Student Achievement, Behavior, Perceptions, and Other Factors Affecting ACT Scores

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Abstract

In this study, we investigated factors related to students' performance on the ACT. We examined how students' background characteristics, academic achievement in high school, education-related accomplishments and activities, and perceptions of self and others affect their ACT scores. Of particular interest were the direct and indirect effects of students' background characteristics, given their other characteristics.

To study this issue, we estimated a multi-group, multi-level structural model. We found that among both African American and Caucasian American students, ACT Composite score was directly influenced only by academic achievement in high school. Family income, parents' level of education, and number of negative situations in the home were related to ACT Composite score only indirectly, through education-related accomplishments and activities, perceptions of self and others, and academic achievement. Moreover, education-related accomplishments and activities and perceptions of self and others had only indirect effects through academic achievement.

These findings showed that, regardless of their race/ethnicity, students can increase their chances of doing well on the ACT, and thus increase their chances of enrolling and succeeding in college.

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Introduction

In recent years, standardized tests have been closely scrutinized with regard to various population subgroups. College admission tests like the ACT Assessment and the SAT I: Reasoning Test have been criticized for "biased" assessment of women and African Americans, in particular (e.g., Cloud, 1997; Cortez, 1997; Cross and Slater, 1997; FairTest Examiner, Fall 1994; Hebel, 1999; Lederman, 1998; Marklein, 2000; Rooney, 1998; St. John, Simmons, and Musoba, 1999). Test publishers have responded that differential test performance reflects inequalities in opportunity to learn and prior academic preparation in high school (e.g., Noble, Crouse, Sawyer, and Gillespie, 1992; Noble, Davenport, Schiel, and Pommerich, 1999). Because score differences could have implications for the educational opportunities of selected population subgroups, it is important to determine what other factors appear to influence test performance of these groups.

In studying racial/ethnic differences on the ACT Assessment, researchers have examined the effects of course work taken, grades earned, student and high school characteristics, educational plans, and high school attended on test performance (e.g., Chambers, 1988; Noble et al., 1992; Noble et al., 1999; Noble and McNabb, 1989). Their findings suggested that differential performance on these tests was largely the result of differences in the type and quality of academic preparation, regardless of race/ethnicity or gender. Noble et al. (1999) found that after statistically controlling for courses taken, grades earned, and high school attended, race/ethnicity accounted for no more than 1% to 2% of additional variance in ACT scores.

Many studies have also examined the relationships between students' noncognitive characteristics and their educational achievement. More recently (possibly due to Goals 2000 (Jennings, ed., 1995) and to an emphasis on equity in education), research on this topic has achieved visibility both in the general media (e.g., Gladwell, 1998; Honan, 1996; Sommers, 1998; Viadero, 1998) and in publications oriented towards educational researchers. Examples of the latter include academic behavior and attitudes, high school preparation, and valuing of education (Stricker, Rock, and Burton, 1992); students' self-concept and self-efficacy beliefs (Hamacheck, 1995; Le, Casillas, Robbins, & Langley, 2005; Schunk, 1991); work and homework (Viadero, 1998); and school support of students (Wehlage, 1991).

Noble, Davenport, and Sawyer (2001) expanded the Noble et al. (1999) study to include noncognitive characteristics of students. This study examined the direct and indirect relationships among ACT Composite scores, academic achievement, students' perceptions of themselves, disadvantaged family background, and activities and accomplishments. ACT Composite scores were found to be directly related to academic achievement and students' perceptions of themselves and others. The researchers were unable to fit a multi-level model addressing the effects of high school attended, however, due to sample size and software constraints. Moreover, the model did not account for the measurement error associated with the individual items that assessed students' perceptions. Finally, race/ethnicity was included as an indicator within the factor structure of the model, rather than as a grouping variable.

The purpose of this study was to extend the work by Noble et al. (2001) to a multi-level, multi-group structural model. The structural model estimates direct and indirect influences, with the effects of measurement errors removed, on ACT Composite score. The multi-group feature of the model evaluates the similarity of the relationships among the variables considered for two separate

racial/ethnic groups (African American and Caucasian American). The multi-level feature of the model accounts for the influence of high school attended.

The Model

Figure 1 illustrates the hypothesized structural model within high school. In this model, the ACT score factor is directly influenced only by academic achievement in high school, but is indirectly influenced by students' psychosocial characteristics (denoted as psychosocial factors), their family background characteristics, and their education-related accomplishments and activities. Note that the family background characteristics do not directly affect ACT score; instead their effects are all indirect, through other mediating variables. The relationships among the factors are imperfectly estimated; disturbance (error) terms are indicated by the unattached arrows adjacent to each factor.

