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AUTHOR Noble, Julie; Powell, Douglas A.
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ABSTRACT

The relationships between course work taken, educational needs and plans, high school attended, and PLAN test scores of high school sophomores were examined. The PLAN tests are higher-order thinking skills tests that are used in educational planning for individuals and in program and curriculum evaluation. The relationships between ethnicity of gender and test scores were then considered by statistically controlling for these factors. The data consisted of two samples: 7,000 sophomores from 65 high schools who were intended to represent sophomores nationwide and a sample of 8,441 sophomores from 73 PLAN user schools that tested all of their sophomores. The results showed that course work taken, students' educational needs and plans, and high school attended were major factors in explaining students' achievement of higher-order thinking skills. Gender and ethnicity explained 2% or less of the variance in PLAN scores, over and above these factors. Appendix A presents clusters for planned course work, and Appendix B presents descriptive statistics and correlations for independent variables in three tables. The text contains 11 tables of study data. (Contains 10 references.) (Author/SLD)

Factors Influencing Differential Performance on Higher-order Thinking Skills Tests

Julie Noble
Research Division
American College Testing
P.O. Box 168
Iowa City, Iowa 52243

Douglas A. Powell
University of Maryland-College Park

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of the American Education Research Association

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Abstract

The relationships between course work taken, educational needs and plans, high school attended, and PLAN test scores of high school sophomores were examined. The relationships between ethnicity or gender and test scores were then considered by statistically controlling for these factors. The data consisted of two samples: 7,000 sophomores from 65 high schools that were intended to represent sophomores nationwide, and a sample of 8,441 sophomores from 73 PLAN user schools that tested all of their sophomores.

The results showed that course work taken, students' educational needs and plans, and high school attended were major factors in explaining students' achievement of higher-order thinking skills. Gender and ethnicity explained 2% or less of the variance in PLAN scores, over and above these factors.

FACTORS INFLUENCING DIFFERENTIAL PERFORMANCE ON HIGHER-ORDER THINKING SKILLS TESTS

The issue of differential performance on standardized tests has grown in importance in recent years. For example, higher-order thinking skills tests, such as those used for college admissions (ACT Assessment and SAT), have been closely scrutinized regarding differential performance by both ethnic and gender groups. Due to the "high stakes" nature of these assessments, it is important to identify those factors that make a difference in students' acquisition of higher-order thinking skills.

The PLAN tests, while not "high stakes" per se, are higher-order thinking skills tests that have implications for the academic futures of students. They are used both in educational planning for high school sophomores and in program and curriculum evaluation. Because PLAN mean scores have been shown to differ across ethnic and gender groups (Noble, 1991), the investigation of factors influencing differential test performance is important.

Research on differential performance on standardized tests (largely by ethnicity and/or gender) has showed associations between high school grades, course work taken, student and high school characteristics, students' educational needs and plans, and test performance (e.g., Noble & McNabb, 1989; Chambers, 1988; Pallas & Alexander, 1983). Noble, Crouse, Sawyer and Gillespie (1992), for example, found that high school course work and course grades were strong predictors of ACT Assessment performance. Additionally, past research has shown a reduction in the role played by ethnic and gender variables in accounting for variation in standardized test scores when course

work taken and course grades earned were statistically controlled (Noble, et al., 1992; Noble & McNabb, 1989; Pallas & Alexander, 1983). The use of course work and course performance along with background and educational needs and plans variables, and high school attended as control variables resulted in a decrease in the variation in ACT Assessment scores attributable to ethnicity. The percent of ACT score variance accounted for by either ethnicity or gender, when statistically controlling for the other variables, was only 1% (Noble, et al., 1992).

Research studies on PLAN scores have largely been descriptive in nature. Previous research has found that sophomores who took, or were currently taking, specific kinds of courses achieved, on average, higher PLAN scores than students who did not take the courses (Noble, 1991). Additionally, African-American and Hispanic (Mexican-American, Chicano, Puerto-Rican, Cuban, other Hispanic origin) students were less likely to score below "chance level" if they were currently taking or planning to take college-preparatory course work than were students not taking the course work (Noble, 1991). In a study of PLAN performance in one state, Noble (1990) found substantial differences in the average PLAN scores of students taking and not taking college-preparatory core courses. Mean gender differences typically favored females for all PLAN tests; differences by ethnicity typically favored Caucasian-Americans and Asian-Americans (ACT, 1994).

In the present study, the impact of course work taken, students' educational needs and plans, and high school attended was considered in explaining variation in PLAN scores of high school sophomores. (Course grades could not be obtained for this study).

The relationships between test scores and ethnic and gender group membership were then considered by statistically controlling for course work taken, students' educational needs and plans, and high school attended. In contrast to previous PLAN research, this study used multiple regression and analysis of covariance techniques to examine the aggregate effects of these variables on PLAN performance.

Including high school attended in the study helps to determine the overall impact of high school attended on PLAN score performance. Moreover, it helps in identifying differences among schools in the relationships between course-taking, educational needs and plans, and students' acquisition of higher-order thinking skills. Further, identifying the characteristics of higher- or lower-scoring schools helps in understanding the context in which students learn (or do not learn) these skills.

The population of students completing PLAN each year differs in several ways from high school sophomores in general. Typically, PLAN-tested students are likely to be more academically able than typical sophomores, and are more likely to attend private and smaller high schools from the North Central and Southern accrediting regions. Approximately 35% of all PLAN user schools test all of their sophomores; 65% test a select group of high-achieving, college-bound students. These groups each comprise approximately 50% of the entire PLAN-tested sophomore population each year. As such, the results based on a nationally-representative sample of sophomores may differ from those obtained using the PLAN-tested sophomore population. Therefore, the independent variables identified as important for the nationally-representative sample of students were used to estimate PLAN scores for a second group of sophomores who

completed PLAN in fall, 1992. This group consisted of a representative sample of students from schools that tested all of their sophomores (denoted as the "all-sophomore tested" sample). The results for both groups of sophomores were then compared. Analyses were also conducted on data from the select group of PLAN-tested sophomores; the results are not reported here but may be obtained from the first author.

Data

A stratified random sample of approximately 65 high schools with 7,000 students was selected for a fall, 1992 national norming study for PLAN. The schools were stratified by affiliation (public/private), ACT user status (user/non-user) and by estimated enrollment in Grade 10, resulting in 10 strata. The average obtained student response rate within schools was 92%.

The 1992 PLAN-tested population consisted of 372,037 sophomores from 4,371 schools testing a minimum of 25 students. Of the total, 197,587 sophomores were from all-sophomore tested schools (1,719 schools). These schools were categorized, stratified, and proportionately sampled based on the number of students tested and average PLAN Composite score. The resulting sample consisted of sophomores from 73 all-sophomore tested schools (8,441 students).

The variables for the study included five PLAN test scores representing the four academic tests (English, Mathematics, Reading and Science Reasoning) and the Composite. The Composite score is the arithmetic mean of the four test scores, rounded to the nearest whole number.

