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Relationships Between ACT Test Scores and High School Courses

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ACT

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ABSTRACT

The 1980s have been a period of renewed concern about the adequacy of high school students' academic preparation for postsecondary education and employment. This study was conducted to determine whether there is a relationship between the number of courses taken in a subject-matter area and the score obtained on the corresponding ACT Assessment test.

It was found that, on the average, students who had taken more coursework scored higher on the relevant test. This relationship was more apparent in the areas of mathematics and natural sciences.

Previous research has shown a relationship between ACT scores and college grades. Thus, it is hypothesized that the students who have taken more high school coursework will earn higher grades as college students. As data become available, further studies are planned to explore this hypothesis.

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Intuitively, one would expect that increased academic coursework in an area would result in increased achievement in that area. Such achievement might be reflected in higher standardized test scores, more effective performance in advanced courses in the area, or improved job performance. In reality, the picture is often less clear. Such factors as the ability levels of individual students and the quality (as distinct from the quantity) of courses taken also have an effect on future academic performance.

Questions about whether increased coursework results in the desired academic outcomes are not new, of course. However, these issues are attracting particular attention in the United States at present because of renewed concern about the adequacy of high school students' academic preparation for postsecondary education and employment. This concern has resulted, in many cases, in an increase in the amount of coursework required to graduate from high school and/or to be accepted into a postsecondary educational institution.

Changing Requirements

Wright (1985) reported on typical high school academic requirements in the 1981-82 school year. At that time, the typical high school student averaged 5 hours of credit classes per day. The average number of credit hours required for graduation was 19.8, although the average number of credit hours actually completed by graduates was 21.7. Subject-area averages were: English/language arts, 3.6; social studies/history, 2.6; mathematics, 1.7; science, 1.6.

During the early 1980s, considerable concern was expressed that high school graduates in the United States were not adequately prepared for higher education or for employment in a complex technological society. Furthermore, it was claimed that United States graduates were less well prepared academically than those in other countries. In particular, it was noted that students' typical exposure to mathematics and science courses was less than adequate (A Nation At Risk, 1983). A high school program consisting of 4 years of English; 3 years of mathematics; 3 years of science; 3 years of social studies; and 1/2 year of computer science was recommended for all students seeking a diploma (not just the college-bound). In addition, 2 years of foreign language were recommended for college-bound students.

Following publication of A Nation at Risk, a number of states passed legislation increasing high school graduation and college entrance requirements. A recent study by Bartell and Noble (1986), sampling from the ACT Assessment-tested population, indicated that there has been an increase (from 1982 to 1986) in the percentage of college-bound students completing the so-called "core curriculum." Percentage increases were: 4 or more years of English, 9%; 3 or more years of mathematics, 13%; 3 or more years of social studies, 5%; and 3 or more years of natural sciences, 13%. Increases were greatest for students from lower-income families, for students attending smaller high schools, and for students from smaller communities.

While there seems to be agreement that high school graduation requirements are becoming more rigorous, not all educators see this change as being unambiguously positive. This may seem surprising--as Orlans (1986) says, "Who would oppose either motherhood or higher standards?"--but many authors have cautioned that the new requirements may actually have a negative effect on the academic achievement of some students. There is concern that, especially for minority and/or educationally disadvantaged students, increasing the standards for high school graduation may simply increase the dropout rate. For some students, the new requirements may not serve as an opportunity for greater learning, but as an insurmountable hurdle. Some educators fear a return to a policy of secondary education as a privilege for the academically elite, rather than as a right for all students (Orlans, 1986; Brandt & Dronka, 1985).

Coursework and Achievement

The relationship of coursework to various measures of achievement has, of course, been studied before. For example, a landmark study was conducted in the 1930s as a reaction to what were then considered overly inflexible academic requirements for college-bound students (Adventure in American Education, 1942). Participating colleges agreed to accept applicants from certain secondary schools, even though the students did not meet certain course requirements; in exchange, the secondary schools involved were to initiate alternative programs that they felt would better prepare their students for college and later life. It was hypothesized that the experimental group would "turn out to be just regular college students like anybody else, achieving approximately the same degree of academic success in proportion to their abilities, engaging in the same student activities to about the same extent, encountering the same academic and personal problems and coming out with similar solutions" (Preface, Volume 4). This was, in fact, how the experimental group fared as college students. It must be recalled, of course, that the experimental students did not simply take less coursework; they were all involved in other structured learning tasks as a substitute for some of the traditional coursework.

Turning to more recent research, Alexander and Cook (1982) reported that their findings indicate that, while curriculum effects of different academic "tracks" are apparent, they may simply reflect differences in earlier academic experiences: ". . . (M)any of the influences upon senior high school outcomes are already well established before students even enter high school (p. 638)."

Alexander and Pallas (1984) suggested that specific patterns of coursework and performance may be more important than simply whether or not students are enrolled in a program referred to as an "academic track." They found that completion of the core curriculum recommended in A Nation at Risk had an impact on senior year SAT performance, but that it was effective only if students had performed well in these core courses.

Schmidt (1983) found "clear and positive" effects of the curriculum an achievement. He noted that effects were most striking for areas in which learning is most closely linked to traditional (school-dependent) coursework, such as mathematics; effects were less clear in vocabulary and reading comprehension, where out-of-school experiences are more likely to affect learning opportunities. Sebring (1984) found that, as one might expect, schools' course offerings, requirements, and policies are related to students' actual exposure to course content.

The Present Study

The study described in this report was designed to learn whether increased amounts of coursework in a subject-matter area resulted in a higher score on the related ACT test. The study also addressed the question of whether such effects were consistent across sex, race, and ability level of students.

