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An Investigation of Educational Outcomes for Students Who Earn College Credit Through the College-Level Examination Program[®]

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An Investigation of
Educational Outcomes
for Students Who Earn
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the College-Level
Examination Program®

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Abstract

This study sought to investigate the educational outcomes of the College-Level Examination Program® (CLEP®) for students who earned credit through CLEP compared to those students who earned comparable credit through the Advanced Placement Program® (AP®) and through traditional course enrollment. In order to evaluate the short- and long-term outcomes of CLEP for students who earn credit through the program, outcome measures on three entering classes of students who earned CLEP credit for nine different CLEP examinations were compared to those of closely matched students who earned credit through course enrollment. CLEP students were also compared to students who earned credit through AP in six of the nine subject areas examined. Results indicated that CLEP students did as well as, or better than, those in the comparison groups in nearly every case.

Introduction

The College-Level Examination Program (CLEP), with a history reaching back to the 1960s, grew out of the need for a standardized national testing program that would allow students (particularly nontraditional college applicants and military veterans) to earn college credit for learning that had occurred outside of a traditional classroom (Krieder, 1980). Currently, 34 CLEP examinations are offered. The most recent development in the program was the move in July 2001 to computer-based testing (CBT) for all CLEP examinations. CBT has allowed for the introduction of new types of items, the provision of immediate test results for examinees, and the introduction of a uniform scoring scale (previously, the range of the scales differed across exams). The addition of the same scale score range makes it possible to recommend a uniform credit-granting score for all 34 exams (ETS, 2000). However, similar scores across tests should not be interpreted as having the same meaning.

CLEP has been the subject of a number of outcome studies that looked at the later academic performance of students who earned credit through CLEP examinations. The results have been extremely positive. Researchers have found that students who earned credit through CLEP have higher GPAs later on in college than students who did not earn CLEP credit, both compared to those who did not take CLEP exams (Volker, 1973, as cited in Druesne, 1982; Enger and Whitney, 1974; Hadley, 1974, as cited in Druesne, 1982; Meenihan, 1976, as cited in Druesne, 1982; Ozaki, 1978) and those who took CLEP, but did not earn credit (Richmond and McCluskey, 1973; McCluskey, 1971, as cited in Druesne, 1982; Richmond and McCluskey, 1976, as cited in Druesne, 1982).

Graduation rates for CLEP students are as good as, or better than, those of students in general (Enger and Whitney, 1974). Studies have found that in sequent or later advanced course work in their area of CLEP credit, CLEP students have earned grades of C or better (McCluskey, 1971, as cited in Druesne, 1982; Ozaki, 1974, as cited in Druesne, 1982; Barrett, 1976, as cited in Druesne, 1982). Pliska (1973, as cited in Druesne, 1982) found correlations of .31 to .62 between CLEP scores in economics, education, and sociology, and final course grades in equivalent courses.

However, CLEP has attracted criticism from some members of the higher education community. Critics argue that performance sufficient for earning credit based on CLEP exams would not be sufficient to earn credit in the equivalent college course work (Caldwell, 1973; Apstein, 1975; Stecher, 1977). Previous research refutes this argument. At the University of Texas at Austin, Appenzellar and Kelley (1983) found a high correlation (.66) between preliminary grade in calculus (obtained from the course professors prior to administration of the exam) and CLEP score on the Calculus with Elementary Functions examination. A similar study on the CLEP College Algebra exam (Curran, Appenzellar, Kelley, and Osborn, 1983) found that the correlation between preliminary course grade and CLEP exam score was .61. Additionally, Chapman and Hargrett (1979) found a slightly higher mean score for students at six colleges who took the CLEP examination in Introductory Psychology after completing an introductory psychology course as compared to those in the CLEP reference group.

The Advanced Placement Program (AP) is the main alternative to CLEP for students who desire to gain credit by examination through a national testing program. As a result of some of the features that differentiate it from CLEP, AP has been more widely accepted by the higher education community (Kennamer, 1980). Research has shown that those who receive AP credit do at least as well as, if not better than, students who do not receive AP credit on a number of indicators, including GPA and number of credit hours earned after completing two years of college (Koch, Fitzpatrick, Triscari, Mahoney, and Cope, 1988); grades in sequent courses and more advanced first-year course work in the area of their AP credit (Morgan and Crone, 1993; Morgan and Ramist, 1998; Dodd, Fitzpatrick, De Ayala, and Jennings, 2002); and graduation in four years or less (Morgan and Maneckshana, 2000).

Although much research has been done on the subsequent performance of students who received credit by examination through CLEP and AP, there is a need for additional research that compares student outcomes for the two programs on subject areas where both an AP and a CLEP examination are available. Additionally, most CLEP studies have not compared CLEP students to a matched sample of students who did not earn CLEP

credit. It is important that a comparison group of students with the same level of previous academic success be used because previous research has found differences between the entrance examination scores and high school ranks of students who did and did not earn CLEP credit (McKean, 1972, as cited in Druesne, 1982; Enger and Whitney, 1974; Richmond and McCluskey, 1973; Richmond and McCluskey, 1976, as cited in Druesne, 1982). Furthermore, much of the published research on CLEP is dated.

This study focused on the educational outcomes of students who had been granted credit for CLEP scores at a large, public, four-year university located in the Southwest. These students were compared to students who received AP credit in subject areas where examinations existed in both programs. The students who received credit by examination were compared to separate matched groups of students who had completed the corresponding college course.

Design and Methodology

Six indicators of short- and long-term educational outcomes were investigated:

1. Overall GPA;
2. Sequent course performance;
3. Number of additional courses later taken in the subject area where credit was received;
4. GPA for additional courses later taken in the subject area where credit was received;
5. Number of semesters enrolled; and
6. Graduation rate.

Methodology

For each indicator, students earning CLEP credit were compared to a matched group of students who received credit for completing the equivalent college course and to students who had received credit for the same course through an AP Examination (when a corresponding AP Examination existed). The participants were selected from existing student records data provided by the university. To allow for analysis of the graduation rates, students in the fall 1994, fall 1995, and fall 1996 entering freshman classes were selected as participants. All students who were both eligible for and accepted CLEP credit through the university's credit-by-examination program in the classes of interest were selected. Students from the same entering classes who earned and accepted credit as a result of scores on AP Exams in the areas corresponding to the CLEP tests were selected for participation as well. Students who qualified for credit by examination under

CLEP or AP but did not accept the credit were not included in the study.

Comparison groups of students who either did not take an eligible AP Exam or CLEP test or who took either (or both) tests but did not qualify for credit for these tests and who did complete the equivalent introductory course at the university were selected. Because of potential differences in the ability distributions of the AP and CLEP groups, separate comparison samples were matched to each group. The comparison groups were matched to the AP and CLEP credit-by-examination groups based on high school rank and SAT® total scores. For those students whose records contained ACT scores, ACT composite scores were converted to SAT total scores using the tables provided by Dorans (1999). Students whose records contained missing data for either high school rank or entrance examination score were excluded from participation.

To accomplish the matching, high school rank was divided into five percentile categories. SAT total score was divided into 13 categories by 100-point increments (ranging from 400 to 1600). Credit-by-examination students were assigned to subgroups based on a 5-by-13 table of high school rank by SAT total score. The records of corresponding subgroups of students who had taken the introductory course were searched to randomly select an equal number as in each of the credit-by-examination subgroups. Small differences in the number of students in a credit-by-examination group and its corresponding matched comparison group resulted when insufficient numbers of students were available in the course-taking group.

Because of the change in the scoring scale that was implemented in 2001, an additional exploratory study was conducted with data from the entering class of 2001. Subject size was too limited to calculate inferential statistics because few students in this cohort had submitted CLEP scores based on the new scoring scale.

The university that provided the data for this study currently accepts the following CLEP examinations for credit: American Government, American Literature, English Literature, College Algebra, Calculus, Introductory Psychology, Introductory Sociology, Principles of Macroeconomics, and Principles of Microeconomics. For four of the exams (American Government, American Literature, English Literature, and College Algebra), the university requires that students pass an additional section designed by the university in order to be awarded credit. No specific CLEP score is set as a cutoff for credit for these exams because of the university's supplemental items. The cutoff scores for the remaining exams were as follows for the 1994-95, 1995-96, and 1996-97 academic years:

Calculus	46
Principles of Macroeconomics	48
Principles of Microeconomics	47
Introductory Psychology	47
Introductory Sociology	53

Students who score at the minimums listed received a C for the corresponding introductory course. Students with higher scores earned an A or B.

The AP Exams accepted by the university that correspond to the subject areas of the CLEP tests in the present study were: Government and Politics of the United States, Calculus AB, Psychology, Macroeconomics, and Microeconomics. AP Exams are not offered in sociology or college algebra. An AP Examination in English Literature and Composition is available; however, it was not a suitable comparison to the CLEP American Literature and English Literature examinations. The AP Exam in English Literature differs enough in content from the CLEP literature examinations to make a comparison difficult. Additionally, approximately 100 times as many students earned credit through the AP Examination as through either of the CLEP literature examinations, making a meaningful comparison of the groups difficult. Therefore, the CLEP students who took exams in literature, sociology, and algebra were not compared to those who earned credit through the AP Program.