Course Work Taken

Course work taken (previously taken or currently taking) and planned was obtained from the Course Information Section of PLAN, which collects information about 30 high school courses. Research has shown that PLAN-tested sophomores provide accurate self-reports of course work they have taken or are currently taking (ACT, 1995). Course work taken combinations were quantified by a series of dichotomous variables indicating whether or not the students had taken or was currently taking the course work. The particular course work combinations were based on prior PLAN research (Noble, 1990; Noble, 1991) and included:

1. English 9 or 10 (taking or not taking either course).
2. English 9 and 10 or English 9, and Speech (taking or not taking either pair).
3. Algebra 1 and Algebra 2, or Algebra 1 and Geometry (taking or not taking either pair).
4. Algebra 1, Algebra 2, or Geometry (taking or not taking any one of the three courses).
5. Art, Music or Drama/Theater (taking or not taking any one of the three courses).
6. Foreign Language (taking or not taking French, Spanish, or other foreign language).
7. Foundational Course Work (taking or not taking English 10, Algebra 1 and any other Mathematics course, any Social Studies course, and Biology).
8. English 9 and 10, or English 9 and Speech; Algebra 1 and Algebra 2, or

Algebra 1 and Geometry; any Social Studies course; and General Science and Biology (taking or not taking these courses).

Educational Needs and Plans

Students' planned course work was shown by whether students planned to complete clusters (combinations) of particular courses. A total of 21 clusters were defined, based on prior research (Noble & McNabb, 1989); see Appendix A for the definitions of particular clusters. Each cluster of courses was represented by dummy-coded variables, indicating whether or not the student planned to take all of the courses in a particular cluster.

Indices of a student's educational needs and plans also included his/her educational plans (plans to attend a two-year or four-year postsecondary institution) and self-reported needs for help (in Reading, Writing, Mathematics, Study Skills, and Test Taking). The self-reported needs for help are given on an ordinal scale, i.e., "a lot", "some", "little/none", with values ranging from 0 (little/none) to 2 (a lot).

High School Attended

High school attended was entered as an effect-coded dummy variable for each high school. School characteristics were obtained from a file maintained by Market Data Retrieval in Shelton, Connecticut. The characteristics included school control (public, private), accrediting region, location (rural, suburban, urban), total per-pupil expenditure, percent below federal poverty level in the district, percentages of African-Americans and Hispanics in the district, and school enrollment.

Gender and Ethnicity

Students' gender and ethnicity were also included as dummy variables. Due to small sample sizes among several ethnic groups (e.g., Asian-Americans), separate effect estimates were derived only for African-Americans, Caucasian-Americans, Hispanics (Mexican-American, Chicano, Puerto Rican, Cuban, other Hispanic origin), and students of other ethnic origins. For gender, males were coded as 0 and females as 1; for ethnicity, dummy variables were coded such that African-Americans, Hispanics, and students of other ethnic origins were compared to Caucasian-Americans.

Method

Sampling weights for the national sample were calculated as follows:

$$W = c*w1*w2, \quad (1)$$

where c = a constant,

w1 = (total number of schools in a stratum)/(total number of schools in the sample associated with a stratum),

w2 = (estimated enrollment in grade 10)/(total number of students tested within a school on a given test form).

Results for the national sample were weighted according to W.

Characteristics of the schools and students in each sample were first summarized; means and standard deviations for all variables were computed for each sample, and by ethnic and gender group within each sample. Simple correlations were then calculated between all independent and dependent variables for both samples.

Multiple regression models were developed for predicting PLAN scores using the

national sample data. The following sets of independent variables were used and entered in this order: (1) courses taken, (2) educational needs and plans variables, (3) high school attended, and (4) ethnicity or gender. Considerations in model development included the statistical significance of simple correlations between prospective independent variables and PLAN scores ($p < .001$ for all variables except ethnicity and gender, where $p < .05$), model parsimony, and collinearity among variables. Individual variables were selected for each variable set in sequential order; e.g., variables were selected to represent courses taken, and then variables were selected to represent students' educational needs and plans, conditioned upon those representing courses taken. A condition number of 15 or greater (with two or more variance-decomposition proportions exceeding .50) was regarded as indicative of collinearity (Belsley, Kuh, & Welsch, 1980). The final models were then used to estimate PLAN scores for the all-sophomore tested sample. Adjusted means were computed for each ethnic and gender group, by sample. All regression results were then compared for the two samples.

Effects of Ethnicity, Gender, and High School Attended

Based on the regression results, a second set of analyses was conducted to determine whether the relationships between course work taken or planned and PLAN scores were moderated by students' ethnicity, gender, or high school attended. Interaction terms were included in the regression models for these effects; the course work (taken and planned) variables included in the interactions were the primary course work variables in the final regression models. Statistically significant ($p < .05$) interactions between ethnicity or gender and course work taken and planned were

plotted to determine the nature of the interactions.

For statistically significant interactions involving high school attended, within-school regression models were developed, and the distributions of predicted PLAN means across high schools were studied. High schools with predicted mean PLAN Composite scores that differed by ±1 or more from the pooled predicted mean PLAN Composite across all students and schools were identified. Predicted school mean differences were also required to be statistically significant ($p < .001$). (Note: Significance tests were based on individual school error variances, rather than pooled error variances.) The regression weights for course work taken and planned, and the characteristics of low-scoring (i.e., "below expected"; predicted mean difference of -1 or more) and high-scoring ("above expected"; predicted mean difference of +1 or more) schools were then compared. This approach, rather than categorizing schools on mean PLAN Composite score, would take into consideration differences in the relationship between course work and PLAN performance across high schools; i.e., lower-scoring schools are those scoring below what would typically be "expected," given their students' course work, educational needs and plans, and ethnicity or gender.

Results

Descriptive Statistics

School characteristics. Table 1 provides a comparison of the schools comprising the national and all-sophomore tested samples. The all-sophomore sample consisted of more private schools (34% vs. 23%), more schools from the North Central accrediting region (68% vs. 52%), and higher per-pupil expenditure (29% vs. 52% with expenditures

of $4200 or higher) than the national sample. Further, the schools in this sample had fewer African-Americans (50% vs. 44% with no African-American students), and were less likely to be in districts with higher poverty rates than the national sample (40% vs. 62% with 12% or more below the federal poverty level)

PLAN scores. Means, standard deviations, and sample sizes for PLAN scores are reported in Table 2. Statistics are reported for each sample by ethnicity, gender, and the total group. Of those students in the national sample indicating their ethnic affiliation (n=5,972), approximately 73% were Caucasian-American, 11% were African-American, 7% were Hispanic, and (% were of other ethnic origin. Of the students in the all-sophomore tested sample who reported their ethnicity (n=7,252), 6% were African-American, 77% were Caucasian-American, 8% were Hispanic, and 9% were other.

Mean PLAN scores for the national sample were generally lower than those for the all-sophomore tested group of students by about 1.5 to 2.0 scale score units. Further, for all PLAN tests except English, standard deviations tended to be smaller for the national sample than for the all-sophomore tested sample.