Methods

The ACT Assessment Program Database

The ACT Assessment is a comprehensive evaluation, guidance, and placement service for students and educators involved in the transition from high school to college. It consists of four academic tests, self-reported high school grades, the Student Profile Section (SPS), and the ACT Interest Inventory. Approximately a million students take the ACT Assessment each year.

The four academic tests of the ACT Assessment measure abilities in the subject areas traditionally identified with college and high school programs: English, mathematics, social studies, and natural sciences. The English Usage Test measures students' understanding and use of the basic elements of correct and effective writing; the Mathematics Usage Test, their mathematical reasoning and problem-solving ability; the Social Studies Reading Test, the problem-solving skills required in the social studies; the Natural Sciences Reading Test, the critical reasoning and problem-solving skills required in the natural sciences. ACT test scores are reported on a standard scale that ranges from 1 to 36. The arithmetic average of the scores on these four tests is the ACT Composite score, which is often used as a measure of overall educational development.

Another component of the ACT Assessment is the Student Profile Section (SPS), completed at registration. Through the SPS, students provide information about their backgrounds, extracurricular accomplishments, special academic needs, housing plans, financial needs, planned major, and career plans.

In the fall of 1985, ACT introduced the collection of expanded high school course/grade information. The High School Course/Grade Information section collects basic information about the courses a student has taken or plans to take in high school, and the grades he/she has earned.

This section collects information concerning 30 secondary-level courses. The particular courses listed include those that customarily form the basis of a college preparatory (academic or "core") high school curriculum and are frequently required or recommended for admission to postsecondary institutions. These 30 courses were selected to give a relatively complete picture of a student's basic academic preparation.

English

English taken during the 9th grade
English taken during the 10th grade
English taken during the 11th grade
English taken during the 12th grade
Speech

Mathematics

First-year Algebra (Algebra I, not pre-Algebra)
Second-year Algebra (Algebra II)
Geometry
Trigonometry
Calculus (not pre-Calculus)
Other Math beyond Algebra II
Computer Math/Computer Science

Natural Science

General/Physical/Earth Science
Biology
Chemistry
Physics

Social Studies

U.S. History (American History)
World History/World Civilization
Other History (European, State, etc.)
American Government/Civics
Economics (Consumer Economics)
Geography
Psychology

Language

Spanish
French
German
Other Language

Arts

Art (painting, etc.)
Music (vocal or instrumental)
Drama/Theater (if taken as a course)

For each of the 30 high school courses listed, the student is asked to indicate whether he/she has taken the course or plans to take it prior to graduation from high school. If the student has taken a course for a full term (semester, trimester, etc.), he/she is asked to indicate the final grade received. (Grades are to be rounded to the closest letter grade and numeric

grades converted to the corresponding letter grade.) If a full term of the course has not been completed, no grades are to be reported.

With the introduction of the collection of this expanded course-grade information in the fall of 1985, it became possible to examine the ACT scores of students with differential preparation in the four subject areas represented in the ACT tests. It was expected that, as these tests are curriculum-based, students who took more courses in an area would obtain higher scores on the corresponding test.

Sample

A 20% random sample of seniors taking the ACT on the October 1985 test date was selected. This 20% sample included 37,826 students. Because of a variety of missing data, the final sample included 31,419 individuals (13,512 males and 17,907 females). Their mean scores on the ACT Assessment were: English, 18.6; Mathematics, 17.5; Social Studies, 17.8; Natural Sciences, 21.5; Composite, 19.0.

Analyses

Means and standard deviations on the appropriate ACT test were calculated for students who reported that they had completed one, two, three (etc.) courses in a subject area. The maximum possible number of courses varied by subject area: English, 5; mathematics, 7; social studies, 7; natural sciences, 4.

Regression analyses, described in the Results section, were also performed.

