Research Notes

Office of Research and Development **RN-03, May 1998**

Block Schedules and Student Performance on AP® Examinations

BACKGROUND

In the past decade, U.S. secondary schools have introduced a variety of alternative classroom schedules in efforts to increase student learning and achievement and other valued educational outcomes. A number of these alternative schedule arrangements have been labeled "block schedules."

Semesterized and extended block schedules have been implemented in schools. Both types of block schedules provide more extended time for teaching and learning than the traditional class periods of 30–45 minutes. First, semesterized block schedules compress a full-year course into a semester though daily extended class periods that range from over 60 to 90 minutes each day per course. Fall courses will be typically completed by late January when a different set of spring courses begin. The second form, extended block schedule, is when a full-year course is completed through the same extended class periods throughout the year. Again, classes are scheduled in blocks of time ranging from over 60 to 90 minutes and may be conducted on five-day or alternative-day schedules. In the latter instances, student classes alternate every other day. Many schools will employ a six-day schedule and students attend 3–4 courses (e.g., English and foreign language) on A, C, and E days and their remaining courses (e.g., math and science) on B, D, and F days.

As more schools move toward these forms of block schedules, or other alternative schedules, there has been increased concern and speculation about the effects of these changes on educational outcomes ranging from disciplinary actions and class attendance to student learning and achievement. Semesterized block schedules face another dilemma when courses have an end-of-course examination, such as those imposed and proposed by some states (e.g., New York Regents examinations, Maryland's proposed assessments) and the College Board's Advanced Placement (AP®) Progam® Examinations.

AP Examinations are offered across 32 subjects in May each year. Approximately 7 percent of AP high schools have adopted a semesterized block schedule. Many of these schools have requested a January examination for students completing the course in the fall. Some educators have expressed concern that students completing the course in January are penalized by having to wait until May to complete the AP Examination. Not instituting a January administration could potentially alienate some of these schools, reduce the number of students from these schools completing the examinations, and disadvantage students completing the course four months prior to the administration of examinations. A related concern has been what, if any, teacher-instructed review of preparation is provided prior to the May examination for students completing courses in the fall semester. In addition, there has been concern that students in the spring block may be at a disadvantage because they have not had sufficient time to adequately cover the curriculum when AP Examinations are offered in early May.

Design of Study

The present study was conducted to examine the effects of block schedules on student AP grades when completing the AP Examinations in May. During the past two years, AP staff have gathered information on the impact of scheduling changes on AP courses and examinations through questionnaires, telephone surveys, and open forums and workshops with teachers. This information suggested that four instructional schedules are used in schools:

1. traditional schedule of 30- to 60-minute sessions

each day during the school year
2. alternating schedule of 61- to 90-minute sessions every day during the school year
3. semesterized fall block course
4. semesterized spring block course

All students completing the four highest volume AP Examinations (U.S. History, English Literature, Biology, and Calculus AB) in 1997 were asked several background questions to assist in examining the impact of alternative schedules on examination performance. Specifically, they were asked to indicate which schedule was employed for the AP course completed in 1996-97, and if they completed a fall semester block course they were asked what type of teacher-instructed review was provided before the spring AP Examination. Students completing a fall semester block course were also asked what teacher-instructed review was provided prior to their May examinations. The actual questions are listed in the appendix.

Students' AP data from the 1997 administration were matched with their scores on the PSAT/NMSQT administered in 1995 or 1996. The PSAT/NMSQT scores were used as a statistical control for differences in student ability that may exist for students across the instructional schedules. It is important to employ a covariate, such as the PSAT/NMSQT, to ensure that any differences in student performance across the various instructional schedules are primarily related to the schedule and not to existing differences in the ability level of students in a specific schedule (e.g., fall semester block). PSAT/NMSQT was selected as the covariate because it provides a standardized and objective measure of students' developed verbal and mathematical reasoning ability. For the U.S. History and English Literature examinations, the PSAT/NMSQT verbal score was used as the covariate. For Calculus AB the PSAT/NMSQT mathematical score was used as the covariate. Both PSAT/NMSQT scores were used for AP Biology. Previous research has reported the high correlation between these AP Examinations and the corresponding PSAT/NMSQT scores (Camara, 1997). Other potential measures of ability such as grade in the AP course or high school GPA were not available, and because of substantial variation in grading standards and the components of grades (Brookhart, 1993; Stiggins, Frisbie, and Griswold, 1989) these measures would have been inferior to the PSAT/NMSQT in serving as a covariance in this study.