With the exception of PLAN Mathematics, means for females in the national sample were slightly higher than those for males, with the differences ranging from 1.6 PLAN score units on the English test to .29 PLAN score units on the Science Reasoning test. On the Mathematics test, males and females scored similarly. For the all-sophomore sample, males and females score similarly on all tests except English and Mathematics. Females scored higher than males on the English test (by 1.0 PLAN score units) and slightly lower than males on the Mathematics test (by .5 PLAN score units).

Caucasian-American students consistently outscored the other ethnic groups in both samples, with the greatest differences on the PLAN English test and the smallest differences on the PLAN Science Reasoning test. Caucasian-American students' scores typically exceeded those of Hispanics by about 2.5 PLAN score units. Scores for Caucasian-American students typically exceeded those of African-American students by about 3.2 PLAN score units. Mean score differences between Caucasian-Americans and African-Americans, and between Caucasian-Americans and students of other ethnic origins, were similar for the two samples.

Course work taken. Descriptive statistics for the various course cluster variables, indicating whether students had taken or were taking particular groups of courses are reported in Table B-1 (Appendix B) for both samples. The table includes the percentages of students completing the various clusters. The correlations of the cluster variables with PLAN scores are also shown. The course work taken variable that was most strongly associated with all five PLAN scores was whether or not the student had taken Algebra 1 and Algebra 2, or Algebra 1 and Geometry, with correlations ranging from .37 to .54 across both samples. A higher percentage of students in the all-sophomore sample than the national sample had taken or were taking these courses. Whether or not the student had taken any foreign language (correlations= .25 to .34), or had taken the foundational course work (r = .35 to .47) was also positively associated with PLAN scores.

Need variables. Table B-2 (Appendix B) contains means and standard deviations for the various need variables, along with the correlations of these variables with PLAN scores. Correlations were fairly consistent across the two samples; greater needs for help

were associated with lower test scores. Needs for help in developing test taking skills correlated consistently with all of the PLAN scores (r = -.25 to -.35). Needs for help in developing writing skills, increasing reading speed, and increasing understanding of what is read were most strongly related to PLAN English, Reading and Composite scores. Needs for help in developing math skills correlated most highly with PLAN Mathematics scores (r = -35 and -.38). Needs for help in developing speaking skills and the needs for choosing a college and choosing a job were minimally associated with PLAN scores.

Planned course work. Descriptive statistics for the clusters of courses that students planned to take are reported in Table B-3 (Appendix B). The table includes the percentages of students planning to complete the various clusters, and correlations with PLAN scores. The percentages of students in both samples planning to take the courses were similar for all courses except social studies courses, where a larger percentage of national students than all-sophomore tested students were planning to take these courses.

In general, planned course work in mathematics (r = .23 to .37) and in natural sciences (r = .13 to .26) was more strongly associated with PLAN scores than other planned course work variables. This finding was consistent across both samples. Unlike course work taken, however, planned course work in foreign languages typically correlated negatively with PLAN score performance (r = -.01 to -.10).

Regression Analyses

Results of the regression analyses are reported in Tables 3 through 6; Tables 3

(gender) and 4 (ethnicity) contain the results for the national sample and Tables 5 (gender) and 6 (ethnicity) contain the all-sophomore results. Each table shows the breakdown in the contributions of the variable groups to explaining variability in PLAN scores. The tables include the regression weight for each variable and the R^2 contribution for each variable group. The tables also show the overall R^2 and SEE (standard error of estimate) for each regression analysis.

Course work taken. The primary course work taken variables included in the final models were indicators of whether or not the student had taken either Algebra I & Algebra II or Algebra I & Geometry; any foreign languages; and for PLAN English, Art, Music, or Drama. All other variables either did not contribute significantly to the model and/or were collinear with these variables.

Across PLAN tests and samples, course work taken explained 17% to 31% of the total variance in PLAN scores; in general, R^2 values were slightly higher for the all-sophomore tested sample than for the national sample. Algebra 1 and Algebra 2, or Algebra 2 and Geometry course work taken was more strongly associated with PLAN scores for the all-sophomore tested group than for the national sample. The variance accounted for by course work taken was generally lowest for Reading and Science Reasoning and highest for PLAN Mathematics and the Composite.

Educational needs and plans. The educational needs and plans variables most effective in explaining PLAN scores were the measures of student need and course work planned in mathematics and foreign languages. The particular need variables varied from test to test, however. Needs for help in developing test taking skills was

consistently associated with PLAN scores, over and above course work taken (regression weights = -.65 to -1.27); the regression weights for help in test taking were higher for the all-sophomore sample than for the national sample, however. Other important need variables were needs for help in developing mathematics skills and in increasing reading speed.

Planned course work. Over and above course work taken, the indicators of whether or not students planned to take Algebra II, Geometry, Trigonometry, and Calculus, or planned to take both Spanish and French were the primary course work planned variables for explaining PLAN scores. Consistent with course work taken, planned mathematics course work was more strongly associated with PLAN scores for the all-sophomore tested sample than for the national sample (regression weights = .99-1.51 vs. .55-1.08). The need variables and the planned course work variables together accounted for between 5% and 9% of the total variance in PLAN scores, over and above course work taken for the national sample. For the all-sophomore sample, these variables accounted for between 8% and 12% of additional variance in PLAN scores.

High school attended. The two samples also differed in the contribution of high school attended, over and above course work taken and educational needs and plans. For the national sample, high school attended accounted for between 11% and 14% of additional variance, compared to 6% to 8% for the all-sophomore tested sample.

Gender and ethnicity. Gender or ethnicity consistently accounted for a minimal proportion of additional variance in PLAN scores. Gender explained, at most, 1% of PLAN score variance, over and above the other variables in the models. For the PLAN

Mathematics test, the increase in R^2 by gender was not found to be statistically significant ($p > .05$), over and above the other variables, for either sample. The percentage of additional PLAN score variance explained by ethnicity ranged from 1% to 2%, over and above the other variables in the models.

Compared to other PLAN scores, the greatest amount of variability was explained for PLAN Mathematics and PLAN Composite scores for both samples ($R^2 = .47$ to .51). The smallest SEE values were found for the Composite for both samples (2.63 to 2.80).

Adjusted mean differences. Tables 7 and 8 provide unadjusted and adjusted means for each gender and ethnic group, by sample. The adjusted mean represents an average PLAN score for a group, controlling for all independent variables other than the grouping variable itself. The adjusted and unadjusted means were rescaled by setting the means for males and Caucasian-Americans equal to the total group mean. The corresponding means for females and the nonwhite ethnic groups were computed relative to the means for males and Caucasian-American students.

Adjusted mean differences between males and females from the national sample (when controlling for courses taken, educational needs and plans, and high school attended) typically were slightly smaller (20-29% smaller) than the corresponding unadjusted mean differences, except for PLAN Mathematics and Science Reasoning (see Table 7). For these tests, the adjusted mean differences were the same as the unadjusted mean differences.

For the all--sophomore tested sample, the adjusted mean gender differences were similar to or slightly larger than the unadjusted mean differences, except for PLAN

Mathematics, where the adjusted mean differences were slightly smaller. The only adjusted mean differences that appeared to favor males from both samples were for PLAN Mathematics; these differences were not statistically significant, however.