Results

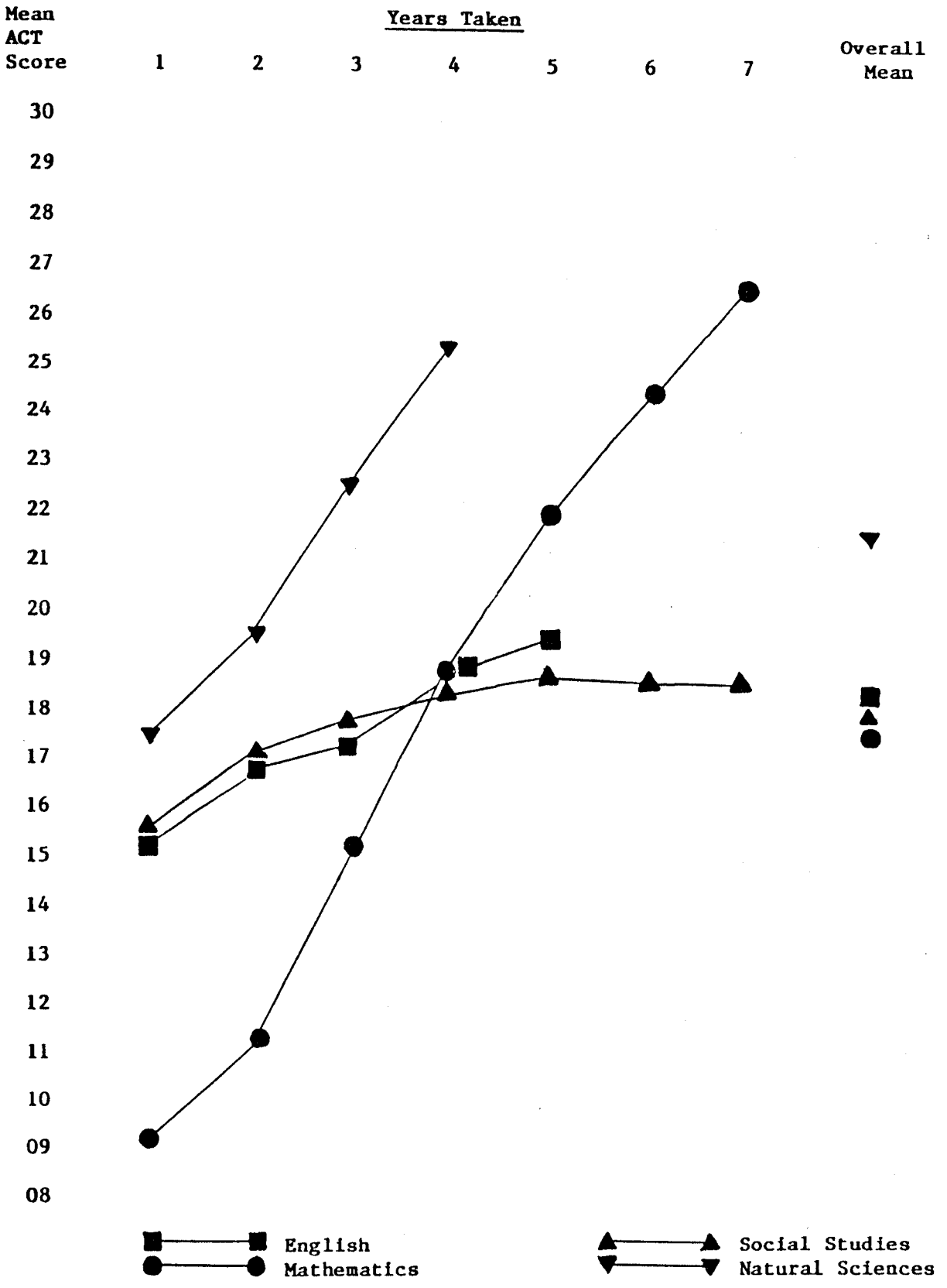
Overall findings

For the total group, adding a course in an area resulted in a higher mean score on the corresponding ACT test, with one exception: a sixth or seventh course in social studies was not associated with higher ACT Social Studies Reading Test scores (Figure 1). In some cases, the score differences were quite substantial. For instance, the mean mathematics test score was 11.29 for students reporting completion of 2 years of mathematics and 18.66 for those reporting completion of 4 years. Means and standard deviations for all preparation levels are shown in Table A1 (in the Appendix).

It is conceivable that the observed positive relationship between the number of courses taken in a subject area and the corresponding ACT test score is not a causal one, but merely reflects the influence of other variables (such as ability). To investigate this possibility, four regression analyses were performed, using the following three variables as predictors of the relevant ACT test score: number of courses taken in the area; rank in class; and high school grade point average. In each case, all three variables contributed significantly to predicting the ACT test score. Furthermore, in the areas of mathematics and natural sciences, the number of courses taken contributed more than either rank in class or high school average. Complete data from these regression analyses are shown in Tables A2-A5 (in the Appendix). As a further check, regression analyses were performed separately for various income levels and racial/ethnic groups, with generally similar results. Tables showing these analyses are available from the senior author.

Figure 1

Mean ACT Scores by Number of Courses Taken in Relevant Content Area, by Area (Total Group)



In addition to the regression analyses, summary tables were prepared separately by sex, racial/ethnic group, and rank in class. These are described below.

Sex

For the purposes of this study, a college preparatory curriculum was defined as 4 or more courses in English and mathematics (including computer math/computer science) and 3 or more years of social studies and natural science. By the beginning of their senior year, most of the ACT-tested seniors in the sample had already completed this curriculum. In the subject areas of mathematics and natural sciences, however, males were more likely than females to have completed the designated amount of coursework (see Table 1).

TABLE 1

Percentages of Students Completing College Preparatory Curriculum, by Sex

	4 or more English	4 or more Mathematics	3 or more Social Studies	3 or more Natural Science
Male	87%	61%	79%	61%
Female	90%	52%	79%	52%

Tables A6-A9 (in the Appendix) provide a detailed breakdown of mean test scores by sex and number of years of coursework. These tables show that, overall, males obtained higher mean scores than females on every test except English. There is, however, a tendency for these differences to be less in the areas of mathematics and natural sciences when the amount of coursework is held constant. For instance, the overall mean score of males on the mathematics test exceeded that of females by 2.7 standard-score points. However, the mean score of males who had taken 4 mathematics courses exceeded that of comparable females (those who had taken 4 mathematics courses) by 1.95 points.

For both males and females, trends clearly show increases in ACT mean scores as the amount of relevant coursework increases. These score increases are especially noticeable in the area of mathematics, where they generally range from 2-4 standard score points for each additional course.

Racial/Ethnic Group

When registering for the ACT Assessment, students are asked to identify their racial/ethnic group. Provision is made for responses in six specific categories: Afro-American/Black, American Indian/Alaskan Native, White,

Mexican-American/Chicano, Asian-American/Pacific Islander, and Puerto Rican/Cuban/Other Hispanic. There are also "Other" and "Prefer not to respond" categories; however, most examinees indicate membership in one of the six specific categories.

As shown in Table 2, course-taking patterns differ by racial/ethnic group. The American Indian/Alaskan Native students were least likely to have completed the college preparatory curriculum, defined as 4 years each of English and mathematics and 3 years each of social studies and natural sciences. Asian-American/Pacific Islander students were the most likely to have taken at least 4 years of mathematics and 3 years of natural sciences. The percentages taking the given amount of coursework varied the most for mathematics (a range of 49 percentage points) and least for social studies (a range of 13 percentage points).