Results

Between 55 and 67 percent of the students completing these four AP Examinations in 1997 had taken the PSAT/NMSQT in 1995 or 1996. Table 1 shows that the resulting sample of students used in this study closely approximated the total population of students completing these AP Examinations. In all instances, the sample of AP students with PSAT/NMSQT scores performed slightly better than the total population on the examinations and these trends remain the same across instructional schedules.[1]

Table 1 also reports the frequencies for the four instructional schedules. Approximately 80 percent of students completed AP courses in traditional year-long periods of 30 to 60 minutes. Year-long extended periods of 61- to 90-minute daily periods were the next most frequent schedule for all AP courses. Over 17 percent of students reported this schedule for AP Biology and 12 percent of AP Calculus students completed courses with extended periods. About 10 percent of students completed AP U.S. History and English Literature in this instructional schedule. Semester block schedules were relatively infrequently employed for the AP courses. About 6 percent of students completed either a fall or spring AP course with this instructional schedule. The exception was in AP English Literature where semesterized block schedules were more popular with nearly 10 percent of students enrolled under this schedule. It is likely that a larger proportion of students may attend schools that have adopted such a semesterized block schedule for most courses but have

[1] All covariates in this study were examined for interaction with the instructional schedule variable. No interactions were found suggesting their suitability as covariates.

TABLE 1

Descriptive Statistics for Total and Analysis Samples by Test and Instructional Schedule

CALCULUS AB

Instructional Schedule	TOTAL AP SAMPLE				ANALYSIS SAMPLE			
	N	Percent*	Mean AP Grade	SD AP Grade	*N*	Percent*	Mean AP Grade	SD AP Grade
Fall	2,619	3.5	2.65	1.29	1,466	3.4	2.70	1.31
Spring	2,660	3.6	2.63	1.30	1,514	3.5	2.68	1.31
Year-long: 30–60	60,018	80.8	2.88	1.29	35,044	81.4	2.96	1.29
Year-long: 61–90	8,984	12.1	2.84	1.31	5,012	11.6	2.92	1.31
TOTAL**	74,281	100.0	2.86	1.29	43,036	100.0	2.93	1.29

BIOLOGY

Instructional Schedule	TOTAL AP SAMPLE				ANALYSIS SAMPLE			
	N	Percent*	Mean AP Grade	SD AP Grade	*N*	Percent*	Mean AP Grade	SD AP Grade
Fall	1,419	3.1	2.80	1.35	805	3.1	3.00	1.37
Spring	1,434	3.2	2.97	1.37	818	3.1	3.06	1.36
Year-long: 30–60	34,652	76.3	3.27	1.28	20,178	76.9	3.38	1.26
Year-long: 61–90	7,903	17.4	3.13	1.27	4,437	16.9	3.24	1.26
TOTAL**	45,408	100.0	3.22	1.28	26,238	100.0	3.33	1.27

U.S. HISTORY

Instructional Schedule	TOTAL AP SAMPLE				ANALYSIS SAMPLE			
	N	Percent*	Mean AP Grade	SD AP Grade	*N*	Percent*	Mean AP Grade	SD AP Grade
Fall	2,673	2.7	2.42	1.15	1, 704	2.7	2.52	1.17
Spring	2,817	2.9	2.54	1.19	1,770	2.8	2.66	1.20
Year-long: 30–60	83,287	84.6	2.91	1.20	54,662	85.0	2.99	1.19
Year-long: 61–90	9,704	9.9	2.72	1.20	6,164	9.6	2.82	1.20
TOTAL**	98,481	100.0	2.87	1.20	64,300	100.0	2.95	1.19