Mean differences between African-American and Caucasian-American students were reduced by 49 to 54% by controlling for course work taken, educational needs and plans, and high school attended. The largest reduction was on the PLAN Mathematics test, and the smallest reduction was on the PLAN Science Reasoning test. Mean differences between Hispanic and Caucasian-American students were reduced by 25 to 46%, with the largest reduction on the PLAN English test and the smallest reduction on the PLAN Science Reasoning test.

Effects of Ethnicity, Gender, and High School Attended

Ethnic group by mathematics course work taken (i.e, Algebra 1 and Algebra 2, or Algebra 2 and Geometry) and by mathematics course work planned (i.e., Algebra 2, Geometry, Trigonometry, and Calculus) interaction terms were added to the regression models. The results showed statistically significant ($p < .05$) ethnic group by mathematics course work planned interactions for the PLAN Composite for the all-sophomore sample, and for PLAN Science Reasoning for the national sample. In both cases the mean PLAN score differences between students planning to take and not planning to take the course work were greater for Caucasian-American students than for students from other ethnic groups, as shown in Figure 1. Though statistically significant, the mean score differences suggest that the interactions were not practically significant.

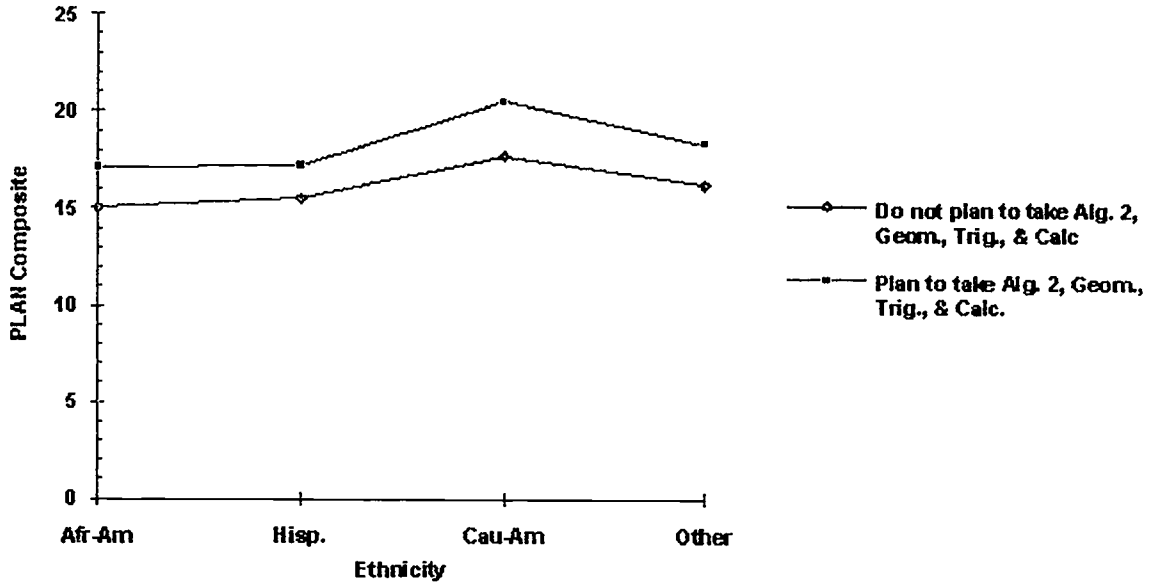

Figure 1. Ethnicity by Planned Mathematics Course Work Interaction--PLAN Composite

Statistically significant ($p < .001$) mathematics course work taken and course work planned by high school attended interactions were also found. For the all-sophomore sample, significant high school by course work planned interactions were found for all PLAN tests except Reading; the only significant course work taken by high school interaction occurred for PLAN Mathematics. For the national sample, statistically significant high school by mathematics course work taken interactions were found for all PLAN tests.

Within-school regression models were developed for both the national and all-sophomore samples. Due to small sample sizes, the numbers of high schools were reduced to 60 and 65, respectively. The regression weights associated with mathematics course work taken and course work planned were then summarized across institutions, as shown in Table 9.

The regression weights for both mathematics course work taken and planned varied widely across high schools. Negative weights associated with these variables were found for some high schools; median values, however, were consistently positive across PLAN tests and samples. As was found earlier in this study using the high school dummy variable regression models, the regression weights associated with mathematics course work taken and planned were larger for the all-sophomore sample than for the national sample.

High school groups. Three general categories of high school were identified for each sample. Schools with predicted mean PLAN Composite scores within ±1 of the pooled predicted mean were identified as performing "as expected," given their students' course work, educational needs, and plans, and ethnicity. Those scoring below the pooled predicted mean Composite score were identified as performing "below expected"; schools scoring above the pooled predicted mean Composite were identified as performing "above expected." The regression weights for mathematics course work taken and planned were then summarized across the schools in each school group, by sample, as shown in Table 10. The number of schools in each group are reported in parentheses in the shaded rows.

For the national sample, for which the high school by mathematics course work taken interaction was found, the regression weights associated with mathematics course work taken were generally smaller for the below expected group; i.e., the relationship between mathematics course work taken and PLAN performance was weaker for schools in this group than for those in the other groups. For the all-sophomore sample, a

similar trend was found for mathematics course work planned: The relationship between planned mathematics course work and PLAN performance was generally weaker for schools in the below expected group than for schools in the other two groups.

As shown in Table 11, schools in the below expected group typically were large, public, rural schools from the Southern accrediting region. These schools were more likely to have lower total per-pupil expenditures, higher percentages of families with incomes below federal poverty level, and higher percentages of African-American students in the district than schools in the other two groups. In contrast, schools in the above expected group were typically suburban, public and private schools from the North Central accrediting region. These schools had higher total per-pupil expenditures, fewer families with incomes below the federal poverty level, and fewer African-American and Hispanic students than schools in the other two groups. It should be noted, however, that large, public, rural schools with low per-pupil expenditures, higher percentages of families with incomes below the federal poverty level, and higher percentages of African-Americans or Hispanics could also be found in the as expected and above expected groups.

Discussion

The study confirmed past research findings on the role of courses taken or being taken as a major factor in explaining students' achievement of higher-order thinking skills, as measured by PLAN. The role of educational needs and plans was also assessed, with the results supporting the power of these variables, over and above

course work taken, in explaining PLAN score variance. Further, the results supported the role of high school attended as a strong predictor of students' higher order thinking skills.

Gender provided little explanatory power, over and above the other variables in the models. The study clearly supports the conclusion that gender is minimally related to levels of higher-order thinking skill, as measured by PLAN scores, over and above courses taken, educational needs and plans, and high school attended. These results support the findings of past research, (e.g., Noble, et al., 1992) on the role of gender in the explanation of score variance on other, higher-order thinking skills test.