Data Analyses

In most cases, univariate analyses (one-way ANOVAs or t-tests, as appropriate) were carried out on each subject area examination in each entering class's data and replicated on the subsequent classes. However, due to the very small number of students who received credit for the American Literature, English Literature, and College Algebra CLEP examinations, data from the 1994, 1995, and 1996 entering classes were aggregated for each of the three examinations to provide sufficient power. In these subject areas, only CLEP and a matched group of students who completed the corresponding introductory course were compared. Comparison group students were matched to CLEP students within each entering class year before the data were aggregated. Chi-square tests of association were conducted to analyze data on graduation status for each of the groups in the 1994, 1995, and 1996 classes.

Univariate analyses were planned for the 2001 class data; however, the very small number of students who took the computer-based CLEP tests between the initiation of CBT for CLEP (July 2001) and the time the data were collected (August 2002) made these comparisons impossible. Descriptive data on students who received CLEP credit in the 2001 class and matched comparison group students are presented where meaningful.

For all analyses, the alpha level for rejecting the null hypothesis was set at $p=.01$ due to the large number of univariate tests conducted. In many of the univariate analyses, the homogeneity of variance assumption was violated. Therefore, the Games-Howell post hoc test (which does not assume equal variances) was used for all pairwise comparisons.

Results

Initial Analyses

To determine whether the matched comparison groups and their corresponding credit-by-examination groups had similar mean high school ranks and SAT total scores, one-way ANOVAs (or t-tests, when appropriate) were conducted comparing all groups for each of the nine subject areas on these variables. There were no significant differences between the CLEP group and the corresponding CLEP match group or the AP group and the corresponding AP match group in any of the analyses. However, significant differences were found in some cases between other pairs of groups. When differences existed, the AP group tended to have a higher SAT score or high school rank than the CLEP group and the CLEP match group. The AP match group also tended to be higher on these variables than the CLEP group or the CLEP match group. Table A1 in the Appendix lists the means and standard deviations for high school rank and SAT total score for all groups. Data on high school rank and SAT total score are presented in Table A2 in the Appendix for the 2001 class participants. Due to the very small number of participants, no statistical group comparisons could be calculated to determine if differences existed between the CLEP group and the corresponding matched group.

Overall GPA

Comparisons of final overall GPA were made between students who received credit by examination through AP or CLEP and students who completed the corresponding introductory course for all nine subject areas.

American Government

In the 1994 sample, the groups differed significantly in overall GPA ($F(3, 2392)=107.35, p<.001$). This result held for the 1995 sample ($F(3, 2319)=118.79, p<.001$) and the 1996 sample ($F(3, 2772)=87.03, p<.001$). Post hoc comparisons indicated that the CLEP group had a significantly higher mean GPA than the CLEP match group and than the AP match group in all three classes ($p<.001$ in all cases). Additionally, the AP group had a significantly higher mean GPA than the AP match group and the CLEP match group in all three classes ($p<.001$). In the 1996 class, the difference in mean GPA between the CLEP and AP groups was significant ($p=.003$), with the AP group having a higher mean GPA.

The means and standard deviations for all groups in all years are given in Table 1.

Table 1Overall GPA for American Government Groups by Year¹

Group	1994			1995			1996			2001		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	3.20 ^{a, b}	.51	967	3.27 ^{a, b}	.47	926	3.23 ^{a, b, f}	.51	1,035	3.55	.44	34
CLEP Match	2.77 ^{a, c, e}	.64	947	2.83 ^{a, e}	.67	870	2.88 ^{a, c, e}	.65	1,014	3.20	.66	25
AP	3.31 ^{c, d}	.50	242	3.36 ^{c, d}	.48	350	3.34 ^{c, d, f}	.53	358			
AP Match	2.97 ^{d, e}	.68	237	3.03 ^{d, e}	.64	338	3.04 ^{d, e}	.68	366			

¹ Means with matching superscript letters within each year are different at the $p=.01$ level.**Table 2**Overall GPA for Calculus Groups by Year²

Group	1994			1995			1996			2001		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	3.11	.75	28	3.24 ^a	.54	24	3.41 ^{a, b}	.50	30	3.39	.45	12
CLEP Match	2.92	.81	28	2.93	.67	20	2.90 ^a	.63	26	3.24	.80	11
AP	3.23 ^a	.56	579	3.28 ^b	.61	581	3.25 ^c	.61	697			
AP Match	2.81 ^a	.74	579	2.85 ^{a, b}	.76	563	2.94 ^{b, c}	.72	654			

² Means with matching superscript letters within each year are different at the $p=.01$ level.**Table 3**Overall GPA for Macroeconomics Groups by Year³

Group	1994			1995			1996			2001		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	3.31	.54	53	3.46 ^{a, b}	.42	45	3.49 ^{a, b}	.45	33	3.77	.25	20
CLEP Match	3.00	.78	53	3.04 ^a	.71	44	3.01 ^a	.66	30	2.99	.70	15
AP	3.33 ^a	.55	153	3.34	.57	209	3.40 ^c	.53	166			
AP Match	3.02 ^a	.69	147	3.18 ^b	.61	202	3.13 ^{b, c}	.79	118			

³ Means with matching superscript letters within each year are different at the $p=.01$ level.**Table 4**Overall GPA for Microeconomics Groups by Year⁴

Group	1994			1995			1996			2001		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	3.46 ^a	.40	57	3.22	.49	44	3.50	.33	16	3.90	.16	5
CLEP Match	2.92 ^{a, b}	.58	55	3.02 ^a	.71	44	3.29	.56	16			
AP	3.50 ^b	.46	42	3.49 ^a	.50	48	3.43	.50	56			
AP Match	3.24	.56	41	3.29	.57	44	3.27	.62	56			

⁴ Means with matching superscript letters within each year are different at the $p=.01$ level.**Table 5**Overall GPA for Psychology Groups by Year⁵

Group	1994			1995			1996			2001		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	3.06	.60	69	3.35 ^{a, b}	.51	64	3.33 ^a	.51	55	3.66	.34	10
CLEP Match	2.87 ^a	.82	69	2.95 ^a	.79	63	2.85 ^{a, b}	.88	55	3.10	.38	7
AP	3.35 ^a	.50	33	3.18	.63	69	3.26 ^b	.54	102			
AP Match	3.07	.71	33	2.98 ^b	.79	68	3.19	.64	102			

⁵ Means with matching superscript letters within each year are different at the $p=.01$ level.

American Literature

Group comparisons for the CLEP American Literature examination were limited to comparing the aggregated 1994–1996 entering class's data with that of a matched comparison group. T-test results reveal that the mean overall GPA of the CLEP group was significantly higher than that of the CLEP match group ($t(89)=2.62, p=.01$). The CLEP group had a mean GPA of 3.33 ($SD=.54, n=46$), compared to 3.01 ($SD=.62, n=45$).

Calculus

A significant difference was found in the mean GPAs of the 1994 ($F(3, 1212)=37.04, p<.001$), 1995 ($F(3, 1187)=37.72, p<.001$), and 1996 Calculus sample ($F(3, 1406)=27.83, p<.001$). In the 1996 class, the CLEP group had a significantly higher mean GPA than the CLEP match group ($p=.009$), but this difference did not replicate in the 1994 or 1995 classes. The CLEP group had a significantly higher mean GPA than the AP match group in the 1995 class ($p=.01$) and in the 1996 class ($p<.001$).

In the 1994 class, there was a statistically significant difference in mean GPA in the AP and AP match groups ($p<.001$), with the AP group having a higher GPA. This difference was replicated in the 1995 sample ($p<.001$) and the 1996 sample ($p<.001$). The means and standard deviations for all groups in all years are given in Table 2.

College Algebra

Aggregated data from the 1994, 1995, and 1996 entering classes indicated no significant difference in overall mean GPA for the CLEP and CLEP match groups ($t(66)=.88, p=.38$). The mean GPA for the CLEP group was 2.88 ($SD=.70, n=35$) compared to a mean GPA of 2.73 ($SD=.70, n=33$) for the CLEP match group. Limited available data from the 2001 entering class showed a mean overall GPA of 3.19 ($SD=.50, n=15$) for the CLEP group and 3.13 ($SD=.56, n=11$) for the CLEP match group.

English Literature

A significant difference in mean overall GPA was found between the CLEP and CLEP match groups ($t(84)=3.07, p=.003$). The CLEP group had a mean GPA of 3.40 ($SD=.57, n=43$), while the CLEP match group had a mean GPA of 3.01 ($SD=.60, n=43$).

Macroeconomics

A significant difference was found in the overall GPAs of the groups in the 1994 ($F(3, 405)=8.15, p<.001$), 1995 ($F(3, 499)=6.51, p<.001$), and the 1996 sample ($F(3, 346)=7.11, p<.001$). In the 1994 sample, the CLEP and CLEP match group showed a trend toward the CLEP group having a higher mean GPA ($p=.076$), but this difference

was statistically significant in the 1995 sample ($p=.006$) and the 1996 sample ($p=.009$). A significant difference was found between the AP and AP match groups in the 1994 sample ($p<.001$) and the 1996 sample ($p=.008$), with the AP group having a higher mean GPA. Table 3 shows the means and standard deviations for all groups.

Microeconomics

A significant difference was found in mean overall GPA for the 1994 ($F(3, 194)=14.52, p<.001$) and 1995 samples ($F(3, 183)=6.48, p<.001$), but not in the 1996 class ($F(3, 143)=1.34, p=.265$). Significant differences were found between the mean GPA of the CLEP and CLEP match groups ($p<.001$) in post hoc tests for the 1994 class only. Table 4 shows the means and standard deviations for all groups.