ENGLISH LITERATURE

Instructional Schedule	TOTAL AP SAMPLE				ANALYSIS SAMPLE			
	N	Percent*	Mean AP Grade	SD AP Grade	*N*	Percent*	Mean AP Grade	SD AP Grade
Fall	4,604	4.5	3.00	1.10	2,599	4.5	3.08	1.05
Spring	5,128	5.0	2.98	1.09	2,793	4.9	3.11	1.07
Year-long: 30–60	84,467	81.7	3.12	1.06	46,928	81.7	3.20	1.10
Year-long: 61–90	9,199	8.9	2.89	1.08	5,137	8.9	3.00	1.07
TOTAL**	103,398	100.0	3.09	1.07	57,457	100.0	3.17	1.09

* Individual percents may not add up to 100 percent due to rounding.

** TOTAL represents the sum of the examines selecting one of the four primary instructional schedules. An "other" option (not presented) constituted approximately 16 percent (a low of 14.6 percent for Calculus AB and a high of 17.2 percent for English Literature) of the sample responding to this question. Approximately 13 percent of the sample did not provide a response to this question.

maintained year-long AP courses because a January examination is not available. However, this study was not designed to determine the extent that these instructional schedules are operated in non-AP courses.

The survey also indicated that most students completing AP courses during the fall semester were provided with teacher-instructed review during the spring semester, prior to the examination. Over 35 percent of students reported that teachers provided an AP review two weeks or less prior to the date of the AP examination. An additional 39 percent of students were provided with such a review three weeks or longer before the examination and only 20 percent said no teacher-instructed review was available. Teacher-instructed reviews were less often provided for English Literature than other AP Examinations studied. Results are reported in the appendix.

Table 2 shows the mean score on the PSAT/NMSQT for the sample of AP students in each of the four groups (i.e., instructional schedules).

The analysis of the covariance controlled for differences in student ability across these groups and differences in the resulting AP grades were assessed by using a Bonferroni controlled *t*-test for multiple comparisons. Since the groups had four levels (four instructional schedules), six comparisons were possible; consequently, a significance level of 0.05/6 = 0.008 was used. Results from the analysis of covariance are reported in the appendix.

Results from the analysis of covariance illustrate significant effects for the instructional schedules, in addition to student ability as measured by their PSAT/NMSQT scores. Results are reported in the appendix. Descriptive statistics for the four AP Examinations are provided in Tables 3–6. As noted above, students in each of these four instructional schedules differed in ability prior to completing the AP course or examination and AP Examination grades must be adjusted to control for these differences before meaningful comparisons can be made. In Tables 3–6, it is the adjusted mean and standard error of the adjusted mean that reflects real differences in AP Examination grades for the instructional schedules after controlling for differences in students' ability. The second portion of each table then shows differences between the respective adjusted group means and determines whether a difference is statistically significant.

The final portion of the table illustrates the effect size for differences between the instructional schedules. The effect size can be considered as a standardized measure of the differences between the mean examination grades for the two groups. The difference between groups is expressed in standard deviation units. In analyses, such as those conducted in this study, where we compare the performance of two groups on examination grades, we are attempting to determine whether there is a practical difference between groups as well as a statistically significant difference. Effect size shows the extent that differences between groups reach "practical significance." Conventional definitions of small, medium, and large effect sizes for this kind of analysis correspond to values of 0.20, 0.50, and 0.80, respectively (Cohen, 1988). Values below 0.20 are considered to have minimal or no effect.