On the other hand, the gender results for the national sample seem at variance with the findings of other research (e.g., Noble & McNabb, 1989), and of the all-sophomore sample, in terms of the reductions in mean differences between gender groups when courses taken and course grades were statistically controlled. The reasons for this discrepancy are not obvious, but a reasonable hypothesis involves the nature of the samples. Noble and McNabb (1989) studied student performance on the ACT Assessment; their sample consisted of high school juniors and seniors who had chosen to take the ACT Assessment tests (i.e., they had "self-selected"). The samples for this study consisted of high school sophomores who took the PLAN test, not of their own choosing, but as an "in school" test. The all-sophomore sample also appeared more academically-able than the national sample.

It seems reasonable that the sample for the ACT Assessment study and the all-sophomore sample would show less variability in terms of prior scholastic achievement,

as measured by course work, than the national sample. Higher percentages of sophomores in the all-sophomore sample than the national sample had taken the mathematics course work; mathematics course work taken also accounted for a greater amount of the variance in the PLAN scores of the all-sophomore sample than of the national sample. Consequently, controlling for indices of prior scholastic achievement would have less potential to reduce mean differences for the ACT Assessment study and for the all-sophomore sample, precisely because there were fewer differences in prior scholastic achievement to control for in the first place.

Additionally, Noble and McNabb (1989), unlike both the present study and other previous research (e.g., Noble et al., 1992), did not control for educational needs and plans or high school attended. The differences in the findings of the studies could also be linked to this difference in method.

Though mean score differences by ethnic group were substantially reduced by controlling for course work taken, educational needs and plans, and high school attended, mean score differences remain. These findings, however, should not lead one to conclude that Caucasian-American students are more predisposed than African-American or Hispanic students to acquire higher-order thinking skills, or that using the PLAN tests would disadvantage students from certain ethnic groups. Ethnicity accounted for only 2% of the total variance in PLAN scores, over and above courses taken, educational needs and plans, and high school attended.

Planned course work in foreign languages was consistently negatively associated with PLAN scores. The simple correlations were not statistically significant, however.

One possible hypothesis concerning this finding is the increasing numbers of schools requiring foreign languages of all of their students, regardless of their academic ability. A complementary hypothesis is that the more academically-able students have or are currently fulfilling their language requirements, where the less academically-able students postpone their language course work until later in high school. Further research is needed on this issue to support these hypotheses, however.

High school attended appears to be a key factor in how students acquire higher-order thinking skills. The results of this study indicate that though students from different high schools may take similar courses, they may not be learning the same skills and knowledge; including course grades in future studies would help solidify this conclusion. Further, effective skills acquisition appears positively related to the financial status of the school and of students' families in the school districts. However, the relationship is not perfect; some lower SES schools appear to be effectively helping students acquire these skills. Future research on factors related to quality of education and noncognitive factors such as student's family income, parent's level of education, the amount of time spent studying, and teacher and student motivation and support would be helpful in addressing these issues. The use of these variables in future research could well reduce the amount of unexplained variance and substantially decrease the contribution of ethnicity to an explanatory model.

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Table 1. School Characteristics of National and All-sophomore Tested PLAN Samples (Percentages)

Characteristic	Category	National (64 schools)	All-sophomore tested (72 schools)
Control	Public	77	66
	Private	23	34
Accrediting region	South	33	24
	West	0	3
	Middle	8	6
	North Central	52	68
	Northwest	5	0
	Northeast	3	0
Location	Urban	13	26
	Suburban	22	36
	Rural	65	38
Per pupil expenditure*	< $2200	0	2
	$2200-$3199	36	18
	$3200-$4199	35	28
	$4200-$5199	15	32
	$5200 and over	14	20
Percent below federal poverty level in the district*	0-4.9%	13	20
	5-11.9%	26	40
	12-24.9%	34	32
	25% and over	28	8
% African-Am. students in the district	0%	44	50
	1-24%	53	46
	25% and over	3	4
% Hispanic students in the district	0%	32	31
	1-24%	68	59
	25% and over	0	10
School enrollment	1-99	1	1
	100-299	25	24
	300-499	28	28
	500-999	30	25
	1000 and over	17	22

* Public schools only

Table 2. PLAN Score Means and Standard Deviations, by Sample

Group	Sample size	PLAN score									
		English		Mathematics		Reading		Science Reasoning		Composite	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
National											
Total	6980	16.1	4.96	16.3	4.00	15.7	4.78	16.5	3.41	16.3	3.78
Males	3512	15.3	4.91	16.4	4.26	15.2	4.78	16.4	3.56	16.0	3.87
Females	3463	16.9	4.89	16.3	3.72	16.3	4.71	16.7	3.24	16.7	3.64
Afr.-Ams.	645	13.5	3.80	14.5	3.07	13.3	3.53	14.8	2.82	14.1	2.69
Cau.-Ams.	4359	17.6	4.89	17.3	3.99	17.1	4.79	17.3	3.38	17.4	3.73
Hispanics	431	14.2	4.31	14.6	3.45	14.3	4.47	15.6	3.19	14.8	3.31
Other	537	14.3	4.34	15.6	3.74	13.9	4.01	15.8	3.13	15.0	3.23
All sophomore tested											
Total	8441	18.2	4.98	17.9	4.22	17.7	4.91	18.0	3.65	18.1	3.94
Males	4491	17.7	5.00	18.2	4.30	17.6	5.08	18.0	3.89	18.0	4.06
Females	3948	18.7	4.90	17.7	4.11	17.8	4.72	18.0	3.36	18.2	3.78
Afr.-Ams.	474	15.6	4.20	15.4	3.54	15.4	4.19	16.1	3.10	15.8	3.29
Cau.-Ams.	5582	19.1	4.87	18.7	4.15	18.5	4.84	18.6	3.62	18.8	3.85
Hispanics	548	15.8	4.23	15.9	3.34	15.6	4.50	16.5	3.04	16.1	3.24
Other	648	16.9	4.85	17.6	4.35	16.5	4.70	17.4	3.34	17.2	3.80

Table 3. Regression Results for Gender - National Sample

Predictor group	Predictor variable	English		Mathematics		Reading		Science Reasoning		Composite	
		Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2
Intercept		14.5		15.2		14.8		15.8		15.4	
Courses taken	(Alg. 1 & Alg. 2) or (Alg. 1 & Geometry)	3.27		3.17		2.70		1.96		2.69	
	Any Foreign Language	1.60		1.11		1.41		.98		1.25	
	Art or Music or Drama	.47	.25	---	.28	---	.17	---	.17	---	.27
Ed. needs & plans	Needs for help										
	Writing	-.63		---		---		---		---	
	Reading Speed	-1.02		---		-1.25		---		-.56	
	Reading Under.	---		-.46		---		---		-.49	
	Mathematics	---		-1.13		---		-.37		-.31	
	Test Taking	-.81		---		-.90		-.78		-.66	
	Planned courses										
	Alg. 2, Geometry, Trig & Calculus	.88		1.08		.84		.55		.84	
	Spanish & French	-.84	.06	---	.09	-.75	.07	---	.05	-.66	.08
H.S. attended			.11		.11		.11		.11		.14
Gender		1.15	.01	-.05*	.00	.67	.01	.26	.00	.54	.01
Overall R^2		.43		.47		.36		.33		.49	
SEE		3.74		2.90		3.84		2.82		2.68	