FIGURE 1. Structural model
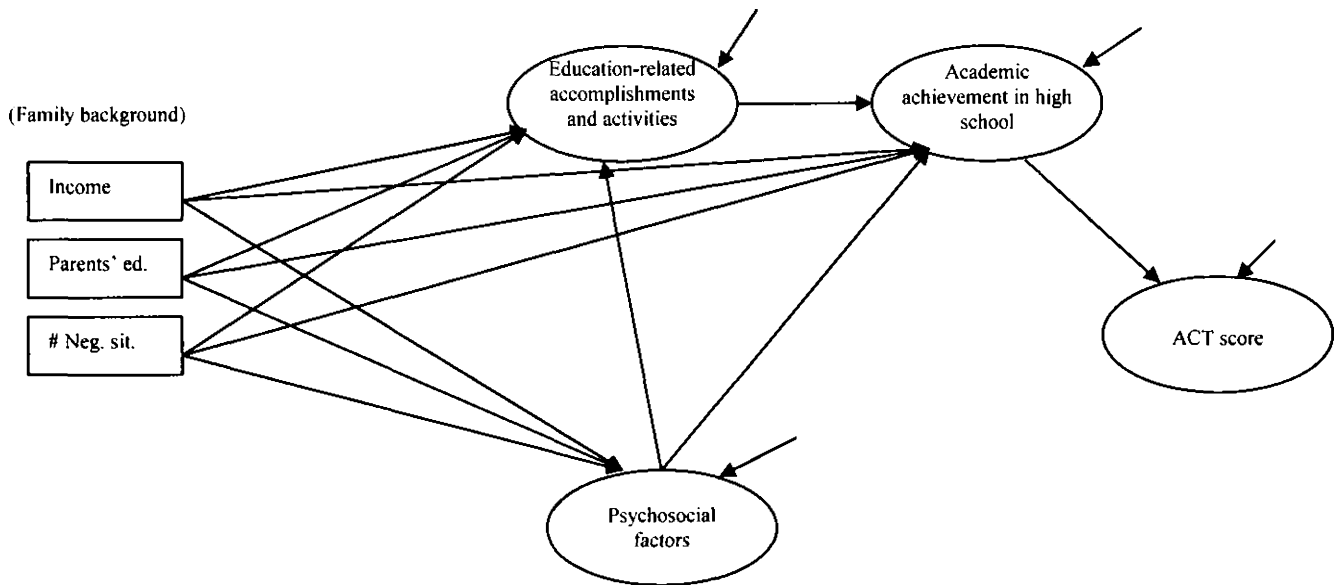
Structural models also allow us to evaluate relationships between groups. Using a multi-group model, we can test whether the relationships among students' psychosocial factors, accomplishments and activities, academic achievement, and ACT Composite score are the same for African American and Caucasian American students. In so doing we can draw conclusions about

how or if these factors contribute to differential academic achievement for these two groups of students, and develop recommendations for improving student achievement, especially for African American students.

Structural models can also be used to quantify and control for measurement error in individual variables: Nearly all data involve measurement error to some degree. Sometimes the measurement error is small, and can be ignored, When the measurement error is not ignorable, it tends to depress the magnitude of statistical relationships. For example, the correlation between two variables measured with a high degree of reliability will tend to be higher than the correlation between the same variables measured with a low degree of reliability. Structural modeling enables us to use reliability information on observed variables to estimate what these relationships would be if the variables could be measured without error.

The ellipses in Figure 1 refer to latent variables (factors or constructs measured without error). Rectangles refer to observed variables (not corrected for measurement error). Arrows between ellipses and rectangles indicate hypothesized relationships; unattached arrows are disturbance terms, and correspond to prediction error remaining after accounting for the relationships among factors. For further information about structural modeling, see Bollen (1989).

The multi-level aspect of the model allowed us to adjust within-school relationships for the effects of high school attended. The adjustment pertained to the intercept terms of the within-school relationships.

The factors for this study are described in the following sections. Procedures for measuring them are described in the Data section.

ACT Score

The ACT is a curriculum-based test intended to measure the skills and knowledge students have acquired in high school and need to be successful in college (ACT, 1997). The ACT Composite score is the arithmetic average of the scores on the four academic subject areas of the test: English, Mathematics, Reading, and Science. Scores are reported on a scale of 1 to 36.