TABLE 2

Percentages of Students Completing College Preparatory Curriculum, by Racial/Ethnic Group

	4 or more English	4 or more Mathematics	3 or more Social Studies	3 or more Natural Science
Black	88%	46%	74%	50%
American Indian	74%	30%	67%	41%
White	89%	57%	80%	57%
Mexican-American/ Chicano	90%	51%	76%	47%
Asian/ Pacific Islander	86%	79%	75%	73%
Hispanic	82%	55%	72%	58%

Tables A10-A13 (in the Appendix) provide a detailed breakdown of mean test scores by racial/ethnic group and number of years of coursework. Consistent, and often large, score differences appear among the six racial/ethnic groups at all levels of course preparation. (Note: There are a few fluctuations at extreme levels, probably attributable to small N's.) The Asian-American/Pacific Islander and White students generally had the highest mean scores; Afro-American/Black and American Indian/Alaskan Native students,

the lowest. Within each group, there is a clear trend for higher scores to be associated with more coursework, except for the sixth and seventh year of social studies.

Class Rank

The final analyses were designed to examine the effects of taking more courses for students at different levels of academic ability, defined here as rank in class. As expected, students who ranked higher tended to take more coursework (see Table 3). This was especially evident in the areas of mathematics and natural sciences.

TABLE 3

Percentages of Students Completing College Preparatory Curriculum, by Class Rank

Class Rank	(N)	4 or more English	4 or more Mathematics	3 or more Social Studies	3 or more Natural Science
Top Quarter	(14,837)	90%	74%	81%	71%
Second Quarter	(11,082)	88%	46%	79%	48%
Third Quarter	(4,988)	85%	29%	76%	34%
Fourth Quarter	(512)	83%	21%	71%	29%

Tables A14-A17 (in the Appendix) provide a detailed breakdown of mean test scores by class rank and number of years of coursework. The "Total" columns show a clear overall relationship between rank in class and test score. However, as was the case when analyses were performed by sex, the mean score differences between students of different class ranks decrease, most strikingly in the areas of mathematics and natural sciences, when the amount of coursework is held constant. For instance, the mean Mathematics Usage Test scores of students in the top and second quarters were 21.32 and 15.13, respectively--a difference of 6.16 standard score points. For students in the top and second quarters who had completed four years of mathematics, the mean Mathematics Usage Test scores were 20.83 and 16.96, respectively--a difference of 3.87 points.

Discussion

The findings of this study are clear. On the average, students who have taken more coursework in the college preparatory curriculum areas of English, mathematics, natural science, and social studies earn higher standard scores on the corresponding ACT test.

This does not mean, of course, that students should be encouraged to take additional courses merely to obtain higher test scores. However, the ACT Assessment is a curriculum-based examination and previous research has demonstrated that there is a direct relationship between achievement at the college level and ACT test scores. Counselors and others should keep these facts in mind when considering the implications of the findings of this report.

The most substantial score increase was in the mathematics area, where the mean score for students completing four courses was almost 10 standard score units higher than that for students completing only one course. Comparable figures were 8 standard score units in natural science, 3.5 in English, and 3 in social studies. When more than four courses were completed, the increases were even greater. Higher mean test scores were obtained when more courses in the relevant area were taken, regardless of gender, racial/ethnic group, or rank in class.

Note that we have no data available on the quality of the individual courses taken by the students. We can, however, say that quantity of courses influences the group mean scores of students, and that completion of one more course generally results in an increase in the mean test score for that group of students.

These findings have implications for the behavior of school counselors and others working with students seeking admission to college. For example, consider the situation of a counselor working with junior high/middle school students who are planning their tentative four-year high school curriculum. The counselor might hypothesize that the relatively flat profiles (see Figure 1) for English and social studies and the contrasting sharply rising profiles for mathematics and natural science reflect the likelihood that English and social studies are frequently learned in environments other than the classroom, such as recreational reading and watching specific types of television programs, whereas mathematics and natural sciences are areas where specific course content is obtained primarily in formal sequential classroom experiences. Therefore, this counselor may want to ensure that students take special care to sign up for adequate coursework in mathematics and natural sciences, while remaining sensitive to the need for a balanced curriculum that reflects the students' individual skills, interests, and career plans.

It might be useful for counselors to be especially attentive to the coursework patterns of their minority-group students, and to those of female students in the areas of mathematics and science. In some cases, students seeking athletic scholarships and admission to NCAA Division One schools might be alerted to the overall relationship of coursework to test scores.

At the individual school level, an attempt could be made to identify the specific course-taking patterns of subgroups of students in each school population to determine their overall academic preparation. Graphic representation of mean ACT scores by numbers of courses taken in relevant content areas might be appropriate in counseling use, if data were available for the students' own school. If gathering of this information is not feasible, some of the data from this study might be made available to students at the time of deciding on their high school program.

Counselors should, however, recall that the findings described in this report represent group data. It is unlikely that forcing students to take courses in which they have no interest and/or for which they are ill-prepared would have a positive effect on their test scores or--more important--on their underlying academic skills and their attitudes toward education. As always, the individual student's needs and goals should be carefully considered when planning his or her high school program.

Suggestions for Further Research

As is so often the case, this study raises more questions than it answers. Possibilities for future research include:

1. A study to ascertain whether there is a direct relationship between the amount of coursework taken in high school and performance in college.

2. A study that looks at the relationship between grades earned in specific courses (e.g., calculus, physics) and test performance. (Recall that this study only involved numbers of courses taken, and did not explore the effect of specific courses or grades.)

3. A study that includes better controls for determining students' level of ability and interest in particular courses.

REFERENCES

Alexander, K. L. & Cook, M. A. (1982). Curricula and coursework: A surprise ending to a familiar story. American Sociological Review, 47, 626-640.