TABLE 2

Descriptive Statistics for Each Covariance (P/N score) by Test and Instructional Schedule

SCHEDULE OF INSTRUCTION	CALCULUS AB			BIOLOGY						U.S. HISTORY			ENGLISH LITERATURE		
	P/N-M			P/N-V			P/N-M			P/N-V			P/N-V		
	N	MEAN	SD	*N*	MEAN	SD	*N*	MEAN	SD	*N*	MEAN	SD	*N*	MEAN	SD
Fall	1,466	61.86	8.33	805	57.86	9.68	805	59.20	10.02	1,704	57.07	9.42	2,599	59.59	8.87
Spring	1,514	61.43	8.60	818	57.54	9.85	818	59.10	10.07	1,770	56.86	8.96	2,793	59.37	8.78
Year-long 30–60	35,044	62.93	7.81	20,178	59.31	8.92	20,178	61.01	9.07	54,662	59.14	8.72	46,928	59.79	8.59
Year-long 61–90	5,012	59.99	8.32	4,437	56.40	8.99	4,437	57.94	9.12	6,164	56.86	8.97	5,137	57.66	8.98

Calculus AB

The range between the lowest and highest adjusted means (0.38) was about one-third of an adjusted

AP grade. All comparisons of instructional schedules were found to differ from each other with the exception of fall and spring semester block schedules where there were no significant differences. Overall, results from Table 3 indicate that students completing a year-long AP Calculus course with extended sessions (61–90 minute sessions each day) obtained a higher score than students completing a year-long course with traditional length sessions (30–60 minute sessions each day). Both groups performed significantly better than students in semester block schedule instructional sessions. There were no significant differences between students completing the course in a fall or spring semester block. Finally, differences between the year-long extended session (61–90 minute classes) and semester (both fall and spring) courses had a small effect of approximately 0.3 of a standard deviation. These results can be illustrated in the following ordering for AP Examination grades:

Year-long 61–90 minutes/day > Year-long 30–60 minutes/day > Fall semester = Spring semester

Overall, results from this study indicate students in AP Calculus AB:

1. earn higher grades in year-long courses;
2. earn higher grades in year-long courses that meet for extended or longer periods each day; and
3. earn similar grades in semester block courses in the fall or spring.

TABLE 3

CALCULUS AB

Descriptive Statistics by Schedule of Instruction

Instruction Schedule	*N*	Observed Mean	Observed SD	Adjusted Mean	Adjusted Std Error
Fall[1]	1,466	2.70	1.31	2.76	0.03
Spring[2]	1,514	2.68	1.31	2.78	0.03
Year-long: 30–60[3]	35,044	2.96	1.29	2.92	0.01
Year-long: 61–90[4]	5,012	2.92	1.31	3.14	0.02

Mean Group Differences with Significance Indicators

Instruction Schedule	Instruction Schedule			
	Fall	Spring	Year-long: 30–60	Year-long: 61–90
Fall	—			
Spring	.50	—		
Year-long: 30–60	5.43*	4.82*	—	
Year-long: 61–90	11.90*	11.43*	13.72*	—

* $p < .008$

Effect Size for Group Differences

Instruction Schedule	Instruction Schedule			
	Fall	Spring	Year-long: 30–60	Year-long: 61–90
Fall	—			
Spring	.015	—		
Year-long: 30–60	.123	.107	—	
Year-long: 61–90	.29*	2.75*	1.68	—

* $p < .008$

[1] Fall = complete course compressed in the Fall 1996 semester
[2] Spring = complete course compressed in the Spring 1997 semester
[3] Year-long: 30–60 = a 30- to 60-minute session every school day throughout the school year
[4] Year-long: 61–90 = a 61- to 90-minute session every school day throughout the school year

Biology

Similar results have been observed for AP Biology as those reported above for AP Calculus AB. The range between lowest and highest adjusted means was one-third (0.38) of an adjusted AP grade and the same ordering of examination scores was found:

Year-long 61–90 minutes/day > Year-long 30–60 minutes/day > Fall semester = Spring semester

Overall, results from this study indicate students in AP Biology:

1. earn higher grades in year-long courses;
2. earn higher grades in year-long courses that meet for extended or longer periods each day; and
3. earn similar grades in semester block courses in the fall or spring.