Psychology

The mean overall GPA differed significantly among the groups for the 1994 ($F(3, 203)=3.78, p=.01$), 1995 ($F(3, 263)=5.01, p=.002$), and 1996 ($F(3, 313)=6.38, p<.001$), classes. In post hoc comparisons, the CLEP groups had significantly higher mean GPAs than the CLEP match groups in the 1995 ($p=.002$) and 1996 ($p=.004$) classes, but showed no differences in the 1994 class. In the 1995 class, the CLEP group also had a significantly higher mean GPA than the AP match group ($p=.01$), but this difference failed to replicate in any other class. Table 5 shows the means and standard deviations for all groups.

Sociology

Comparisons of the 1994, 1995, and 1996 classes indicated the presence of significant differences in the mean overall GPAs of the CLEP and CLEP match groups only in the 1994 class ($t(177.52)=3.35, p=.001$). The 1994 CLEP group had a mean GPA of 3.14 ($SD=.52, n=104$), which was significantly higher than the CLEP match group's mean of 2.84 ($SD=.78, n=103$). Although the difference in mean GPA between the groups was not statistically significant in the 1995 class, it did approach significance ($t(182.31)=2.40, p=.017$). The 1995 CLEP group had a mean GPA of 3.20 ($SD=.56, n=94$), while the mean GPA for the match group was 2.99 ($SD=.65, n=94$). The difference also neared significance in the 1996 class ($t(176)=2.52, p=.013$). The 1996 CLEP group had a mean GPA of 3.23 ($SD=.54, n=89$) and the CLEP match group had a mean GPA of 3.01 ($SD=.60, n=89$).

Summary

Across the nine CLEP examinations, differences in mean overall GPA between the CLEP group and its matched comparison group were found in at least one year in all subject areas except for College Algebra. These differences replicated in at least one other year in three of the six subject areas where replication was attempted.

These results suggest that students who receive credit by examination through CLEP for an introductory course generally have higher overall GPAs than students who complete the introductory course.

Sequent Course Performance

Differences in sequent course performance could only be explored for the College Algebra and Calculus samples. Of the nine subject areas, only these two have a sequent course at the university from which data were obtained. For the Calculus groups, differences were investigated on the 1994 entering class and replicated on the 1995 and 1996 entering classes. For College Algebra, data were aggregated across the three entering classes because insufficient numbers of CLEP students were present to allow for replication.

Calculus

A significant difference in sequent course grade was found in the 1994 ($F(3, 659)=7.13, p<.001$), 1995 ($F(3, 651)=3.90, p=.009$), and 1996 ($F(3, 813)=5.33, p=.001$) classes. In post hoc comparisons, no groups differed at the $p=.01$ level in the 1995 class. In the 1994 and 1995 classes, the CLEP group showed a trend toward having a higher mean sequent course grade than the AP match group ($p=.035$ for 1994 and $p=.025$ for 1995). In the 1996 class, the CLEP group had a higher mean sequent course grade than the AP match group ($p=.004$). The AP and AP match groups differed significantly in the 1994 class ($p=.001$), with the AP group having a higher mean sequent course grade than the AP match group. Table 6 shows the means and standard deviations for all groups in the calculus samples.

College Algebra

The aggregated data from the 1994, 1995, and 1996 entering classes showed no significant difference in mean sequent course grade between the CLEP and CLEP match groups ($t(18.26)=1.77, p=.094$). The mean sequent course grade for the CLEP group was 3.40 ($SD=1.04, n=30$) and the mean sequent course grade for the CLEP match group was 2.57 ($SD=1.60, n=14$). Data from the 2001 class showed a mean sequent course grade of 3.67 ($SD=.21, n=6$) for the CLEP group and 2.50 ($SD=.29, n=4$) for the CLEP match group.

Summary

The results from the Calculus samples show differences that indicate superior performance by the credit-by-examination groups. The direction of any difference that might exist in the College Algebra sample is toward the CLEP group having a higher mean grade than its matched comparison group.

Number of Additional Courses Taken in Subject Area

Comparisons of the number of additional courses taken in the subject area where credit by examination or course completion was received were made for all nine subject areas.

American Government

A significant difference between groups in the mean number of additional courses taken in the subject area of the introductory course was found in the 1994 class ($F(3, 2382)=6.48, p<.001$). The difference approached significance in the 1995 ($F(3, 2483)=3.21, p=.022$) and 1996 ($F(3, 2772)=3.03, p=.028$) classes. No significant differences were found between the CLEP and CLEP match groups in any cases. In the 1994 class, AP students took significantly more courses than students in the AP match group ($p=.004$). This difference failed to replicate in the 1995 and 1996 classes. In the 1994 class, the difference in mean number of additional courses taken between the AP and CLEP groups approached significance ($p=.017$). See Table 7 for the means and standard deviations for all groups.

American Literature

No significant difference existed in the number of additional English courses taken by students in the aggregated data from the 1994, 1995, and 1996 classes ($t(75.71)=-1.38, p=.17$). The CLEP group, on average, took 1.50 additional English courses ($SD=2.05, n=46$), and the CLEP match group, on average, took 2.27 additional English courses ($SD=3.13, n=45$).

Table 6

Sequent Course Grade for Calculus Groups by Year⁶

Group	1994			1995			1996			2001		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	3.39	.78	18	3.39	.70	18	3.35 ^a	.78	23	3.00	.93	8
CLEP Match	3.26	.99	19	3.08	.95	13	2.72	1.27	18	3.57	.54	3
AP	3.09 ^a	.82	322	3.03	.81	309	2.95 ^b	1.06	404			
AP Match	2.82 ^a	.88	301	2.85	.91	312	2.69 ^{a, b}	1.15	369			

⁶ Means with matching superscript letters within each year are different at the $p=.01$ level.

Calculus

Although significant differences were indicated by the F test in the 1994 ($F(3, 1212)=4.69, p=.003$) and 1995 ($F(3, 1187)=4.47, p=.004$) classes, post hoc comparisons showed no differences for any pairs in either class. As shown in Table 8, the means vary numerically by the largest degree between the CLEP group and the AP and AP match groups. The result of no differences for pair comparisons may result from the large difference in cell size between these groups. The 1996 Calculus groups did not differ in the number of additional math courses taken ($F(3, 1406)=1.11, p=.343$).

College Algebra

A significant difference was found in the number of additional math courses taken by CLEP and CLEP match group students in the aggregated data from the 1994, 1995, and 1996 classes ($t(52.28)=3.69, p<.001$). The mean number of additional math courses taken by the CLEP students was 3.03 ($SD=2.31, n=35$), while for CLEP match group students the mean was 1.36 ($SD=1.22, n=33$).

English Literature

The aggregated data from the 1994, 1995, and 1996 classes showed no differences in the number of additional English courses taken by the CLEP and CLEP match group students. CLEP students took, on average, 1.42 additional English courses ($SD=2.18, n=43$), while CLEP match group students took, on average, 1.88 additional English courses ($SD=2.30, n=43$).

Macroeconomics

No significant differences were found in the number of additional economics courses taken by students in the 1994 ($F(3, 405)=1.55, p=.202$) or 1996 ($F(3, 346)=1.93, p=.124$) classes. In the 1995 class, the difference approached significance ($F(3, 499)=2.65, p=.048$). Table 9 contains the means and standard deviations for all groups.

Microeconomics

Significant differences in the number of additional economics courses were found only in the 1995 class ($F(3, 183)=3.87, p=.01$). However, no significant differences were present in the 1994 class ($F(3, 194)=2.39, p=.07$) or 1996 class data ($F(3, 143)=.60, p=.615$). In post hoc comparisons for the 1995 class, a significant difference was found between the CLEP group and the AP group ($p=.01$), with the CLEP group having taken more courses. See Table 10 for the means and standard deviations for all groups.

Psychology

In the 1995 and 1996 classes, significant differences were found in the number of additional psychology courses taken (for 1995, $F(3, 263)=4.52, p=.004$; for 1996, $F(3, 313)=7.45, p<.001$). In the 1994 class, there was no difference ($F(3, 203)=2.58, p=.055$). Post hoc comparisons with the 1995 data showed no significant pairwise differences. However, the difference between the AP group and the AP match group approached significance ($p=.037$), as did the difference between the AP and CLEP groups ($p=.054$). In both cases, the trend was toward the AP group taking more psychology courses. The difference between the AP group and the AP match group was significant in the 1996 class ($p<.001$), with the AP group taking more psychology courses. Table 11 shows the means and standard deviations for all groups.

Sociology

No significant differences were found between the CLEP group and the CLEP match group for number of additional sociology courses taken in the 1994 ($t(187.26)=-1.36, p=.175$) and the 1995 ($t(186)=.58, p=.563$) classes. In the 1996 class, there was a trend toward a difference ($t(176)=-1.97, p=.051$). The means indicate few additional sociology courses taken overall by students in these samples. The 1994 CLEP group took an average of .38 additional courses ($SD=1.18, n=104$), while the CLEP match group took an average of .65 additional courses ($SD=1.60, n=103$). In the 1995 class, the CLEP group took an average of .70 additional courses ($SD=1.83, n=94$), and the CLEP match group took an average of .55 additional courses ($SD=1.70, n=94$). The trend in the 1996 class was toward the CLEP match group taking more courses. They took a mean of 1.35 additional courses ($SD=2.75, n=89$), while the CLEP group took, on average, an additional .63 courses ($SD=1.35, n=89$).

Summary

No consistent pattern of differences was found in the number of additional courses later taken in the subject area of the introductory course or examination. Differences were found in five of the nine subject areas, but all failed to replicate across years. Where differences existed, the credit-by-examination groups tended to take more additional courses in the subject area than the match groups. Students who receive credit by examination generally take at least as many courses in the subject area as students who complete the introductory course in that subject area.

