L is based on the *AP Government and Politics: United States* grade and performance on the *UT Austin Test on Texas Government*.

** *Minimum AP Exam Grade* represents the minimum AP grade required to receive CBE for at least one of the eligible courses listed for the respective subject. Some courses have higher AP Exam grade requirements to receive CBE.

Appendix B: Classification of AP Exams into Subject Areas

Subject Area	AP Exams Included
Mathematics	Calculus AB Calculus BC Statistics Computer Science A Computer Science AB
Sciences	Biology Chemistry Environmental Science Physics B Physics C
Foreign Languages	French Language French Literature German Language Latin Spanish Language Spanish Literature
Social Sciences	European History Comparative Government and Politics Human Geography US Government and Politics Macroeconomics Microeconomics Psychology US History World History
English	English Language and Composition English Literature and Composition
Arts	Art History Music Theory Studio Art