U.S. History

In AP U.S. History, the differences between the lowest and highest adjusted means is one-third (0.31) of an AP grade. There were no differences between students enrolled in the year-long courses; however, both groups performed significantly better than students enrolled in semester block courses. In addition, students in the spring semester block sessions had significantly higher adjusted mean AP grades than students in the fall semester block sessions. Small effect sizes were found between both year-long courses and the fall semester block schedule (but not with the spring semester block schedule). The ordering of AP Examination grades by schedules is:

TABLE 4

BIOLOGY

Descriptive Statistics by Schedule of Instruction

Instruction Schedule	*N*	Observed Mean	Observed SD	Adjusted Mean	Adjusted Std Error
Fall[1]	805	3.00	1.37	3.10	0.03
Spring[2]	818	3.06	1.36	3.18	0.03
Year-long: 30–60[3]	20,178	3.38	1.26	3.32	0.01
Year-long: 61–90[4]	4,437	3.24	1.26	3.48	0.01

Mean Group Differences with Significance Indicators

Instruction Schedule	Instruction Schedule			
	Fall	Spring	Year-long: 30–60	Year-long: 61–90
Fall	—			
Spring	1.68	—		
Year-long: 30–60	6.31*	4.02*	—	
Year-long: 61–90	10.41*	8.30*	10.29*	—

* $p < .008$

Effect Size for Group Differences

Instruction Schedule	Instruction Schedule			
	Fall	Spring	Year-long: 30–60	Year-long: 61–90
Fall	—			
Spring	.063	—		
Year-long: 30–60	.173	.110	—	
Year-long: 61–90	.299*	.236*	1.26	—

* $p < .008$

[1] Fall = complete course compressed in the Fall 1996 semester
[2] Spring = complete course compressed in the Spring 1997 semester
[3] Year-long: 30–60 = a 30- to 60-minute session every school day throughout the school year
[4] Year-long: 61–90 = a 61- to 90-minute session every school day throughout the school year

TABLE 5

U.S. HISTORY

Descriptive Statistics by Schedule of Instruction

Instruction Schedule	*N*	Observed Mean	Observed SD	Adjusted Mean	Adjusted Std Error
Fall[1]	1,704	2.52	1.17	2.66	0.02
Spring[2]	1,770	2.66	1.20	2.82	0.02
Year-long: 30–60[3]	54,662	2.99	1.19	2.97	0.00
Year-long: 61–90[4]	6,164	2.82	1.20	2.97	0.01

Mean Group Differences with Significance Indicators

Instruction Schedule	Instruction Schedule			
	Fall	Spring	Year-long: 30–60	Year-long: 61–90
Fall	—			
Spring	4.70*	—		
Year-long: 30–60	12.70*	6.33*	—	
Year-long: 61–90	11.71*	5.97*	0.59*	—

* $p < .008$

Effect Size for Group Differences

Instruction Schedule	Instruction Schedule			
	Fall	Spring	Year-long: 30–60	Year-long: 61–90
Fall	—			
Spring	.135		—	
Year-long: 30–60	.261*	.126	—	
Year-long: 61–90	.261*	.126	0	—

* $p < .008$

[1] Fall = complete course compressed in the Fall 1996 semester
[2] Spring = complete course compressed in the Spring 1997 semester
[3] Year-long: 30-60 = a 30- to 60-minute session every school day throughout the school year
[4] Year-long: 61-90 = a 61- to 90-minute session every school day throughout the school year

Year-long 61–90 minutes/day = Year-long 30–60 minutes/day > Spring semester > Fall semester

Overall, results from this study indicate students in AP U.S. History:

1. earn higher grades in year-long courses irrespective of the length of class periods, and
2. earn higher grades in spring semester courses than fall semester courses.