Table 7Number of Additional Government Courses for American Government Groups by Year⁷

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	1.37	1.49	967	1.18	1.06	926	1.40	1.62	1,035
CLEP Match	1.34	1.73	947	1.29	1.56	870	1.45	1.86	1,014
AP	1.81 ^a	2.39	242	1.43	1.70	350	1.71	2.16	358
AP Match	1.22 ^a	1.23	237	1.35	1.65	338	1.36	1.79	366

⁷ Means with matching superscript letters within each subject area and year are different at the $p=.01$ level.**Table 8**

Number of Additional Math Courses for Calculus Groups by Year

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	4.50	4.46	28	4.71	4.22	24	3.50	1.91	30
CLEP Match	3.00	1.56	28	3.00	1.56	20	2.89	2.20	26
AP	2.75	2.26	579	2.90	2.74	581	2.95	2.58	697
AP Match	2.88	2.53	578	2.77	2.29	563	2.79	2.42	654

Table 9

Number of Additional Economics Courses for Macroeconomics Groups by Year

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	1.02	2.16	53	.78	1.13	45	1.15	1.68	33
CLEP Match	1.00	1.57	53	.96	1.36	44	1.17	1.23	30
AP	.78	1.80	153	.87	1.81	209	1.08	2.12	166
AP Match	1.24	1.88	147	1.32	1.95	202	1.65	2.11	118

Table 10Number of Additional Economics Courses for Microeconomics Groups by Year⁸

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	1.19	1.42	57	2.68 ^a	3.21	44	.69	.70	16
CLEP Match	1.75	2.38	55	2.00	2.58	44	1.38	2.63	56
AP	.76	1.67	42	.85 ^a	2.07	48	1.04	2.13	56
AP Match	1.24	1.56	41	1.69	2.53	48	.82	.97	56

⁸ Means with matching superscript letters within each subject area and year are different at the $p=.01$ level.**Table 11**Number of Additional Psychology Courses for Psychology Groups by Year⁹

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	.68	1.84	69	.92	2.39	64	1.33	2.76	55
CLEP Match	.57	2.01	69	.91	2.42	63	.56 ^a	1.81	55
AP	1.85	3.46	33	2.39	4.02	69	1.97 ^{a,b}	3.63	102
AP Match	1.24	2.87	33	.87	2.31	68	.38 ^b	1.18	102

⁹ Means with matching superscript letters within each subject area and year are different at the $p=.01$ level.

Table 12GPA for Additional Government Courses for American Government Groups by Year¹⁰

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	3.13 ^{a, b}	.77	942	3.13 ^{a, b, c}	.82	907	3.10 ^a	.85	1,005
CLEP Match	2.80 ^{a, c}	.94	832	2.83 ^{a, c}	.94	771	2.86 ^{a, b}	.94	909
AP	3.26 ^{c, d}	.79	237	3.35 ^{c, d, e}	.76	336	3.26 ^{b, c}	.84	346
AP Match	2.94 ^{b, d}	.82	219	2.93 ^{b, d}	.98	306	2.96 ^c	.96	330

¹⁰ Means with matching superscript letters within each subject area and year are different at the $p=.01$ level.

GPA for Additional Courses in the Subject Area

Comparisons of GPAs for additional courses later taken in the subject area of the introductory course were made between students who received credit by examination through AP or CLEP and students who completed the corresponding introductory course for all nine subject areas. For all of the analyses conducted for this research question, participants who had taken no additional course work in the subject area were excluded from the samples.

American Government

Significant differences exist in the mean GPAs for government courses among the groups in the 1994 ($F(3, 2229)=30.42, p<.001$), 1995 ($F(3, 2319)=33.68, p<.001$), and 1996 ($F(3, 2589)=20.60, p<.001$) classes. In post hoc comparisons, the pattern of group differences was fairly consistent across years. In the 1994 and 1995 classes, the CLEP group had a significantly higher mean government GPA than the CLEP match group ($p<.001$ in both years) and the AP match group ($p=.01$ for 1994; $p=.007$ for 1995). The difference between the CLEP group and the CLEP match groups was replicated in the 1996 class also ($p<.001$), but the difference between the CLEP group and the AP match group was not ($p=.076$). Across all three years, the AP group had a significantly higher mean government GPA than the AP match and CLEP match groups ($p<.001$ in all cases). In the 1995 class, the AP group had a significantly higher government GPA than the CLEP group ($p<.001$). In the 1996 class, the difference between the AP and CLEP groups approached

significance ($p=.013$), but no differences were observed in the 1994 class ($p=.126$). See Table 12 for the means and standard deviations of all groups.

American Literature

No difference was found between the CLEP group and the CLEP match group in their mean English GPAs in the aggregated data from the 1994, 1995, and 1996 classes ($t(72)=1.66, p=.10$). The CLEP group had a mean English GPA of 3.71 ($SD=.42, n=38$). The CLEP match group had a mean English GPA of 3.51 ($SD=.57, n=36$).

Calculus

Significant differences were found in mean math GPAs in the 1994 ($F(3, 1161)=7.32, p<.001$), 1995 ($F(3, 1181)=5.20, p=.001$), and 1996 ($F(3, 1309)=8.65, p<.001$) classes. In post hoc comparisons, the only group difference shown to replicate across years was the difference between the AP group and the AP match group ($p<.001$ in all three classes), with the AP group having a higher mean math GPA than the AP match group. In the 1996 class, the CLEP group had a significantly higher mean math GPA than the AP match group ($p=.002$). Table 13 lists the means and standard deviations for all groups.

College Algebra

No significant difference in mean math GPA appeared in the aggregated data from the 1994, 1995, and 1996 classes ($t(51.06)=.04, p=.97$). The CLEP group had a mean math GPA of 2.75 ($SD=.98, n=33$), while the CLEP match group had a mean math GPA of 2.74 ($SD=.86, n=23$).

Table 13GPA for Additional Math Courses for Calculus Groups by Year¹¹

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	3.36	.86	28	3.32	.77	24	3.54 ^a	.61	30
CLEP Match	3.18	.83	27	3.06	.81	19	3.13	.76	25
AP	3.38 ^a	.75	539	3.30 ^a	.85	539	3.30 ^b	.85	652
AP Match	3.02 ^a	.87	539	3.01 ^a	.91	529	3.08 ^{a, b}	.89	603

¹¹ Means with matching superscript letters within each subject area and year are different at the $p=.01$ level.

English Literature

The difference in mean English GPA in the aggregated data from the 1994, 1995, and 1996 classes approached significance ($t(62.96)=2.39, p=.02$). The mean English GPA for additional course work for the CLEP group was 3.83 ($SD=.35, n=31$). The CLEP match group had a mean English GPA of 3.55 ($SD=.64, n=40$).

Macroeconomics

Significant differences in mean economics GPA were found only in the 1996 class ($F(3, 222)=4.14, p=.007$). Results for the 1995 class approached significance ($F(3, 268)=3.76, p=.011$). No significant differences appeared in the 1994 class data ($F(3, 199)=.55, p=.646$). In post hoc comparisons for the 1996 class, no pairs differed significantly. In the 1995 class, the difference in mean economics GPA between the CLEP group and the CLEP match group approached significance ($p=.018$). The trend was for CLEP students to have a higher GPA. See Table 14 for the means and standard deviations for all groups.

Microeconomics

Significant differences between groups were found in 1994 class data ($F(3, 127)=6.83, p<.001$). This result failed to replicate in the 1995 ($F(3, 124)=.49, p=.687$) and 1996 ($F(3, 74)=.42, p=.738$) classes. In post hoc comparisons, the only significant group difference occurred between the CLEP group and the CLEP match group ($p<.001$), with the CLEP group having a higher mean economics GPA. See Table 15 for the means and standard deviations for each group.

Psychology

No significant differences appeared in mean psychology GPA for the 1994 ($F(3, 47)=.23, p=.873$), 1995 ($F(3, 74)=.44, p=.729$), or 1996 ($F(3, 95)=.70, p=.556$) classes. Table 16 provides the means and standard deviations for each group.

Sociology

Significant differences were not found in the mean sociology GPA for the 1994 ($t(41)=.05, p=.958$), 1995 ($t(24.12)=1.26, p=.219$), or 1996 ($t(50)=-.46, p=.610$) classes. For the 1994 class, the CLEP group had a mean sociology GPA of 3.03 ($SD=.66, n=19$), while the CLEP match group's mean was 3.02 ($SD=.71, n=24$). For the 1995 class, the CLEP group's mean was 2.94 ($SD=.69, n=23$) and the CLEP match group's mean was 2.54 ($SD=1.17, n=17$). For the 1996 class, the CLEP group had a mean sociology GPA of 2.79 ($SD=.83, n=11$) and the CLEP match group had a mean of 2.94 ($SD=1.02, n=41$).

Summary

Significant differences were found between the CLEP group and the CLEP match group on their mean GPAs for additional course work in the subject area of the introductory course in two of the nine subject areas. However, overall differences replicated across years in just one subject area (American Government). AP group and AP match group differences were found in two subject areas and replicated in all three classes in those areas. In all but one instance, where differences existed, the credit-by-examination group had a higher overall GPA for the subject area than the course-taking group. These results indicate that, for the most part, few differences exist in the additional course work GPAs of students who receive credit for the introductory course via examination and those who complete the additional course.