Alexander, K. L. & Pallas, A. M. (1984). Curriculum reform and school performance: An evaluation of the "New Basics." American Journal of Education, 92, 391-420.

Bartell, T. & Noble, J. (1986, April). Changes in course selection by high school students: The impact of national educational reform. Paper presented at the meeting of the American Educational Research Association, San Francisco.

Brandt, R. & Dronka, P. (Eds.) (1985). With consequences for all. Alexandria, VA: Association for Supervision and Curriculum Development.

The National Commission on Excellence in Education. (1983). A nation at risk: The imperative for educational reform. Washington, D.C.: U.S. Government Printing Office.

Orlans, H. (1986, July 23). On higher standards, minority enrollment, and money. The Chronicle of Higher Education, 32(2), p. 72.

Progressive Education Association, the Commission on the Relation of School and College. (1942-43). Adventure in American Education (vols. 1-5). New York: Harper & Brothers.

Schmidt, W. H. (1983). High school course-taking: Its relationship to achievement. Journal of Curriculum Studies, 15, 311-332.

Sebring, P. A. (1984, April). Course taking and achievement: Findings and implications for curricular policy. Paper presented at the meeting of the American Educational Research Association, New Orleans.

Wright, D. A., Tomlinson, T., & Farris, E. (1985). Academic requirements and achievement in high schools 1982 (FRSS Report No. 15). Washington, D.C.: National Center for Education Statistics.

Appendix

TABLE A1

Mean ACT Scores and Standard Deviations by Number of Courses Taken in Relevant Content Area, by Area (Total Group)

	Years Taken								
Content Area	1	2	3	4	5	6	7	NR	Total
English									
$\bar{X}$	15.16	16.70	17.30	18.67	19.02	--	--	16.33	18.57
SD	5.28	5.37	5.22	5.04	4.97	--	--	5.67	5.09
(N)	(223)	(150)	(2,561)	(19,283)	(8,521)	--	--	(681)	(31,419)
Mathematics									
$\bar{X}$	9.27	11.29	15.11	18.66	21.99	24.25	26.45	11.45	17.50
SD	5.39	5.51	6.20	6.20	5.79	5.11	5.11	7.41	7.59
(N)	(2,085)	(3,648)	(6,657)	(7,715)	(6,025)	(3,119)	(771)	(1,380)	(31,400)
Social Studies									
$\bar{X}$	15.22	16.98	17.92	18.24	18.51	18.41	18.31	15.58	17.84
SD	6.91	7.07	7.03	6.91	6.74	6.72	5.91	7.38	6.99
(N)	(769)	(4,983)	(10,342)	(8,832)	(4,040)	(1,197)	(240)	(739)	(31,142)
Natural Science									
$\bar{X}$	17.43	19.27	22.55	25.36	--	--	--	19.26	21.51
SD	5.33	5.55	5.67	5.27	--	--	--	6.59	6.11
(N)	(2,676)	(1,0134)	(1,1439)	(6,077)	--	--	--	(822)	(31,148)

TABLE A2

Summary Table for Prediction of ACT English Usage Score—
October 1985 Seniors

Variable	Degrees Freedom	b-weight (unstandardized)	Standard error	t-statistic H_o:b=o	P > |t|	Beta weight (standardized)
Intercept	1	10.502	0.238	44.10	.0001	0
English background	1	0.404	0.027	14.79	.0001	0.070
Class Rank	1	1.119	0.043	25.53	.0001	0.173
HSGPA	1	1.525	0.028	54.81	.0001	0.371

R^2 = .27
Standard error of estimate = 4.36

Means and Standard Deviations

Variable	N	Mean	Standard Deviation
English Usage Test	36,543	18.31	5.2
English Background	36,543	3.8	1.3
Class Rank	33,148	1.7	0.8
HSGPA	33,298	5.4	1.2

TABLE A3

Summary Table for Prediction of ACT Mathematics Usage Score--
October 1985 Seniors

Variable	Degrees Freedom	b-weight (unstandardized)	Standard error	t-statistic H_o:b=o	P > |t|	Beta weight (standardized)
Intercept	1	5.610	0.279	20.1	.0001	0
Mathematics background	1	2.114	0.215	98.4	.0001	0.454
Class Rank	1	1.455	0.057	25.5	.0001	0.151
HSGPA	1	1.220	0.037	33.0	.0001	0.200

R^2 = .45
Standard error of estimate = 5.62

Means and Standard Deviations

Variable	N	Mean	Standard Deviation
Mathematics Usage Test	36,543	17.12	7.7
Mathematics Background	36,543	3.40	1.8
Class Rank	33,148	1.73	0.8
HSGPA	33,298	5.45	1.2

TABLE A4

Summary Table for Prediction of ACT Social Studies Reading Score--
October 1985 Seniors

Variable	Degrees Freedom	b-weight (unstandardized)	Standard error	t-statistic H_o:b=o	P > |t|	Beta weight (standardized)
Intercept	1	10.309	0.318	32.45	.0001	0
Social Studies Background	1	0.391	0.027	14.25	.0001	0.070
Class Rank	1	1.634	0.063	26.05	.0001	0.184
HSGPA	1	1.641	0.040	41.23	.0001	0.292

R^2 = .20
Standard error of estimate = 6.24

Means and Standard Deviations

Variable	N	Mean	Standard Deviation
Social Studies Reading Test	36,543	17.52	7.1
Social Studies Background	36,543	3.20	1.5
Class Rank	33,148	1.73	0.8
HSGPA	33,298	5.45	1.2

TABLE A5

Summary Table for Prediction of ACT Natural Sciences Reading Score--
October 1985 Seniors