* $p > .05$

Table 4. Regression Results for Ethnicity - National Sample

Predictor group	Predictor variable	English		Mathematics		Reading		Science Reasoning		Composite	
		Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2
Intercept		15.4		15.6		15.6		16.2		16.0	
Courses taken	(Alg. 1 & Alg. 2) or (Alg. 1 & Geometry)	3.10		2.95		2.54		1.77		2.53	
	Any Foreign Language	1.75		1.10		1.40		.97		1.27	
	Art or Music or Drama	.45	.24	---	.28	---	.17	---	.17	---	.26
Ed. needs and plans	Needs for help										
	Writing	-.55		---		---		---		---	
	Reading Speed	-1.00		---		-1.21		---		-.53	
	Reading Under.	---		-.47		---		---		-.46	
	Mathematics	---		-1.14		---		-.35		-.25	
	Test Taking	-.72		---		-.84		-.75		-.65	
	Planned courses										
	Alg. 2, Geometry, Trig & Calculus	.77		1.04		.80		.57		.81	
	Spanish & French	-.56	06	---	.09	-.54	.07	---	.05	-.45	.08
H.S. attended			.11		.11		.12		.11		.14
Ethnicity	African-Americans	-1.97		-1.31		-1.71		-1.31		-1.55	
	Hispanics	-1.79		-1.65		-1.67		-1.34		-1.61	
	Other	-1.69	.02	-.62	.02	-1.99	.02	-1.04	.02	-1.26	.02
Overall R^2		.44		.49		.37		.35		.51	
SEE		3.72		2.82		3.78		2.76		2.63	

Table 5. Regression Results for Gender - All-sophomore Tested Sample

Predictor group	Predictor variable	English		Mathematics		Reading		Science Reasoning		Composite	
		Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2
Intercept		15.3		15.6		15.8		16.3		16.3	
Courses taken	(Alg. 1 & Alg. 2) or (Alg. 1 & Geometry)	3.48		3.50		3.07		2.48		3.03	
	Any Foreign Language	1.56		1.16		1.36		.88		1.23	
	Art or Music or Drama	.29	.25	---	.30	---	.20	---	.22	---	.31
Ed. needs & plans	Needs for help										
	Writing	-.45		---		---		---		---	
	Reading Speed	-.87		---		-1.24		---		-.48	
	Reading Under.	---		-.43		---		---		-.57	
	Mathematics	---		-1.44		---		-.41		-.46	
	Test Taking	-1.27		---		-1.20		-.99		-.91	
	Planned courses										
	Alg. 2, Geometry, Trig & Calculus	1.09		1.45		1.08		.99		1.11	
	Spanish & French	-.69	.08	---	.12	-.53	.09	---	.08	-.66	.12
H.S. attended			.07		.07		.07		.06		.07
Gender		1.12	.01	-.15*	.00	.38	.00	.26	.00	.46	.00
Overall R^2		.41		.49		.36		.36		.50	
SEE		3.81		3.06		3.92		2.93		2.80	

* $p > .05$

Table 6. Regression Results for Ethnicity - All-sophomore Tested Sample

Predictor group	Predictor variable	English		Mathematics		Reading		Science Reasoning		Composite	
		Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2	Regr wgt	Increase in R^2
Intercept		16.1		15.8		16.4		16.7		16.8	
Courses taken	(Alg. 1 & Alg. 2) or (Alg. 1 & Geometry)	3.38		3.39		2.96		2.37		2.95	
	Any Foreign Language	1.73		1.15		1.37		.91		1.29	
	Art or Music or Drama	.35	.24	---	.29	---	.19	---	.21	---	.30
Ed. needs & plans	Needs for help										
	Writing	-.47		---		---		---		---	
	Reading Speed	-.94		---		-1.25		---		-.50	
	Reading Under.	---		-.41		---		---		-.54	
	Mathematics	---		-1.41		---		-.34		-.39	
	Test Taking	-1.15		---		-1.13		-.97		-.87	
	Planned courses										
	Alg. 2, Geometry, Trig & Calculus	1.10		1.51		1.11		1.04		1.16	
	Spanish & French	-.56	.08	---	.12	-.43	.09	---	.08	-.55	.12
H.S. attended			.07		.08		.07		.06		.08
Ethnicity	African-Americans	-1.98		-1.28		-1.48		-1.07		-1.40	
	Hispanics	-1.99		-1.42		-1.67		-1.28		-1.52	
	Other	-1.70	.02	-.75	.01	-1.73	.01	-.89	.01	-1.19	.01
Overall R^2		.41		.49		.37		.36		.51	
SEE		3.77		3.01		3.88		2.88		2.74	

Table 7. Unadjusted and Adjusted PLAN Means by Gender and Sample

Test	Mean difference (females-males)		Unadjusted mean (SD)		Adjusted mean	
	Unadjusted	Adjusted	Males	Females	Males	Females
National						
English	1.6	1.2	16.1	17.7	16.1	17.3
Mathematics	-.1	-.1*	16.3	16.2	16.3	16.3
Reading	1.0	.8	15.7	16.7	15.7	16.4
Science Reasoning	.3	.3	16.5	16.8	16.5	16.8
Composite	.7	.5	16.3	17.0	16.3	16.8
All sophomore tested						
English	1.0	1.1	18.2	19.2	18.2	19.3
Mathematics	.5	-.2*	17.9	18.4	17.9	17.8
Reading	.2	.3	17.7	17.9	17.7	18.1
Science Reasoning	.0	.3	18.0	18.0	18.0	18.3
Composite	.2	.5	18.1	18.3	18.1	18.6

* $p > .05$

Both unadjusted and adjusted means are computed by setting the mean for males equal to the total group mean for each sample. The unadjusted and adjusted means for females are measured relative to the mean for males.

Table 8. Unadjusted and Adjusted PLAN Means by Ethnicity and Sample

Test	Mean difference						Unadjusted mean (SD)				Adjusted mean			
	Unadjusted			Adjusted										
	Afr.-Am. - Cau.-Am.	Hisp - Cau.-Am.	Other - Cau.-Am.	Afr.-Am. - Cau.-Am.	Hisp. - Cau.-Am.	Other - Cauc-Am.	Afr.-Am.	Cau.-Am.	Hisp.	Other	Afr.-Am.	Cau.-Am.	Hisp.	Other
National														
English	-4.1	-3.3	-3.3	-2.0	-1.8	-1.7	12.1	16.1	12.8	12.8	14.1	16.1	14.3	14.4
Mathematics	-3.9	-2.7	-1.7	-1.3	-1.7	-.6	13.4	16.3	13.6	14.6	15.0	16.3	14.7	15.7
Reading	-3.7	-2.7	-3.2	-1.7	-1.7	-2.0	12.0	15.7	13.0	12.5	14.0	15.7	14.0	13.7
Science Reasoning	-2.6	-1.8	-1.5	-1.3	-1.3	-1.0	14.0	16.5	14.7	15.0	15.2	16.5	15.2	15.5
Composite	-3.3	-2.6	-2.4	-1.6	-1.6	-1.3	13.0	16.3	13.7	13.9	14.8	16.3	14.7	15.0
All-sophomore tested														
English	-3.5	-3.3	-2.2	-2.0	-2.0	-1.7	14.7	18.2	14.9	16.0	16.2	18.2	16.2	16.5
Mathematics	-3.2	-2.8	-1.1	-1.3	-1.4	-.8	14.7	17.9	15.1	16.8	16.6	17.9	16.5	17.2
Reading	-3.1	-2.9	-2.0	-1.3	-1.7	-1.7	14.6	17.7	16.8	15.7	16.2	17.7	16.0	16.0
Science Reasoning	-2.5	-2.0	-1.2	-1.1	-1.3	-.9	15.5	18.0	16.0	16.8	16.9	18.0	16.7	17.1
Composite	-3.0	-2.7	-1.6	-1.4	-1.5	-1.2	15.1	18.1	15.4	16.5	16.7	18.1	16.6	16.9