Number of Semesters Enrolled

Comparisons of number of semesters enrolled were made between students who received credit by examination through AP or CLEP and students who completed the corresponding introductory course for all nine subject areas.

American Government

Significant differences in the number of semesters enrolled were found in the 1995 ($F(3, 2483)=10.29, p<.001$) and 1996 ($F(3, 2769)=6.46, p<.001$) classes, but not in the 1994 class ($F(3, 2392)=6.50, p=.451$). In post hoc comparisons, there were no differences in the mean number of semesters enrolled for CLEP students and their matched comparison group in any class year. CLEP students were observed to be enrolled for more semesters than AP students in the 1995 ($p<.001$) and 1996 ($p<.001$) classes. See Table 17 for the means and standard deviations for all groups.

American Literature

In the 1994-96 aggregated data for the CLEP American Literature examination, no differences exist between the CLEP group and the CLEP match group in the mean number of semesters enrolled ($t(77.19)=.83, p=.408$). The mean number of semesters enrolled for the CLEP group is 9.41 ($SD=2.37, n=46$), while the mean for the CLEP match group is 9.93 ($SD=3.50, n=45$).

Calculus

There were no significant differences in the mean number of semesters enrolled for the 1994 ($F(3, 1212)=1.83, p=.14$), 1995 ($F(3, 1187)=1.87, p=.13$), or 1996 ($F(3, 1406)=1.52, p=.21$) classes. Table 18 contains the means and standard deviations for each group.

Table 14

GPA for Additional Economics Courses for Macroeconomics Groups by Year

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	3.17	.79	22	3.45	.12	26	3.27	.76	22
CLEP Match	2.90	1.12	32	2.69	1.06	25	2.71	.90	25
AP	3.10	.88	51	3.19	.90	82	3.35	.78	72
AP Match	2.97	.95	95	3.06	.83	136	3.03	.92	104

Table 15GPA for Additional Economics Courses for Microeconomics Groups by Year¹²

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	3.63 ^a	.56	41	3.27	.92	40	3.56	.53	9
CLEP Match	2.88 ^a	.92	41	3.03	.85	36	3.31	.78	11
AP	3.35	.74	14	3.16	1.21	14	3.39	.76	20
AP Match	3.08	.85	32	3.11	.76	35	3.27	.69	35

¹² Means with matching superscript letters within each subject area and year are different at the $p=.01$ level.**Table 16**

GPA for Additional Psychology Courses for Psychology Groups by Year

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	2.70	.89	14	2.99	.76	17	3.06	1.00	18
CLEP Match	2.87	.74	11	2.79	1.06	14	2.59	.85	13
AP	2.96	.99	13	2.81	.92	29	2.93	.88	46
AP Match	2.89	.71	10	3.11	1.09	15	2.78	1.25	19

Table 17Number of Semesters Enrolled for American Government Groups by Year¹³

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	10.03	2.17	967	9.93 ^a	1.96	926	9.87 ^a	1.98	1,035
CLEP Match	10.12	3.20	947	10.22 ^b	2.96	870	9.81 ^b	2.73	1,014
AP	9.85	2.48	242	9.38 ^{a, b}	1.96	350	9.26 ^{a, b}	2.08	358
AP Match	10.12	3.20	947	9.74	2.74	338	9.59	2.71	366

¹³ Means with matching superscript letters within each year are different at the $p=.01$ level.**Table 18**

Number of Semesters Enrolled for Calculus Groups by Year

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	10.50	3.36	28	9.96	1.83	24	8.87	2.94	30
CLEP Match	10.50	2.78	28	10.00	3.60	20	9.42	2.67	26
AP	9.44	2.75	579	9.13	2.69	581	9.25	2.55	697
AP Match	9.60	3.72	578	9.48	3.52	563	9.42	2.67	26

Table 19

Number of Semesters Enrolled for Macroeconomics Groups by Year									
Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	9.55	2.61	53	8.78	1.59	45	8.88	1.82	33
CLEP Match	9.21	3.21	53	9.02	3.10	44	10.10	2.75	30
AP	9.06	2.20	153	9.14	2.60	209	9.15	2.26	166
AP Match	9.18	3.11	147	9.02	2.61	202	8.53	2.86	118

College Algebra

There was no significant difference between the CLEP group and the CLEP match group in the mean number of semesters enrolled for the aggregated data from the 1994, 1995, and 1996 classes ($t(66)=.77$, $p=.445$). The CLEP group was enrolled for an average of 10.54 semesters ($SD=3.15$, $n=35$). The CLEP match group was enrolled for an average of 11.12 semesters ($SD=3.06$, $n=33$).

English Literature

No statistically significant difference existed in the mean number of semesters enrolled for the aggregated data from the 1994, 1995, and 1996 classes, but there was a trend ($t(84)=2.00$, $p=.049$). The CLEP students were enrolled, on average, for 9.14 semesters ($SD=2.04$, $n=43$), while the CLEP match group students were enrolled, on average, for 10.16 semesters ($SD=2.67$, $n=43$).

Macroeconomics

No significant differences in the mean number of semesters enrolled were found in the 1994 ($F(3, 405)=.42$, $p=.742$) or 1995 ($F(3, 499)=.27$, $p=.847$) class data. In the 1996 class, the difference approached significance ($F(3, 346)=3.55$, $p=.015$). However, in post hoc comparisons, the only trend toward a group difference observed was between the AP match group and the CLEP match group ($p=.039$). Table 19 contains the means and standard deviations for all groups.

Microeconomics

No significant differences were found in the mean number of semesters enrolled for the 1994 ($F(3, 194)=1.35$, $p=.26$), 1995 ($F(3, 183)=.252$, $p=.86$), or 1996 ($F(3, 143)=.96$,

$p=.412$) classes. See Table 20 for the means and standard deviations for all groups.

Psychology

No significant differences were found in the mean number of semesters enrolled for the students in the 1994 ($F(3, 203)=1.51$, $p=.214$) class. Differences approached significance in the 1995 ($F(3, 263)=2.83$, $p=.039$) and 1996 ($F(3, 313)=3.03$, $p=.03$) classes. In the 1995 data, the CLEP group showed a slight trend toward being enrolled fewer semesters than the CLEP match group ($p=.085$) and the AP match group ($p=.096$). The trend occurred in the 1996 data, but only for the CLEP group and the AP match group ($p=.031$). Table 21 shows the means and standard deviations for each group.

Sociology

A significant difference was present in the mean number of semesters enrolled for the 1994 class ($t(177.52)=3.33$, $p=.001$). The mean number of semesters enrolled for the 1994 CLEP group was 10.28 ($SD=2.23$, $n=104$), while the mean number of semesters enrolled for the CLEP match group was 8.88 ($SD=3.59$, $n=103$). However, this difference failed to replicate in the 1995 ($t(169.15)=1.42$, $p=.158$) or 1996 ($t(176)=0.00$, $p=1.00$) classes. The mean number of semesters enrolled for the 1995 CLEP group was 10.05 ($SD=2.17$, $n=94$), while the CLEP match group had a mean of 9.51 semesters ($SD=2.17$, $n=94$). In the 1996 class, both the CLEP group and the CLEP match group were enrolled for an average of 9.52 semesters, though their standard deviations differed (for CLEP, $SD=2.60$, $n=89$; for CLEP match, $SD=2.84$, $n=89$).

Table 20

Number of Semesters Enrolled for Microeconomics Groups by Year									
Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	8.95	2.13	57	9.14	2.00	44	8.06	1.53	16
CLEP Match	9.29	2.90	55	9.11	2.04	44	8.88	1.78	16
AP	8.48	2.03	42	9.27	2.46	48	9.05	2.42	56
AP Match	9.42	2.29	41	8.90	2.01	44	8.82	1.86	56

Table 21

Number of Semesters Enrolled for Psychology Groups by Year

Group	1994			1995			1996		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CLEP	9.48	3.07	69	8.62	2.49	64	8.31	2.62	55
CLEP Match	9.67	3.72	69	9.78	2.98	63	8.56	2.97	55
AP	8.24	3.41	33	8.96	2.57	69	8.82	2.74	102
AP Match	9.06	2.87	33	9.68	2.71	68	9.56	2.79	102

Summary

The results from the analyses indicate that CLEP students are enrolled for about the same number of semesters as students who took the introductory course. Significant differences were found only in two of the nine subject examinations, and the differences only replicated across years in one instance (American Government). In no cases were differences found between the CLEP group and the AP group in the number of semesters enrolled. Additionally, differences were found between the AP group and either its match group or the CLEP match group in only two comparisons. Therefore, it appears that earning credit by examination does not shorten a student's length of college enrollment.

Graduation Rate

Using a chi-squared analysis, comparisons of graduation rate were made between students who received credit by examination through AP or CLEP and students who completed the corresponding introductory course for all nine subject areas.

American Government

Significant differences in graduation rate were found in all three class years. More CLEP students than CLEP match group students graduated in the 1994 ($\chi^2(1, n=1,914)=155.16, p<.001$), 1995 ($\chi^2(1, n=1,796)=176.42, p<.001$), and 1996 ($\chi^2(1, n=2,049)=114.51, p<.001$) classes. Additionally, more AP students graduated than AP match group students in the 1994 ($\chi^2(1, n=479)=22.24, p<.001$), 1995 ($\chi^2(1, n=688)=33.30, p<.001$), and 1996 ($\chi^2(1, n=724)=27.92, p<.001$) classes. Significant differences in graduation rate between CLEP students and AP students were found only in the 1995 class

($\chi^2(1, n=1,276)=6.94, p=.008$). See Table 22 for the number and percentage in each group who graduated.