Variable	Degrees Freedom	b-weight (unstandardized)	Standard error	t-statistic H_o:b=o	P > ltl	Beta weight (standardized)
Intercept	1	13.497	0.265	50.93	.0001	0
Natural Sciences Background	1	1.717	0.031	54.70	.0001	0.275
Class Rank	1	1.304	0.053	24.59	.0001	0.168
HSGPA	1	1.047	0.034	30.96	.0001	0.213

R^2 = .27
Standard error of estimate = 5.24

Means and Standard Deviations

Variable	N	Mean	Standard Deviation
Natural Sciences Reading Test	36,543	21.19	6.2
Natural Sciences Background	36,543	2.45	1.1
Class Rank	33,148	1.73	0.8
HSGPA	33,298	5.45	1.2

TABLE A6

English: Mean Scores and Standard Deviations by Number of Courses Taken and Sex

	1	2	3	4	5	NR	Total
Male							
$\bar{X}$	14.27	16.70	16.74	18.07	18.34	15.70	17.92
SD	5.18	4.85	5.28	5.18	5.06	5.74	5.21
(N)	(127)	(76)	(1,191)	(8,281)	(3,475)	(362)	(13,512)
Female							
$\bar{X}$	16.34	16.70	17.78	19.12	19.48	17.05	19.06
SD	5.21	5.88	5.12	4.89	4.85	5.51	4.95
(N)	(96)	(74)	(1,370)	(11,002)	(5,046)	(319)	(17,907)

TABLE A7

Mathematics: Mean Scores and Standard Deviations by Number of Courses Taken and Sex

	1	2	3	4	5	6	7	NR	Total
Male									
$\bar{X}$	10.14	12.31	16.14	19.77	22.84	25.06	27.42	12.79	19.03
SD	5.87	5.74	6.28	6.06	5.65	5.09	4.94	8.00	7.59
(N)	(751)	(1,359)	(2,479)	(3,321)	(2,875)	(1,623)	(454)	(645)	(13,507)
Female									
$\bar{X}$	8.78	10.68	14.50	17.82	21.20	23.36	25.06	10.28	16.33
SD	5.04	5.28	6.06	6.17	5.79	4.98	5.03	6.64	7.38
(N)	(1,334)	(2,289)	(4,178)	(4,394)	(3,150)	(1,496)	(317)	(735)	(17,893)

TABLE A8

Social Studies: Mean Scores and Standard Deviations by Number of Courses Taken and Sex

	1	2	3	4	5	6	7	NR	Total
Male									
$\bar{X}$	16.03	18.24	18.75	19.27	19.42	19.31	19.20	16.24	18.79
SD	6.96	7.10	7.09	6.89	6.76	6.83	5.61	7.53	7.02
(N)	(339)	(2,110)	(4,398)	(3,790)	(1,764)	(514)	(87)	(389)	(13,391)
Female									
$\bar{X}$	14.59	16.05	17.31	17.47	17.79	17.73	17.81	14.86	17.12
SD	6.81	6.91	6.93	6.83	6.64	6.55	6.03	7.14	6.88
(N)	(430)	(2,873)	(5,944)	(5,042)	(2,276)	(683)	(153)	(350)	(17,751)

TABLE A9

Natural Science: Mean Scores and Standard Deviations by Number of Courses Taken and Sex

	1	2	3	4	NR	Total
Male						
$\bar{X}$	18.65	20.36	23.94	26.38	20.48	23.05
SD	5.56	5.67	5.69	5.05	6.69	6.13
(N)	(981)	(3,773)	(4,805)	(3,399)	(434)	(13,392)
Female						
$\bar{X}$	16.73	18.63	21.55	24.07	17.89	20.34
SD	5.06	5.37	5.45	5.27	6.19	5.83
(N)	(1,695)	(6,361)	(6,634)	(2,678)	(388)	(17,756)

English: Mean Scores and Standard Deviations by Number of Courses Taken and Racial/Ethnic Group

	1	2	3	4	5	NR	Total
Black							
$\bar{X}$	13.31	16.10	13.02	14.75	15.26	12.59	14.66
SD	5.54	4.20	4.99	5.38	5.37	4.44	5.36
(N)	(36)	(10)	(123)	(1,279)	(464)	(75)	(1,987)
American Indian							
$\bar{X}$	-	14.00	14.75	14.62	15.76	10.98	15.25
SD	-	-	5.36	5.92	5.20	5.01	5.77
(N)	-	(1)	(32)	(182)	(51)	(49)	(315)
White							
$\bar{X}$	15.84	17.65	17.76	19.19	19.38	17.80	19.07
SD	4.94	4.89	5.04	4.76	4.78	5.05	4.83
(N)	(159)	(114)	(2,220)	(16,331)	(7,464)	(465)	(26,753)
Mexican-American/ Chicano							
$\bar{X}$	13.67	14.00	14.69	16.06	16.94	16.00	16.11
SD	6.30	-	5.80	5.38	5.12	5.43	5.38
(N)	(9)	(1)	(35)	(370)	(115)	(9)	(539)
Asian/ Pacific Islander							
$\bar{X}$	13.56	11.60	15.54	18.44	19.08	18.21	18.18
SD	5.96	5.91	6.52	5.55	5.41	6.30	5.76
(N)	(9)	(10)	(46)	(407)	(131)	(19)	(622)
Hispanic							
$\bar{X}$	23.00	19.67	18.46	17.34	18.07	14.56	17.26
SD	-	1.53	3.20	5.31	5.10	6.05	5.32
(N)	(1)	(3)	(13)	(159)	(40)	(27)	(243)

TABLE A11

Mathematics: Mean Scores and Standard Deviations by Number of Courses Taken and Racial/Ethnic Group