Academic Achievement in High School

Previous research (e.g., Noble, et al., 1992; Noble, Davenport, Schiel, and Pommerich, 1999; Noble and McNabb, 1989) concluded that the best predictors of ACT performance are those measuring prior achievement in high school (e.g., high school course work and grades). Thus, a direct effect of academic achievement on ACT score was expected for both African American and Caucasian American students.

Education-Related Accomplishments and Activities

Students' participation in extracurricular and education-related activities, as well as how they spend their out-of-class time have been shown to influence (positively or negatively) their academic achievement (Noble et al., 2001; Stricker, et al., 1992; Viadero, 1998). In turn, academic achievement would influence their performance on the ACT. These activities do not affect academic achievement equally across racial/ethnic groups or across content areas (Schreiber, 2002).

Psychosocial Factors

Ten psychosocial factors were originally identified from current research on psychosocial factors related to the educational process and to academic achievement. Due to software constraints on the numbers of variables that could be used in later iterative procedures, five factors were deleted, based on their relatively low correlations with academic achievement and ACT score, and high correlations among some factors. Several of the original items, following additional review and

research, were incorporated into ACT's *Student Readiness Inventory* (Le et al., 2005).

Additional details about the psychosocial factors may be obtained from the first author. The following discussion describes the remaining factors of interest.

Self-concept. Students' perceptions of themselves influence the amount of effort they are willing to put forth in school, their educational aspirations, and their academic achievement (e.g., Ajzen and Fishbein, 1977; Byrne and Shavelson, 1986; Noble et al., 2001; Purkey, 1970; Smey-Richman, 1991). Research has shown that positive attitudes towards self and school ultimately determine students' motivation and effort in doing schoolwork (Haladyna, Shaughnessy, and Shaughnessy, 1983).

Positive attributions. Weiner's (1986) concept of causal attribution states that students tend to seek a cause for their successes and failures. Students who attribute their success and failures to positive attributions (success is due to high ability, whereas failure is due to a lack of effort) tend to perform better than do their negatively-oriented counterparts. Negatively-oriented students are those students who attribute their success to luck, and they attribute their failure to low ability or to external sources.

Self-efficacy. Self-regulated learners are typically described as active learners who effectively manage the cognitive, motivational, and behavioral aspects of their learning (Zimmerman, 1989). Academic self–regulation includes a strong sense of self-efficacy, which refers to a student's resilience, their ability to rebound or bounce back from adversity.

Problem-solving skills and interpersonal communications skills. Coping strategies (e.g., problem-solving skills, interpersonal communication skills) protect against environmental stress (Losel and Bliesener, 1994). Harter (1981) and Stipek (1988) found that students who indicated that they knew specific behaviors that result in successful outcomes, and that they felt able to execute

these behaviors, achieved better grades than students without these strategies.

Rubin, Graham, and Mignerey (1990) reported that better communications skills were associated with higher high school GPAs. Chesebro, McCroskey, Atwater, Bahrenfuss, Cawelti, Gaudino, and Hodges (1992) found that students who are academically at risk have lower self-perceptions of their interpersonal communication skills than do students who are not academically at-risk.

Family Background

Consistent with other studies on family background and achievement (e.g., Chubb and Moe, 1990; Honan, 1996; Noble et al., 1992; Noble, et al., 1999; Noble and McNabb, 1989), students from lower income, less educated families are less likely to succeed academically in high school. This finding is most often attributed to differences among groups in their opportunities to learn, the quality of the education to which they have access, and to their home environment.

Given these findings, as well as the philosophy underlying the ACT and the developmental procedures used to construct it, we would expect that the influences of background characteristics on ACT performance are all indirect (i.e., they are mediated by achievement and accomplishments in high school and by psychosocial factors). In contrast, we would expect positive, direct effects of family income and parents' level of education on achievement and accomplishments in high school, and on psychosocial factors. Similarly, we would expect a negative, direct influence of the number of negative situations in the home on these factors. Finally, we expect that these results would hold for both racial/ethnic groups.

High School Attended

Prior research (e.g., Noble, et al., 1992; Noble and McNabb, 1989) has shown that high school attended explained from 12% to 15% of the variance in ACT scores, given students' course

work taken, grades earned, and background characteristics. Additional research (Noble, et al., 1999) showed that high school attended is associated with 5% to 7% of the variance in ACT scores, when students' perceptions and activities and behavior are also considered. We therefore included high school attended in the model at the between-schools level, with students nested within schools. Failure to account for between-school differences could otherwise result in biased standard errors and estimated path coefficients for the within-schools model (Muthen, 1989).