Both unadjusted and adjusted means are computed by setting the mean for Caucasian-American students equal to the total group mean for each sample. The unadjusted and adjusted means for minority students are measured relative to the mean for Caucasian-American students.

Table 9. Regression Weights for Mathematics Course Work Taken and Planned - National and All-sophomore Tested Samples

PLAN test	Taken Alg. 1 & Alg. 2, or Alg. 1 & Geometry			Plan to take Alg. 2, Geom., Trig., & Calc.		
	Med.	Min.	Max.	Med.	Min.	Max.
National (60 schools)						
English	2.65	-4.68	6.64	.93	-2.36	8.96
Mathematics	2.83	-4.19	5.83	1.31	-3.08	4.59
Reading	2.30	-5.16	6.34	.91	- 3.93	5.57
Science Reasoning	1.67	-4.22	7.92	.73	2.56	3.78
Composite	2.49	-2.84	6.67	1.09	-1.58	5.90
All-sophomore tested (65 schools)						
English	3.02	.31	7.90	1.04	-4.78	5.48
Mathematics	3.02	.19	7.37	1.46	-2.01	4.93
Reading	3.09	-2.19	8.70	1.06	-1.97	4.79
Science Reasoning	2.28	-1.07	9.00	1.03	-2.44	6.50
Composite	2.78	.29	5.91	1.11	-2.20	3.91

Table 10. Regression Weights for Mathematics Course Work Taken and Planned - National and All-sophomore Tested Samples, by School Group

PLAN test	Taken Alg. 1 & Alg. 2, or Alg. 1 & Geometry									Plan to take Alg. 2, Geom., Trig., & Calc.								
	Below expected			As expected			Above expected			Below expected			As expected			Above expected		
	Med.	Min.	Max.	Med.	Min.	Max.	Med.	Min.	Max.	Med.	Min.	Max.	Med.	Min.	Max.	Med.	Min.	Max.
National	(8)			(39)			(13)											
English	1.93	-.19	5.66	2.65	-.88	6.64	2.99	-4.68	5.36	1.10	.31	4.00	1.00	-1.83	8.96	.71	-.43	4.45
Mathematics	1.87	-.51	5.83	2.97	-.98	5.52	2.33	-4.19	4.15	1.15	.29	2.12	1.35	-1.52	4.59	1.74	.09	3.95
Reading	.82	-1.21	4.07	2.38	-3.11	6.34	3.60	-5.16	5.02	1.78	.35	3.92	.59	-3.93	5.57	1.76	-1.34	4.76
Science Reasoning	1.24	-.65	4.15	1.82	-4.23	5.18	1.75	-1.28	7.92	.70	.21	1.22	.58	-2.56	3.78	1.14	.26	2.53
Composite	1.04	-.26	5.01	2.57	-.54	6.67	2.64	-2.84	4.19	1.34	.43	2.95	.94	-1.58	5.90	1.51	-.64	4.47
All-sophomore tested	(11)			(45)			(9)											
English	2.94	.42	6.14	3.02	.31	7.90	3.53	1.35	4.89	.28	-2.81	5.48	1.18	-4.78	4.11	1.39	.52	3.48
Mathematics	2.53	.19	4.82	3.08	.88	7.37	3.47	.94	4.75	-.23	-2.01	2.14	1.75	-1.56	4.65	1.47	.74	4.93
Reading	2.54	.54	6.21	3.40	-2.19	8.70	1.99	-.24	8.46	.25	-1.37	4.02	1.06	-1.97	4.79	1.33	.46	4.28
Science Reasoning	2.09	.93	4.27	2.23	-.28	9.00	2.62	-1.07	3.77	.39	-1.18	2.06	1.07	-2.44	6.50	1.20	.86	2.44
Composite	2.89	.29	5.43	2.78	.83	5.91	1.94	.92	4.22	.42	-1.40	3.91	1.21	-2.20	3.21	1.11	.53	2.74

Table 11. School Characteristics of National and All-sophomore Tested PLAN Samples by School Group (Percentages)

Characteristic	Category	National			All-sophomore tested		
		Below expected (8)	As expected (39)	Above expected (13)	Below expected (11)	As expected (45)	Above expected (9)
Control	Public	100	82	69	90	57	89
	Private	0	18	31	10	43	11
Accrediting region	South	50	33	8	54	18	11
	West	0	0	0	9	2	0
	Middle	13	8	7	0	2	22
	North Central	38	57	69	36	78	67
	Northwest	0	3	8	0	0	0
	Northeast	0	0	8	0	0	0
Location	Urban	0	13	17	27	24	33
	Suburban	25	15	42	27	31	56
	Rural	75	72	42	46	44	11
Per pupil expenditure*	< $2200	0	0	0	10	0	0
	$2200-$3199	50	47	22	30	21	0
	$3200-$4199	25	38	44	20	28	25
	$4200-$5199	13	9	11	20	28	50
	$5200 and over	13	6	22	20	17	25
Percent below federal poverty level*	0-4.9%	0	6	33	0	10	75
	5-11.9%	13	13	67	30	52	13
	12-24.9%	13	56	0	60	28	13
	25% and over	75	25	0	10	10	0
% African-American students	0%	13	46	62	46	51	44
	1-24%	63	49	39	45	45	56
	25% and over	25	5	0	9	4	0
% Hispanic students	0%	25	28	54	18	33	11
	1-24%	75	64	46	55	58	89
	25% and over	0	8	0	27	9	0
School enrollment	1-99	0	3	0	0	2	0
	100-299	0	23	23	0	33	0
	300-499	13	28	39	36	29	33
	500-999	63	28	31	36	20	11
	1000 and over	25	18	8	27	16	56