American Literature

In the aggregated data for the 1994–1996 classes, the CLEP students were more likely to graduate than the CLEP match group students ($\chi^2(1, n=91)=14.36, p<.001$). Overall, 93.5 percent of the CLEP group graduated (43 students), compared to 60 percent (27 students) in the CLEP match group.

Calculus

CLEP students did not appear to be significantly more likely to graduate than CLEP match group students in the 1994 ($\chi^2(1, n=56)=1.70, p=.193$), 1995 ($\chi^2(1, n=44)=1.15, p=.284$), or 1996 ($\chi^2(1, n=56)=.38, p=.541$) classes. However, AP students were more likely to graduate than AP match group students in the 1994 ($\chi^2(1, n=1,157)=29.31, p<.001$), 1995 ($\chi^2(1, n=1,144)=39.24, p<.001$), and 1996 ($\chi^2(1, n=1,351)=38.04, p<.001$) classes. CLEP students and AP students were not found to differ in their graduation rates in any of the classes. See Table 23 for the graduation rates of all groups.

College Algebra

CLEP students may have been somewhat more likely to graduate than CLEP match group students in the aggregated data from the 1994–96 classes. The difference in their graduation rates approached significance ($\chi^2(1, n=68)=4.42, p=.036$). In all, 85.7 percent (30 students) in the CLEP group graduated, compared to 63.6 percent (21 students) in the CLEP match group.

Table 22

Number and Percentage of Students Graduating in All American Government Groups

Group	1994		1995		1996	
	N	%	N	%	N	%
CLEP	913	94.4	892	96.3	938	90.6
CLEP Match	697	73.6	647	74.4	733	72.3
AP	228	94.2	325	92.9	321	89.7
AP Match	189	79.7	261	77.2	273	74.6

Table 23

Number and Percentage of Students Graduating in All Calculus Groups

Group	1994		1995		1996	
	N	%	N	%	N	%
CLEP	20	71.4	21	87.5	24	80.0
CLEP Match	24	85.7	15	75.0	19	73.1
AP	490	84.6	492	84.7	581	83.4
AP Match	413	71.5	389	69.1	452	69.1

Table 24

Number and Percentage of Students Graduating in All Macroeconomics Groups

Group	1994		1995		1996	
	N	%	N	%	N	%
CLEP	47	88.7	44	97.8	30	90.9
CLEP Match	43	81.1	33	75.0	24	80.0
AP	137	89.5	185	88.5	144	86.7
AP Match	112	76.2	174	86.1	90	76.3

English Literature

CLEP students were no more likely than CLEP match group students to graduate in the aggregated data from the 1994-96 classes ($\chi^2(1, n=86)=.31, p=.579$). In the CLEP group, 83.7 percent of students (36) graduated. By comparison, in the CLEP match group, 79.1 percent of students (34) graduated.

Macroeconomics

CLEP students in the 1995 class were more likely to have graduated than CLEP match group students ($\chi^2(1, n=89)=9.90, p=.002$). However, in the 1994 class both groups of students were equally likely to have graduated ($\chi^2(1, n=106)=1.18, p=.278$). The same result held for the 1996 class ($\chi^2(1, n=63)=1.53, p=.217$). Similarly, students in the AP group in the 1994 class were more likely to have graduated than AP match group students ($\chi^2(1, n=300)=9.48, p=.002$). This result failed to replicate in the 1995 class ($\chi^2(1, n=411)=.53, p=.468$), but in the 1996 class the association between group membership and graduation rate approached significance ($\chi^2(1, n=411)=5.22, p=.022$). No differences were found between CLEP students and AP students in the likelihood that they had graduated in any of the three classes. See Table 24 for the number and percentage of students who graduated in each group.

Microeconomics

In the 1994 class, CLEP students were not found to be significantly more likely than CLEP match group students to have graduated ($\chi^2(1, n=112)=2.65, p=.104$). This result

Table 25

Number and Percentage of Students Graduating in All Microeconomics Groups

Group	1994		1995		1996	
	N	%	N	%	N	%
CLEP	51	89.5	42	95.5	16	100
CLEP Match	43	78.2	37	84.1	13	81.3
AP	39	92.9	44	91.7	45	80.4
AP Match	36	87.8	37	84.1	52	81.3

held true for the 1995 class ($\chi^2(1, n=88)=3.09, p=.079$) and the 1996 class, ($\chi^2(1, n=32)=3.31, p=.069$). Differences in their likelihood to have graduated were not found in the AP group and the AP match group in the 1994 ($\chi^2(1, n=83)=.61, p=.436$), 1995 ($\chi^2(1, n=96)=.71, p=.399$), or 1996 classes ($\chi^2(1, n=112)=3.77, p=.052$). No differences were found between the CLEP group and the AP group. Table 25 lists the number and percentage of students who have graduated in each group.

Psychology

CLEP students were significantly more likely than CLEP match group students to graduate only in the 1994 class ($\chi^2(1, n=127)=7.69, p=.006$). In the 1996 class, the difference approached significance ($\chi^2(1, n=110)=5.95, p=.015$), but no differences were present in the 1995 class data ($\chi^2(1, n=138)=1.71, p=.191$). Among AP students and AP match group students, no differences were found in the 1994 ($\chi^2(1, n=66)=.09, p=.769$), 1995 ($\chi^2(1, n=137)=.002, p=.967$), or 1996 ($\chi^2(1, n=204)=.74, p=.391$) classes. Differences between the AP groups and the CLEP groups were not found. See Table 26 for the number and percentage of students who graduated in each group.

Sociology

CLEP students were significantly more likely to have graduated than CLEP match group students in the 1995 class ($\chi^2(1, n=207)=16.53, p<.001$). The 1994 data showed a trend toward the same result ($\chi^2(1, n=188)=5.71, p=.017$), but in the 1996 class no significant difference was found ($\chi^2(1, n=178)=.61, p=.435$). In the 1994 CLEP group, 90.4 percent (85 students) had graduated, compared to 77.7 percent (73 students) in the CLEP match group. In the 1995 class, 93.3 percent (97) of the CLEP students had graduated, compared to 71.8 percent (74) of the CLEP match group students. In the 1996 class, 84.3 percent (75) of the CLEP students had graduated, compared to 79.8 percent (71) of the CLEP match group students.

Summary

Differences in the graduation rates of CLEP students and CLEP match group students were found in at least one class in five of the nine subject areas. However,

Table 26

Number and Percentage of Students Graduating in All Psychology Groups

Group	1994		1995		1996	
	N	%	N	%	N	%
CLEP	58	92.1	59	85.5	43	78.2
CLEP Match	47	73.4	53	76.8	31	56.4
AP	56	81.2	25	75.8	83	81.4
AP Match	55	80.9	26	78.8	78	76.5

Table 27Number of Semesters Enrolled for Graduates in All Groups¹⁴

1994	Group	Mean	SD	N	1996	Group	Mean	SD	N
American Government	CLEP	10.10 ^a	2.01	913	American Government	CLEP	9.82 ^{a, b}	1.68	938
	CLEP Match	10.86 ^{a, b}	2.26	697		CLEP Match	10.31 ^a	1.87	733
	AP	9.89 ^b	2.13	228		AP	9.31 ^{b, c}	1.79	321
	AP Match	10.38	1.99	189		AP Match	10.18 ^c	1.87	273
Calculus	CLEP	10.50	1.79	20	Calculus	CLEP	9.71	2.07	24
	CLEP Match	10.79	2.23	24		CLEP Match	10.53	1.78	19
	AP	9.92 ^a	1.95	490		AP	9.56 ^a	1.77	581
	AP Match	11.01 ^a	2.34	413		AP Match	10.60 ^a	1.99	452
Macroeconomics	CLEP	9.89	2.41	47	Macroeconomics	CLEP	8.77 ^a	1.25	30
	CLEP Match	9.91	2.24	43		CLEP Match	10.38 ^a	2.10	24
	AP	9.31	1.85	137		AP	9.10	1.83	144
	AP Match	9.88	2.00	112		AP Match	9.32	1.75	90
Microeconomics	CLEP	9.31	1.73	51	Microeconomics	CLEP	8.06	1.53	16
	CLEP Match	9.56	1.81	43		CLEP Match	9.23	1.74	13
	AP	8.77	1.69	39		AP	9.09	1.84	45
	AP Match	9.92	1.79	36		AP Match	9.04	1.55	52
Psychology	CLEP	10.07	2.33	59	Psychology	CLEP	8.98	1.88	43
	CLEP Match	10.55	2.51	53		CLEP Match	10.03	1.82	31
	AP	9.36	1.66	25		AP	9.37	1.94	83
	AP Match	9.92	2.24	26		AP Match	9.95	1.62	78
Sociology	CLEP	10.37	2.12	97	Sociology	CLEP	9.73	2.03	75
	CLEP Match	10.45	2.25	74		CLEP Match	10.16	1.90	71