Data

Data Collection and Sample

A sample of students was identified from the high school juniors and seniors who registered to take the ACT either in February 2002 (n = 202,036) or April 2002 (n = 366,752). These test dates were used because April ACT-tested students are typically juniors, and February ACT-tested students are typically a mixture of juniors and seniors. Including students from multiple test dates would provide a more representative sample of the entire ACT-tested population.

It was determined that a sample size of 3,000 students per test date would achieve a reasonable level of precision. First, 5,139 students were identified for the February test date to allow for attrition (from ACT registration to testing) and for survey non-response. Sampling was done by school to maximize within-school sample sizes. Stratification variables included school size (based on the number of students registered for each test date) and geographic region. All students tested within a school were included in the sample.

Only those schools from which at least 60 students registered for the February ACT test dates were included. Schools with fewer than 60 students registered to take the test comprise approximately 50% of all students registered for that test date. This sampling constraint was used to allow for student attrition from ACT registration to testing and student non-response to the survey,

and to insure racial/ethnic representation from each school. A 40% to 50% decrease in the sample was anticipated.

Two weeks after the ACT Assessment was administered, students in the sample were sent a questionnaire designed to collect information about their behaviors and attitudes in several noncognitive areas. The questionnaire is described later in this report. Two weeks after the initial mailing, postcards were sent to non-respondents; a second copy of the questionnaire was mailed to non-respondents after one month. Of the original sample, 1,906 students from 63 schools completed and returned the questionnaire, for a response rate of 37%.

Due to the relatively low response rate for the February test date, the original sampling design was modified. Rather than selecting an entirely new sample of schools for the April administration, students registering for the April test date from the same 63 high schools were identified, with no restrictions on minimum sample size. Of these students, 5,066 students were selected for the sample. These students did not participate in the February administration of the survey; i.e., students who took the test on both the April and February test dates were surveyed only after the February test date.

The survey administration for the April test date paralleled that for the February test date. Of the original sample of 5,066 students, 1,400 students completed and returned the survey, for a response rate of 28%.

In order for the sample of respondents to represent the population from which it was selected, weights were applied to the data collected. The weights were calculated as follows:

$$W_{hi} = \frac{N_h}{n_h} * \frac{M_{hi}}{m_{hi}} * K,$$

where: h = the stratum to which school belongs,

i = school,

N_h = the number of schools, in the population, from stratum h,

n_h = the number of schools, in the sample, from stratum h,

M_{hi} = the number of students in the 2002 ACT-tested high school graduating class
from school i in stratum h,

m_{hi} = the number of students in the sample from school i in stratum h, and

K = constant to make the weighted sample size equal to that of a simple random
sample of equal precision.

The resulting weighted sample differed somewhat from ACT-tested students nationwide (ACT, 2002). The weighted mean ACT Composite score (21.9) for the sample was higher than that for the entire 2002 ACT-tested high school graduating class (20.9). There were also fewer Hispanic males and females in the sample (1.3% and 1.4%, respectively) than in the entire ACT-tested high school graduating class (2.3% and 3.4%, respectively).

To adjust for the differences in mean ACT Composite score, the weights were adjusted to reflect the distribution of ACT Composite scores for 2002 ACT-tested high school graduates nationwide. The weights were also adjusted to reflect the distribution of Hispanic and non-Hispanic males and females. New weights were calculated as follows:

$$W'_{hik}(x) = W_{hi} * \frac{PF(x)}{SF(x)} * \frac{\sum_y SF(y)}{\sum_y PF(y)} * \frac{PP_k}{SP_k},$$

where: x = ACT score

PF(x) = population frequency at score x,

SF(x) = sample frequency at score x,

$\sum_y SF(y)$ and $\sum_y PF(y)$ are the total frequencies for the sample and

population, respectively,

PP_k = population percentage of Hispanic/non-Hispanic by gender group k,

and

SP_k = sample percentage of Hispanic/non-Hispanic by gender group k.

Reweighted percentages of Mexican American and Hispanic students were 2.1% and 2.5% respectively. The reweighted mean ACT Composite score was 21.3.

Sample sizes for racial/ethnic groups other than African American or Caucasian American were very small. Given the small percentages of racial/ethnic minorities overall, it might have proven necessary to combine African American and Hispanic students into one racial/ethnic category for the multi-group part of the structural model, thus the need for reweighting for Hispanic and non-Hispanic students. However, this proved unnecessary. To maximize information about the characteristics of participating high schools and students and to maximize sample sizes within racial/ethnic groups, the data were limited to African American and Caucasian American students. The resulting unweighted sample size was 2,650 students from 63 high schools. The effective sample size was 487 students. The effective sample size is the size of a random sample whose precision is equal to that estimated for the actual sample. In other words, the standard errors would be the same

as those obtained using a simple random sample of 487 students. All analyses were conducted using weighted data.