	1	2	3	4	5	6	7	NR	Total
Black									
$\bar{X}$	6.22	7.72	10.60	13.24	16.22	19.19	22.25	8.43	11.75
SD	4.42	5.01	5.64	6.39	6.78	5.95	6.93	6.08	7.09
(N)	(225)	(271)	(419)	(451)	(294)	(143)	(28)	(157)	(1,988)
American Indian									
$\bar{X}$	7.07	10.78	13.10	15.11	20.48	25.54	25.00	8.65	12.74
SD	4.70	6.02	6.62	6.33	6.82	3.45	1.00	6.51	7.79
(N)	(43)	(41)	(71)	(45)	(33)	(13)	(3)	(65)	(314)
White									
$\bar{X}$	9.76	11.70	15.56	19.12	22.37	24.50	26.63	11.93	18.02
SD	5.35	5.46	6.09	5.98	5.51	4.87	4.96	7.33	7.38
(N)	(1,634)	(3,068)	(5,745)	(6,696)	(5,254)	(2,703)	(632)	(1,002)	(26,734)
Mexican-American/ Chicano									
$\bar{X}$	9.09	9.84	13.54	16.02	19.64	23.07	23.78	9.29	14.94
SD	5.34	4.79	5.59	6.92	5.95	5.43	5.01	4.95	7.38
(N)	(57)	(83)	(99)	(123)	(90)	(42)	(18)	(28)	(540)
Asian/ Pacific Islander									
$\bar{X}$	12.69	11.14	15.37	19.84	22.90	25.80	27.44	20.33	21.48
SD	6.93	5.99	5.93	6.12	5.87	5.59	5.16	8.52	7.35
(N)	(13)	(28)	(68)	(155)	(151)	(126)	(57)	(24)	(622)
Hispanic									
$\bar{X}$	9.90	9.76	13.55	18.36	21.77	23.96	25.29	12.94	17.07
SD	4.91	5.66	5.72	6.08	5.31	4.21	3.20	8.87	7.65
(N)	(10)	(21)	(44)	(55)	(48)	(24)	(7)	(34)	(243)

TABLE A12

Social Studies: Mean Scores and Standard Deviations by Number of Courses Taken and Racial/Ethnic Group

	1	2	3	4	5	6	7	NR	Total
Black									
$\bar{X}$	9.00	11.35	12.21	13.01	14.47	14.20	13.00	10.36	12.34
SD	5.60	6.02	6.54	6.93	6.79	6.35	5.00	5.56	6.60
(N)	(81)	(361)	(666)	(539)	(194)	(41)	(13)	(73)	(1,968)
American Indian									
$\bar{X}$	12.43	11.47	13.03	14.24	15.10	14.31	12.33	10.13	12.89
SD	4.79	6.05	7.73	6.93	9.34	8.98	5.13	6.23	7.37
(N)	(7)	(47)	(96)	(66)	(30)	(16)	(3)	(48)	(313)
White									
$\bar{X}$	16.50	17.68	18.59	18.83	18.91	18.72	18.82	17.20	18.49
SD	6.55	6.88	6.76	6.67	6.56	6.55	5.77	7.02	6.73
(N)	(600)	(4,179)	(8,808)	(7,560)	(3,582)	(1,063)	(209)	(524)	(26,525)
Mexican-American/ Chicano									
$\bar{X}$	11.24	15.09	14.66	15.32	14.19	13.85	-	16.00	14.70
SD	6.69	6.84	7.12	7.08	6.98	7.76	-	7.25	7.06
(N)	(25)	(93)	(207)	(139)	(47)	(13)	-	(8)	(532)
Asian/ Pacific Islander									
$\bar{X}$	13.91	17.54	16.34	18.21	19.25	20.05	18.50	17.00	17.47
SD	5.80	7.39	7.79	7.82	7.66	7.74	6.60	8.85	7.74
(N)	(22)	(112)	(194)	(186)	(59)	(19)	(6)	(20)	(618)
Hispanic									
$\bar{X}$	15.00	15.26	17.06	17.80	17.34	13.63	13.67	12.37	16.32
SD	4.24	6.62	7.30	6.49	7.44	7.48	6.03	6.39	7.01
(N)	(2)	(38)	(66)	(65)	(32)	(8)	(3)	(27)	(241)

TABLE A13

Natural Science: Mean Scores and Standard Deviations by Number of Courses Taken and Racial/Ethnic Group

	1	2	3	4	NR	Total
Black						
$\bar{X}$	12.93	14.75	17.05	19.79	14.16	16.09
SD	4.52	5.17	5.39	5.71	5.05	5.66
(N)	(218)	(689)	(668)	(307)	(85)	(1,967)
American Indian						
$\bar{X}$	16.55	15.74	20.03	23.09	15.10	17.80
SD	5.07	5.52	5.72	7.12	5.43	6.30
(N)	(31)	(106)	(91)	(35)	(48)	(311)
White						
$\bar{X}$	18.05	19.84	23.03	25.83	20.52	22.08
SD	5.17	5.35	5.43	4.94	6.30	5.86
(N)	(2,195)	(8,619)	(9,874)	(5,259)	(581)	(26,528)
Mexican-American/ Chicano						
$\bar{X}$	14.76	16.99	20.87	23.18	18.08	18.92
SD	4.27	5.72	5.60	5.47	4.65	6.08
(N)	(55)	(215)	(176)	(74)	(13)	(533)
Asian/ Pacific Islander						
$\bar{X}$	16.35	17.42	22.98	24.72	19.39	22.07
SD	5.64	6.33	6.29	5.88	8.07	6.84
(N)	(31)	(112)	(252)	(201)	(23)	(619)
Hispanic						
$\bar{X}$	18.65	18.13	20.95	22.61	18.70	20.30
SD	5.43	5.96	6.52	5.81	7.13	6.40
(N)	(20)	(54)	(80)	(61)	(27)	(242)