1995	Group	Mean	SD	N
American Government	CLEP	9.91 ^{a, b}	1.84	892
	CLEP Match	10.63 ^{a, c}	2.02	647
	AP	9.41 ^{b, c, d}	1.87	325
	AP Match	10.35 ^d	2.05	261
Calculus	CLEP	9.96	1.82	24
	CLEP Match	10.00	3.60	20
	AP	9.13	2.69	581
	AP Match	9.48	3.52	563
Macroeconomics	CLEP	8.82	1.59	44
	CLEP Match	10.00	1.82	33
	AP	9.59	2.06	185
	AP Match	9.56	1.93	174
Microeconomics	CLEP	9.21	2.01	42
	CLEP Match	9.49	1.39	37
	AP	9.52	2.22	44
	AP Match	9.17	1.52	46
Psychology	CLEP	9.10 ^a	1.82	58
	CLEP Match	10.49 ^a	2.14	47
	AP	9.32	1.86	56
	AP Match	10.13	1.83	56
Sociology	CLEP	9.89	1.68	85
	CLEP Match	10.19	1.91	73

Aggregated 1994-1996	Group	Mean	SD	N
American Literature	CLEP	9.54	2.39	43
	CLEP Match	10.07	2.15	27
College Algebra	CLEP	10.60	2.44	30
	CLEP Match	11.48	2.09	21
English Literature	CLEP	9.08 ^a	1.54	36
	CLEP Match	10.41 ^a	1.92	34

¹⁴ Means with matching superscript letters within each subject area and year are different at the $p=.01$ level.

these results only replicated across years in two of the five subject areas. Therefore, a firm conclusion about an increased likelihood of graduation among students who receive credit by examination through CLEP as opposed to those who complete an introductory course cannot be reached. It appears that CLEP students are at least as likely to graduate as those who complete an introductory course. Based on the results presented above, the same can be said about AP students compared to a matched sample of students who complete an introductory course. Few instances of differences were found in the graduation rates of CLEP students and AP students. It appears that students in these groups are equally likely to graduate.

Additional Post Hoc Analyses

A question related to differences in graduation rates is whether students who receive credit by examination graduate in less time than those who complete an introductory course. This question was explored by examining the mean number of semesters enrolled among only those students in all four groups who had graduated. In four of the nine subject areas, graduates who had received credit by examination through CLEP graduated in significantly fewer semesters than those in the matched comparison group (1994–1996 American Government, $p < .001$; 1995 Psychology, $p = .004$; 1996 Macroeconomics, $p = .01$; English Literature, $p = .002$). Significant differences between AP group graduates and CLEP group graduates were found only in the 1995 and 1996 American Government groups ($p < .001$ in both years), with AP students graduating sooner. AP students graduated in significantly fewer semesters than AP match group students in the 1995 and 1996 American Government groups and in the 1994 and 1996 Calculus groups ($p < .001$ in all cases). Table 27 lists the mean number of semesters enrolled for graduates from all groups.

Given that the number of semesters enrolled was the same for most groups in the above analysis, it may be that students who earn credit by examination use this credit to lower their course load (and thus take fewer courses per semester than students who did not earn credit by examination) rather than to reduce the length of their undergraduate career. However, it is also possible that students who earn credit by examination enroll in more advanced courses or take additional elective courses in place of the course for which they earned credit by examination (and thus take the same number of credits per semester as students who did not earn credit by examination). To explore these possibilities, group comparisons were conducted on the average number of credits taken per semester in all groups. Credits earned through examination were not included in calculating the mean number of credits taken per semester in any of the groups.

Significant differences were found in the average number of credits taken between the CLEP group and the CLEP match group (at the $p = .01$ level) in two of the nine

subject areas. Significantly higher mean number of credits per semester were taken by the CLEP students in the 1994 Sociology sample ($p = .001$) and in the aggregated College Algebra sample ($p = .002$). In the 1996 Calculus sample, the AP group had a significantly higher average number of credits taken per semester than the AP match group ($p = .001$). The only other potential difference between the AP group and the AP match group was a difference approaching significance in the 1994 Macroeconomics sample ($p = .013$). Table 28 presents the means and standard deviations for the average number of credits taken per semester for all groups.

Summary

In general, these additional analyses indicated few differences between groups in the number of semesters enrolled prior to graduation and the average number of credits taken per semester. Differences between the CLEP group and the CLEP match group in the number of semesters enrolled prior to graduation were observed in four subject areas but replicated only in one. Two subject areas showed differences that replicated for the AP group and the AP match group. Differences between AP students and CLEP students were seen in two classes in one subject area. Students who earn credit by examination may not be graduating sooner than other students because they take additional courses in place of those for which they received credit by examination.

Discussion

When compared to a closely matched sample of students who earned credit through introductory college course work, students who earned credit through CLEP generally had higher overall GPAs at the terminus of their undergraduate education. CLEP students did at least as well as course-taking students in sequent mathematics courses. They remained enrolled for a similar amount of time as other students, took a similar number of additional courses in the subject area (indicating their interest in further learning in the area where they earned credit by examination), and did at least as well as other students in these courses. CLEP students were somewhat more likely to graduate than students who completed a comparable course, graduated in about the same number of semesters, and carried a similar course load while enrolled. For all of these indicators, CLEP students were not found to be systematically different from AP students. This finding refutes the positions of those who find AP acceptable as a means of credit by examination and yet object to CLEP.

Additional research is needed to continue to explore the outcomes of CLEP for students who earn credit

Table 28Average Number of Credits Taken per Semester in All Groups¹⁵

1994	Group	Mean	SD	N
American Government	CLEP	13.31	1.86	967
	CLEP Match	13.05 ^a	2.58	947
	AP	13.55 ^a	2.00	242
	AP Match	13.42	3.00	237
Calculus	CLEP	13.86	1.75	28
	CLEP Match	13.15	2.25	28
	AP	13.72	2.03	579
	AP Match	13.57	2.69	578
Macroeconomics	CLEP	13.46	2.61	53
	CLEP Match	13.39	1.71	53
	AP	14.13	1.75	153
	AP Match	13.42	2.21	147
Microeconomics	CLEP	13.68	2.31	57
	CLEP Match	13.47	2.22	55
	AP	14.73	1.93	42
	AP Match	13.37	2.67	41
Psychology	CLEP	13.48	3.24	69
	CLEP Match	14.16	7.62	69
	AP	13.31	1.80	33
	AP Match	13.48	1.49	33
Sociology	CLEP	13.06 ^a	2.16	104
	CLEP Match	13.10 ^a	1.81	103

1995	Group	Mean	SD	N
American Government	CLEP	13.37	2.17	926
	CLEP Match	13.21	3.64	870
	AP	13.62	1.92	350
	AP Match	13.36	2.71	338
Calculus	CLEP	13.99	2.24	24
	CLEP Match	14.04	2.60	20
	AP	13.83	1.94	581
	AP Match	13.65	2.97	563
Macroeconomics	CLEP	13.90	2.05	45
	CLEP Match	13.10	2.22	44
	AP	13.79	1.85	209
	AP Match	13.76	3.22	202
Microeconomics	CLEP	13.89	2.09	44
	CLEP Match	13.60	1.66	44
	AP	14.13	1.94	48
	AP Match	13.39	1.37	48
Psychology	CLEP	14.10	2.59	64
	CLEP Match	13.27	2.22	63
	AP	13.51	1.98	69
	AP Match	13.48	1.95	68
Sociology	CLEP	13.21	1.70	94
	CLEP Match	13.29	2.01	94

1996	Group	Mean	SD	N
American Government	CLEP	13.08	2.02	1,035
	CLEP Match	13.00	2.34	1,014
	AP	13.40	2.10	358
	AP Match	13.10	2.17	366
Calculus	CLEP	14.76	3.57	30
	CLEP Match	13.90	2.47	26
	AP	13.85 ^a	2.02	697
	AP Match	13.42 ^a	1.87	654
Macroeconomics	CLEP	13.18	2.58	33
	CLEP Match	12.62	2.73	30
	AP	13.74	1.96	166
	AP Match	13.44	2.18	118
Microeconomics	CLEP	14.64	2.35	16
	CLEP Match	13.77	1.26	16
	AP	13.76	2.04	56
	AP Match	14.31	2.11	56
Psychology	CLEP	14.57	3.67	55
	CLEP Match	13.32	1.98	55
	AP	13.63	2.61	102
	AP Match	13.69	2.93	102
Sociology	CLEP	13.48	3.18	89
	CLEP Match	13.43	2.05	89

Aggregated 1994-1996	Group	Mean	SD	N
American Literature	CLEP	13.21	2.47	46
	CLEP Match	13.54	4.65	45
College Algebra	CLEP	13.79 ^a	1.88	35
	CLEP Match	12.33 ^a	1.77	33
English Literature	CLEP	13.58	1.56	43
	CLEP Match	12.89	1.92	43

¹⁵ Means with matching superscript letters within each subject area and year are different at the $p=.01$ level.

through the program. Compared to the AP Program, little published research is available on CLEP. Further research is also needed given the switch to CBT for CLEP. Data available for the present study were insufficient to investigate whether results found for the paper-and-pencil versions of the examinations would replicate for the computer-based versions. However, it is critical that this research be completed as the use of CLEP CBT grows.

Future research is needed to replicate the present findings at additional public universities, small colleges, community colleges, private colleges and universities, and other types of postsecondary institutions represented among the 2,900 that participate in CLEP. Though the university that provided data for this study is one of the largest users of CLEP, it is not typical of the population of postsecondary institutions that accept CLEP scores. Given the university's selectivity in admissions, it may be that CLEP students enrolled there have a higher level of academic achievement than CLEP students in general. Additionally, this university's implementation of CLEP is not typical. The university requires additional work for four of the nine examinations accepted in order for students to be awarded credit for their CLEP scores. Also, this university awards letter grades for CLEP scores in some subject areas. These differences may mean that students who receive CLEP credit at this university are higher achieving students than CLEP students in general.