English Literature

The results are less clear for AP English Literature than for other AP Examinations. The range between the lowest and highest mean adjusted scores was only 0.11. No significant differences were found between fall and spring semester block courses, or between the year-long courses. However, students in year-long extended period classes did significantly better than students in the fall semester block courses, while students in the traditional length year-long classes did significantly better than fall and spring semester block courses. None of the comparisons between course schedules had an effect size equal to 0.20, indicating no practical significance between schedules for AP English Literature. These results can be displayed as follows:

Fall semester = Spring semester
Year-long 61–90 minutes/day = Year long 30–60 minutes/day > Fall semester
Year-long 30–60 minutes/day > Spring semester

Overall, results from this study indicate students in AP English Literature:

TABLE 6

ENGLISH LITERATURE

Descriptive Statistics by Schedule of Instruction

Instruction Schedule	*N*	Observed Mean	Observed SD	Adjusted Mean	Adjusted Std Error
Fall[1]	2,599	3.08	1.05	3.08	0.02
Spring[2]	2,793	3.11	1.07	3.13	0.01
Year-long: 30–60[3]	46,928	3.20	1.10	3.19	0.00
Year-long: 61–90[4]	5,137	3.00	1.07	3.16	0.01

Mean Group Differences with Significance Indicators

Instruction Schedule	Instruction Schedule			
	Fall	Spring	Year-long: 30–60	Year-long: 61–90
Fall	—			
Spring	2.20	—		
Year-long: 30–60	6.62*	3.77*		—
Year-long: 61–90	4.19*	1.74	-2.21	—

* $p < .008$

Effect Size for Group Differences

Instruction Schedule	Instruction Schedule			
	Fall	Spring	Year-long: 30–60	Year-long: 61–90
Fall	—			
Spring	.046		—	
Year-long: 30–60	.101	.055	—	
Year-long: 61–90	.074	.028	.028	—

* $p < .008$

[1] Fall = complete course compressed in the Fall 1996 semester
[2] Spring = complete course compressed in the Spring 1997 semester
[3] Year-long: 30–60 = a 30- to 60-minute session every school day throughout the school year
[4] Year-long: 61–90 = a 61- to 90-minute session every school day throughout the school year

1. earn similar grades in semester block courses in the fall or spring;
2. enrollees in year-long courses receive similar grades irrespective of the length of class periods;
3. enrollees in year-long traditional timed classes perform somewhat better than students in either fall or spring semester block schedules; and
4. enrollees in year-long extended time classes earn somewhat higher grades than students in fall semester block classes.

Other Instructional Schedules

Fifteen percent of all students completing the questions on block schedules indicated that they followed an instruction schedule other than the four types identified above. Because these students indicated an "other schedule," their AP performance was not included in this study, yet their responses provide some perspective on instructional practices across AP courses. Table 7 shows that this "other schedule" often was the second most frequently selected, and this varied little by AP course. Of these students, 56 percent followed a full-year, alternating day schedule and 4 percent of students said the length of their classes varied.

CONCLUSIONS

The instructional schedule does affect student grades on the four AP Examinations in this study after they have been adjusted for group differences in student ability. The results from this study gen-

erally suggest that students, on average, obtain higher AP grades when instruction is given over an entire year rather than in a semesterized block schedule format. These results are consistent across the four AP Examinations and are found on 15 of the 16 comparisons between year-long and semester block courses.[2] The remaining results differ by examination and subject.

For AP Biology and Calculus AB, the length of class time appears to influence students' grades, with students in longer or extended periods receiving significantly higher grades. More recent instruction (spring versus fall semester block schedule) did not affect grades.

In AP U.S. History, longer instructional periods still resulted in higher AP grades. However, more recent instruction (spring) also appears to result in higher grades on the examination. As noted above, results for AP English Literature are less compelling. The recency of instruction (spring versus fall) and length of year-long instructional periods did not significantly affect student grades. Students in year-long courses meeting daily did receive higher grades than students enrolled in semesterized courses in three out of four comparisons.

It is unclear why different patterns of results were found for different AP Examinations. While different scores from the PSAT/NMSQT were used as the covariances for the different examinations, there does not appear to be any systematic evidence that this resulted in the different results across examinations. A possible explanation may be related to how the course material is learned. Biology and calculus are primarily learned through specific instruction delivered over short periods of time (i.e., one course), while instruction in U.S. history occurs several times over the course of a student's schooling. English literature, like U.S. history, occurs at multiple points in a student's educational career, however, literature lends itself, more than the other courses investigated here, to self-instruction and self-study. Perhaps, course content that is subject to self-instruction is less dependent on the instructional schedule for high performing and motivated students who typically enroll in AP courses.