TABLE A14

English: Mean Scores and Standard Deviations by Number of Courses Taken and Class Rank

	1	2	3	4	5	NR	Total
Top Quarter							
$\bar{X}$	18.71	18.71	19.87	20.91	21.26	19.31	20.89
SD	4.40	5.25	4.73	4.35	4.35	5.70	4.42
(N)	(75)	(56)	(1,094)	(9,412)	(4,003)	(197)	(14,837)
Second Quarter							
$\bar{X}$	14.11	16.46	16.27	17.25	17.59	15.61	17.19
SD	4.44	4.90	4.60	4.53	4.47	5.31	4.57
(N)	(80)	(48)	(943)	(6,661)	(3,089)	(261)	(11,082)
Third Quarter							
$\bar{X}$	12.62	14.51	13.78	15.20	15.99	14.58	15.21
SD	4.91	5.20	4.48	4.73	4.63	5.03	4.74
(N)	(60)	(41)	(482)	(2,929)	(1,287)	(189)	(4,988)
Fourth Quarter							
$\bar{X}$	11.50	14.40	13.45	13.89	14.51	14.35	14.02
SD	5.98	5.32	4.95	5.09	5.54	4.98	5.21
(N)	(8)	(5)	(42)	(281)	(142)	(34)	(512)

TABLE A15

Mathematics: Mean Scores and Standard Deviations by Number of Courses Taken and Class Rank

	1	2	3	4	5	6	7	NR	Total
Top Quarter									
$\bar{X}$	11.83	13.31	17.38	20.83	23.55	25.19	27.00	16.84	21.32
SD	6.37	5.70	5.94	5.63	5.05	4.66	4.72	8.50	6.57
(N)	(321)	(809)	(2,382)	(3,917)	(4,019)	(2,419)	(665)	(295)	(14,827)
Second Quarter									
$\bar{X}$	9.24	11.11	14.48	16.96	19.35	21.41	23.22	11.27	15.13
SD	5.20	5.47	5.95	5.88	5.72	4.84	6.00	6.92	6.74
(N)	(943)	(1,723)	(2,844)	(2,828)	(1,581)	(573)	(93)	(493)	(11,078)
Third Quarter									
$\bar{X}$	8.31	10.61	12.62	14.86	16.99	19.25	20.75	8.99	12.06
SD	4.82	5.03	5.81	5.95	6.11	6.21	6.36	5.66	6.29
(N)	(722)	(1,010)	(1,322)	(906)	(398)	(114)	(12)	(499)	(4,983)
Fourth Quarter									
$\bar{X}$	8.22	9.67	12.26	14.89	17.33	17.15	26.00	8.53	11.01
SD	5.10	4.98	5.70	5.89	7.57	8.13	-	5.26	6.28
(N)	(99)	(106)	(109)	(64)	(27)	(13)	(1)	(93)	(512)

TABLE A16

Social Studies: Mean Scores and Standard Deviations by Number of Courses Taken and Class Rank

	1	2	3	4	5	6	7	NR	Total
Top Quarter									
$\bar{X}$	18.25	20.04	20.73	20.94	21.29	21.12	20.57	18.93	20.69
SD	6.58	6.52	6.45	6.28	6.24	6.07	5.66	7.71	6.41
(N)	(301)	(2,358)	(5,108)	(4,262)	(1,877)	(528)	(91)	(211)	(14,736)
Second Quarter									
$\bar{X}$	14.05	14.98	15.94	16.48	16.84	16.88	17.35	15.18	16.05
SD	6.47	6.43	6.37	6.42	6.12	6.37	5.77	6.90	6.41
(N)	(274)	(1,723)	(3,589)	(3,059)	(1,491)	(465)	(99)	(282)	(10,982)
Third Quarter									
$\bar{X}$	12.06	12.87	13.70	14.27	14.54	15.10	15.79	13.02	13.82
SD	6.09	6.08	6.38	6.32	6.08	6.39	5.11	6.38	6.29
(N)	(169)	(814)	(1,502)	(1,379)	(614)	(184)	(48)	(211)	(4,921)
Fourth Quarter									
$\bar{X}$	13.04	11.83	11.46	13.30	13.14	12.60	23.50	14.17	12.56
SD	6.60	5.55	6.24	7.12	6.14	5.76	7.78	7.46	6.51
(N)	(25)	(88)	(143)	(132)	(58)	(20)	(2)	(35)	(503)

TABLE A17

Natural Science: Mean Scores and Standard Deviations by Number of Courses Taken and Class Rank

	1	2	3	4	NR	Total
Top Quarter						
$\bar{X}$	19.52	21.64	24.36	26.29	23.21	25.05
SD	5.24	5.35	5.29	4.86	6.64	5.56
(N)	(708)	(3,407)	(6,021)	(4,372)	(228)	(14,736)
Second Quarter						
$\bar{X}$	17.10	18.72	20.97	23.45	18.71	19.94
SD	5.15	5.18	5.32	5.38	5.81	5.58
(N)	(1,158)	(4,197)	(3,938)	(1,364)	(319)	(10,976)
Third Quarter						
$\bar{X}$	16.23	17.10	19.49	21.21	16.79	17.88
SD	5.04	5.18	5.41	5.60	5.81	5.48
(N)	(729)	(2,292)	(1,369)	(313)	(233)	(4,936)
Fourth Quarter						
$\bar{X}$	14.77	16.03	18.61	20.32	15.55	16.60
SD	5.52	5.27	6.32	8.11	5.82	5.97
(N)	(81)	(238)	(111)	(28)	(42)	(500)

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