It is important that future research include both a closely matched comparison group for the CLEP credit-earning group and a group of students earning credit through AP. The worth of future findings of positive outcomes for CLEP can only be judged by the groups to which CLEP is compared.

Summary

The purpose of this study was to investigate the short-term and long-term educational outcomes of students who earned college credit through nine CLEP examinations. Some have criticized CLEP as being an unacceptably easy way for students who don't have college-level knowledge of a subject area to earn credit. However, previous research has indicated that outcomes for students receiving credit for CLEP are generally favorable.

Outcomes investigated included overall GPA, sequent course grade (for two examinations), number of additional courses taken in the subject area, GPA for additional courses in the subject area, number of semesters enrolled, graduation rate, number of semesters enrolled for those who graduated, and average number of credit hours taken per semester. Outcomes for students who earned credit through CLEP were found to be as good as or better than those of students of similar ability who earned credit through course enrollment. CLEP students also had educational outcomes

that were similar to those of AP students earning credit in the same subject areas. Where replication studies were possible, these results replicated across data obtained from three entering classes of students.

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Appendix: High School Rank and SAT® Scores for All Groups

Table A1

High School Rank and SAT Total Score of 1994–1996 Groups¹⁶

<i>Year/Exam</i>	<i>Group</i>	<i>High School Rank</i>			<i>SAT Total Score</i>		
<i>1994</i>		<i>Mean</i>	<i>SD</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>N</i>
American Government	CLEP	15.69 ^{a, b}	14.47	970	1223.78 ^{e, f}	151.98	970
	CLEP Match	16.01 ^{c, d}	14.18	947	1221.03 ^{g, h}	129.43	947
	AP	10.37 ^{a, c}	10.73	243	1313.50 ^{e, g}	153.66	243
	AP Match	11.77 ^{b, d}	10.31	237	1314.64 ^{f, h}	125.21	237
American Literature	CLEP	15.27	14.31	16	1301.25	179.51	16
	CLEP Match	15.41	16.25	15	1271.33	174.84	15
Calculus	CLEP	10.10	11.08	28	1325.00	23.25	28
	CLEP Match	9.36	8.80	28	1328.93	127.49	28
	AP	8.67	8.98	586	1274.04	182.47	586
	AP Match	9.36	9.15	578	1283.93	117.49	578
College Algebra	CLEP	7.84	5.95	11	1162.73	153.43	11
	CLEP Match	11.09	7.55	11	1160.00	175.50	11
English Literature	CLEP	13.14	12.74	12	1317.50	94.21	12
	CLEP Match	16.53	14.46	12	1304.17	98.02	12
Macroeconomics	CLEP	11.41	10.34	53	1289.81	113.84	53
	CLEP Match	13.25	11.53	53	1282.08 ^a	111.72	53
	AP	10.97	12.03	153	1348.89 ^a	127.90	153
	AP Match	11.95	11.73	147	1332.72	124.24	147
Microeconomics	CLEP	11.41	9.53	57	1281.93 ^a	141.54	57
	CLEP Match	12.97	9.85	55	1265.27 ^{b, c}	136.18	55
	AP	8.22	9.64	42	1361.19 ^{a, b}	101.77	42
	AP Match	9.10	9.74	41	1345.61 ^c	108.14	41
Psychology	CLEP	18.21	17.03	71	1196.48 ^{a, b}	244.87	71
	CLEP Match	17.37	18.09	69	1221.88 ^{c, d}	135.42	69
	AP	11.64	12.94	33	1322.73 ^{a, c}	102.02	33
	AP Match	11.84	15.93	33	1320.91 ^{b, d}	116.17	33
Sociology	CLEP	16.67	17.01	106	1226.04	211.14	106
	CLEP Match	17.90	16.50	103	1235.53	124.25	103
1995	Group	Mean	SD	N	Mean	SD	N
American Government	CLEP	14.90 ^{a, b}	14.09	926	1241.31	138.98	926
	CLEP Match	15.16 ^{c, d}	13.77	870	1227.99	125.90	870
	AP	9.39 ^{a, c}	10.82	350	1318.26	114.24	350
	AP Match	11.42 ^{b, d}	10.37	338	1305.47	113.70	338
American Literature	CLEP	11.97	7.07	12	1350.00	76.63	12
	CLEP Match	8.39	8.95	12	1347.50	80.35	12
Calculus	CLEP	5.79	6.25	24	1304.17	150.13	24
	CLEP Match	9.56	6.34	20	1263.50	129.30	20
	AP	8.16	7.56	581	1317.68	120.11	581
	AP Match	9.44	8.25	563	1307.41	118.19	563

College Algebra	CLEP	16.95	9.71	9	1160.00	142.57	9
	CLEP Match	22.00	12.77	8	1167.50	109.25	8
English Literature	CLEP	6.41	7.47	17	1409.41	112.50	17
	CLEP Match	9.95	7.71	17	1401.76	99.64	17
Macroeconomics	CLEP	9.64	8.44	45	1310.22	126.98	45
	CLEP Match	10.31	9.12	44	1313.64	123.08	44
	AP	10.10	11.23	209	1341.77	113.09	209
	AP Match	11.11	11.31	202	1328.02	107.20	202
Microeconomics	CLEP	13.78 ^a	12.93	44	1298.41 ^a	100.97	44
	CLEP Match	14.45 ^b	13.69	44	1288.64	105.71	44
	AP	6.10 ^{a, b}	6.42	49	1350.00	221.93	49
	AP Match	7.51	5.82	48	1367.71 ^a	106.02	48
Psychology	CLEP	14.09	11.49	63	1282.54	146.91	63
	CLEP Match	13.41	10.47	63	1278.44	139.50	63
	AP	12.62	12.86	69	1303.48	109.34	69
	AP Match	13.85	12.62	68	1290.44	114.64	68
Sociology	CLEP	17.01	16.79	94	1256.06	139.32	94
	CLEP Match	15.44	15.16	94	1259.04	136.09	94

1996	Group	Mean	SD	N	Mean	SD	N
American Government	CLEP	17.14 ^{a, b}	15.87	1,042	1223.02 ^{a, b}	174.51	1,042
	CLEP Match	17.15 ^{c, d}	15.38	1,014	1228.22 ^{c, d}	141.32	1,014
	AP	11.10 ^{a, c}	11.63	359	1326.02 ^{a, c}	114.24	359
	AP Match	12.20 ^{b, d}	11.36	366	1330.82 ^{b, d}	130.02	366
American Literature	CLEP	11.57	13.07	18	1361.67	117.29	18
	CLEP Match	12.28	9.87	18	1358.33	120.40	18
Calculus	CLEP	7.66	7.08	30	1350.33	132.65	30
	CLEP Match	13.50	7.14	26	1328.08	118.83	26
	AP	9.69	9.50	697	1317.65	127.68	697
	AP Match	11.20	10.03	654	1298.79	123.16	654
College Algebra	CLEP	14.36	14.98	15	1278.67	128.94	15
	CLEP Match	16.15	14.95	14	1228.57	115.55	14
English Literature	CLEP	9.24	7.66	14	1325.71	121.45	14
	CLEP Match	9.22	6.19	14	1312.14	124.97	14
Macroeconomics	CLEP	10.08	7.09	33	1289.70 ^a	146.30	33
	CLEP Match	11.91	9.83	30	1281.33 ^b	120.48	30
	AP	9.02	9.44	166	1381.51 ^{a, b}	111.29	166
	AP Match	9.63	7.61	118	1347.54	105.45	118
Microeconomics	CLEP	7.11	6.32	16	1315.00	132.97	16
	CLEP Match	9.84	6.09	16	1295.00	130.08	16
	AP	10.13	9.72	56	1351.42	150.63	56
	AP Match	10.57	8.79	56	1352.14	146.57	56
Psychology	CLEP	12.45	11.55	56	1262.14 ^a	220.72	56
	CLEP Match	13.24	12.93	55	1279.82	154.05	55
	AP	13.41	12.92	102	1338.04 ^a	102.30	102
	AP Match	13.25	12.93	102	1333.92	104.01	102
Sociology	CLEP	15.08	12.34	89	1283.03	139.64	89
	CLEP Match	14.97	12.16	89	1275.84	144.60	89

¹⁶ Means with matching superscript letters within each subject area and year are different at the $p=.01$ level.

Table A2

High School Rank and SAT Total Score of 2001 Groups

<i>Year/Exam</i>	<i>Group</i>	<i>High School Rank</i>			<i>SAT Total Score</i>		
		<i>Mean</i>	<i>SD</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>N</i>
2001							
American Government	CLEP	9.27	11.18	34	1313.24	116.64	25
	CLEP Match	11.31	9.22	25	1315.20	123.56	25
Calculus	CLEP	17.92	19.60	12	1384.17	119.88	12
	CLEP Match	14.06	12.97	11	1366.36	131.93	11
College Algebra	CLEP	14.64	12.07	12	1142.00	130.89	15
	CLEP Match	11.92	11.69	11	1104.55	127.31	11
Macroeconomics	CLEP	6.78	8.14	16	1365.50	109.38	20
	CLEP Match	10.56	7.91	15	1310.00	178.63	14
Microeconomics	CLEP				1386.00	117.18	5
Psychology	CLEP	16.71	7.45	8	1373.00	60.01	10
	CLEP Match	12.21	8.01	7	1368.57	86.68	7
Sociology	CLEP	10.08	16.20	15	1337.65	157.54	17
	CLEP Match	11.56	8.50	14	1310.00	178.63	14