* Public schools only

APPENDIX A

Descriptions of Clusters for Planned Course Work

Cluster	Description	Courses included in cluster
1	English	English 11, English 12
2	English	English 11, Speech
3	English	English 11, English 12, Speech
4	Math	Algebra 2, Trigonometry
5	Math	Geometry, Trigonometry
6	Math	Algebra 2, Geometry, Trigonometry
7	Math	Algebra 2, Geometry, Trigonometry, Calculus
8	Soc. Studies	World History, American Gvt.
9	Soc. Studies	World History, Geography
10	Soc. Studies	World History, American Gvt., Economics
11	Soc. Studies	World History, American Gvt., Economics, Geography
12	Soc. Studies	American Gvt., Economics
13	Soc. Studies	American Gvt., Economics, Geography
14	Science	Biology, Chemistry
15	Science	Biology, Chemistry, Physics
16	Science	Chemistry, Physics
17	Foreign Language	Spanish
18	Foreign Language	Spanish, French
19	Fine Arts	Art
20	Fine Arts	Music
21	Fine Arts	Art, Music

APPENDIX B

Descriptive Statistics and Correlations for Independent Variables

Table B-1. Percentages of Students Taking Course Work Clusters, and Correlations of Clusters with PLAN Scores, by Sample

Course work cluster taken/taking		Percent of students taken/taking cluster		Correlation of cluster with PLAN score									
				English		Mathematics		Reading		Science Reasoning		Composite	
		Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.
1	Eng. 9 or 10	99.9	99.9	.05	.06	.04*	.05	.03*	.05	.04*	.04	.05	.05
2	Eng. 9 & 10, or Eng. 9 & Speech	98.4	98.5	.08	.08	.09	.06	.09	.07	.09	.07	.10	.08
3	Alg. 1 & 2, or Alg. 1 & Geometry	62.1	71.6	.44	.48	.51	.53	.38	.44	.37	.46	.48	.54
4	Alg. 1 or Alg. 2 or Geometry	89.2	91.9	.28	.31	.34	.35	.22	.27	.24	.29	.30	.35
5	Art or Music or Drama	62.8	67.4	.15	.09	.08	.05	.11	.07	.08	.09	.12	.08
6	Any Foreign Language	66.2	78.9	.32	.30	.30	.29	.28	.26	.27	.25	.34	.31
7	Foundational course work	56.0	65.4	.41	.42	.47	.46	.36	.40	.35	.42	.46	.47
8	2 yrs. Eng., 2 yrs. Math.,1 yr. Soc. Studies, 2 yrs. Sci.	50.3	52.5	.31	.27	.35	.31	.28	.25	.25	.27	.34	.31

* $p > .001$

Table B-2. Means and Standard Deviations for Need Variables, and Correlations with PLAN Scores

Need variable	Mean		SD		Correlation with PLAN score									
					English		Mathematics		Reading		Science Reasoning		Composite	
	Nat'l	All-soph.	Nat'l	All-soph	Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.
Writing	.06	.06	.65	.62	-.15	-.13	-.05	-.03	-.13	-.11	-.09	-.07	-.13	-.10
Speaking	1.10	1.10	.73	.71	.03*	-.01*	.04	.01*	.01*	-.02*	.03*	-.00*	.03*	-.01*
Reading speed	.70	.70	.71	.73	-.24	-.20	-.11	-.06	-.25	-.23	-.14	-.15	-.21	-.19
Reading understanding	.70	.80	.73	.71	-.21	-.26	-.16	-.18	-.26	-.29	-.20	-.24	-.24	-.28
Mathematics	.90	.90	.76	.74	-.14	-.18	-.35	-.38	-.11	-.13	-.22	-.23	-.22	-.25
Study skills	1.00	1.00	.72	.71	-.15	-.18	-.18	-.19	-.16	-.16	-.18	-.19	-.19	-.20
Test taking	.90	.90	.71	.71	-.25	-.32	-.28	-.32	-.25	-.31	-.26	-.32	-.29	-.35
Choosing college	1.10	1.10	.75	.74	.07	.08	.06	.07	.06	.06	.04	.06	.07	.07
Choosing career/job	.90	.90	.76	.75	.05	.09	.06	.09	.03	.09	.03*	.08	.05	.10

* $p > .001$

Table B-3. Percentages of Students Planning to Take Course Work Clusters, and Correlations of Clusters with PLAN Scores, by Sample.

Course work cluster planning to take	Percent planning to take cluster		Correlation of cluster with PLAN score									
			English		Mathematics		Reading		Science Reasoning		Composite	
	Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.	Nat'l	All-soph.
1 Eng. 11 & Eng. 12	88.2	81.7	.16	.06	.18	.07	.14	.07	.16	.08	.18	.08
2 Eng. 11 & Speech	30.7	32.2	.10	.07	.08	.09	.08	.08	.08	.07	.10	.09
3 Eng. 11, Eng. 12, & Speech	29.3	30.7	.11	.08	.09	.10	.10	.09	.09	.08	.11	.10
4 Alg. 2 & Trig.	48.8	51.9	.31	.25	.37	.33	.27	.25	.28	.27	.34	.31
5 Geometry & Trig.	50.3	55.0	.31	.25	.37	.32	.27	.24	.28	.27	.34	.30
6 Alg. 2, Geometry, & Trig.	48.1	51.6	.31	.26	.37	.33	.27	.25	.28	.28	.35	.31
7 Alg. 2, Geometry, Trig., & Calculus	31.7	35.5	.25	.24	.34	.34	.23	.24	.24	.27	.30	.30
8 World History & American Gvt.	66.4	62.5	.18	.08	.19	.10	.17	.11	.16	.12	.20	.12
9 World History & Geography	49.9	38.3	.03*	-.03*	.03*	-.01*	.03*	-.02*	.02*	-.01*	.03*	-.02*
10 World History, American Gvt., Economics	40.5	37.1	.13	.08	.14	.11	.12	.10	.12	.10	.14	.11
11 World History, American Gvt., Economics, Geography	26.1	20.8	.04*	-.00*	.04*	.03*	.03*	.01*	.03*	-.00*	.03*	.01
12 American Gvt. & Economics	43.8	40.5	.12	.09	.13	.12	.11	.10	.12	.10	.14	.12
13 American Gvt., Economics, & Geography	28.4	23.3	.03*	.01*	.03*	.03*	.02*	.01*	.02	.02*	.03*	.02*
14 Biology & Chemistry	77.2	76.7	.21	.13	.23	.16	.17	.14	.19	.16	.23	.16
15 Biology, Chemistry, & Physics	57.0	60.0	.22	.18	.26	.22	.19	.18	.19	.21	.24	.22
16 Chemistry & Physics	57.4	60.3	.23	.18	.26	.22	.20	.18	.19	.21	.25	.22
17 Spanish	58.7	60.9	.03*	-.02*	.02*	-.01*	.02	-.01*	.02*	-.01*	.04*	-.01*
18 Spanish & French	12.0	9.8	-.09	-.06	-.09	-.08	-.08	-.04	-.08	-.06	-.10	-.07
19 Art	51.1	51.9	-.03*	-.07	-.02	-.07	*-.03*	-.06	-.04	-.06	-.03*	-.07
20 Music	45.8	42.6	.12	.10	.08	.05	.08	.06	.07	.07	.10	.08
21 Art & Music	26.3	25.6	.01*	.01*	.00*	-.03*	.00*	-.02*	-.02*	-.01*	.00*	-.01*

* $p > .001$