TABLE 7

Percent of All Students Completing AP Course by Instructional Schedule

SURVEY QUESTIONS	NUMBER RESPONDING	PERCENTAGE RESPONDING	MEAN AP GRADE
Which option best describes the AP course you completed in 1996/97?			
(a) compressed course in the fall 1996 semester	26,647	3	2.88
(b) compressed course in the spring 1997 semester	30,488	4	2.93
(c) 30–60 minute session ever school day throughout the year	467,445	58	3.07
(d) 61–90 minute session every school day throughout the year	60,849	7	2.93
(e) other schedule *	119,871	15	3.02
no response	106,525	13	
Other schedule:			
(a) fall 1996 semester and first grading period of spring 1997	3,182	3	3.09
(b) fall 1996 semester and second grading period of spring 1997	1,450	1	2.75
(c) number of classes per week varied	67,823	56	2.93
(d) the length of classes varied	5,129	4	3.28
(e) other	37,369	31	3.17
no response	6,228	5	

* "Other schedule" responses were further broken down into six categories.

[2] No significant difference was found between the year-long extended classes and the spring semester block classes for the AP English Literature Examination.

While these results are not uniform across the tests examined, the evidence in this study suggests that students who are taught in compressed schedules score lower on all four AP Examinations than those who receive year-long instruction. For courses on compressed schedules (fall or spring), there is some evidence that higher AP Examination grades may be obtained when testing immediately follows instruction. Finally, there is also some supporting evidence that students obtain higher AP grades when more time is devoted to instruction.

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TABLE A1

Analysis of Covariance Results by Test

CALCULUS AB*

Source of Variance	DF	Mean Square**	F
P/N - M	1	21,869.36	18,905.43***
Schedule	3	100.93	87.25***
Error	43,031	1.16	
Total	43,035		

* Overall model had an observed F = 4791.80, $p < .001$

BIOLOGY*

Source of Variance	DF	Mean Square**	F
P/N - V	1	4,450.65	16,142.89***
P/N - M	1	4,064.93	4,540.95***
Schedule	3	53.81	60.11
Error	26,232	.90	
Total	26,237		

* Overall model had an observed F = 4791.83, $p < .001$

U.S. HISTORY*

Source of Variance	DF	Mean Square**	F
P/N - M	1	31,992.67	34,096.63***
Schedule	3	62.29	66.39***
Error	64,295	.94	
Total	64,299		

* Overall model had an observed F = 8573.95, $p < .001$

ENGLISH LITERATURE*

Source of Variance	DF	Mean Square**	F
P/N - M	1	29,486.37	49,077.73***
Schedule	3	11.56	19.24***
Error	57,452	.60	
Total	57,456		

* Overall model had an observed F = 12,283.86, $p < .001$
** The mean squares were computed using Type I sums of squares.
*** $p < .001$

TABLE A2

Teacher-instructed Review for Students Completing AP Courses in Fall Semester Block

	Percentages				
	Total	**Calculus AB**	**Biology**	**U.S. History**	**English Lit.**
review during second grading period	18%	24%	18%	28%	19%
review 3–4 weeks prior to exam	21%	23%	22%	26%	18%
review 1–2 weeks prior to exam	19%	17%	19%	17%	17%
review less than 1 week prior to exam	16%	13%	13%	8%	18%
no teacher-instructed review	20%	18%	20%	16%	24%
no response	5%	6%	7%	6%	4%

A more complete report on other AP Examinations and how to use PSAT/NMSQT scores will be available from the College Board in 1998. For more information or additional copies of this report, please write to Office of Research, The College Board, 45 Columbus Avenue, New York, NY 10023-6992, or contact us by e-mail at *research@collegeboard.org*.