Variables in the Model

Information about the grouping and coding of all of the independent variables is provided in Table 1.

Data for this study were taken from the ACT Assessment and from a questionnaire developed to collect information about student perceptions and behaviors. ACT Composite score was used as a single indicator of the latent factor identified as the ACT Composite true score.

In the measurement model for the ACT Composite score, we fixed to unity the regression coefficient between the observed score and the latent true score, and we specified the measurement error variance from the reliability estimate (.96) published in the *ACT Technical Manual* (1997). Fixing the value of the regression coefficient and specifying the error variance for a single indicator is necessary for model identification (Jöreskog and Sörbom, 1989).

TABLE 1

Description of Independent Variables

Variables	Description	Original coding
Academic achievement		
High school grade average in 4 core areas	Average of course grades in 23 core courses in English, mathematics, natural sciences, and social studies	0.0 to 4.0
Number of years of courses taken/taking in mathematics	Algebra 1, Algebra 2, Geometry, Trig., Calculus, Other math beyond Algebra 2, and Computer Math/Computer Science	0-5: 1 year each for Algebra 1, Algebra 2, and Geometry: .5 years for all other courses
Number of honors, accelerated, or advanced placement courses	Sum of yes responses for English mathematics, social studies, and science,	0 to 4
Education-related accomplishments and activities		

Number of out-of-class accomplishments	Sum of out-of-class educational accomplishments in each area:
	    Writing
	    Science
	    Art, music, or speech
		0 to 7

Education-related extracurricular activities	Sum of yes responses to extracurricular activities:
	    Instrumental music
	    Vocal music
	    Publications
	    Debate
	    Departmental clubs
	    Dramatics, theater
		0 to 7

Background characteristics		
Family income	Estimated, pre-tax parental income range.	1 - 10: $18k or less increasing in increments of about $8k up to $100k or more
Negative situations in the home	Number of negative situations in the home (e.g., a recent divorce, health problems, etc.)	0 – 9
Parents' education level	Average level of education of both parents or guardians.	1= Less than HS diploma or GED; 2 = HS diploma or GED; 3 = Some college, no degree; 4 = Voc.-tech diploma or cert.; 5 = Associate's degree; 6 = Bachelor's degree; 7 = Master's degree; 8 = Doctoral or Professional degree
Perception of self and others		
Self-concept	Perception of self-concept for succeeding in academic activities.	1 = Strongly disagree, ..., 5 = Strongly agree; Does not apply = missing
Positive attributions	Perception that academic success is related to high ability: failure to lack of effort.	
Self-efficacy	Perception of ability to rebound or bounce back from adversity.	1 = Strongly agree, ..., 6 = Strongly disagree
Problem solving skills	Perception of ability to use appropriate strategies to solve problems.	1 = Never, ..., 6 = Always
Interpersonal communication skills	Perception of ability to use effectively appropriate communication strategies.	

Academic achievement in high school. The Course/Grade Information Section (CGIS) of the ACT provides information about students' course work and grades in 30 specific high school courses. Students are asked to indicate whether they have taken or are currently taking a particular course, or whether they plan to take it in the future. For courses already completed, students are also asked to indicate the letter grade they received (A-F). In earlier studies, students were found to report these data with a high degree of accuracy, relative to information provided in their transcripts (Sawyer, Laing, and Houston, 1988; Valiga, 1987). We used the CGIS was to calculate high school GPA (based on grades in English, mathematics, social studies, and natural science) and the number of years of high school courses taken in mathematics. These variables had been shown in prior research to be effective indicators of high school achievement (e.g., Noble et al., 2001).

The Student Profile Section (SPS) of the ACT Assessment collects demographic and background information, and information about students' interests, accomplishments, educational plans, and career plans. The number of subject areas (English, mathematics, social studies, or science) in which the student reported taking honors, accelerated, or advanced placement course work was identified. This sum, high school GPA, and the years of course work taken in mathematics were used to represent academic achievement.

Psychosocial Factors. The Survey of ACT-Tested Students was designed to provide information about students' perceptions and behavior in several areas (see Appendix A for questionnaire items). Sections 2 and 6 of the survey asked students to indicate their level of agreement with statements about self, school and schoolwork, teachers, counselors, and parents (see Table 1 for coding. Several of the items in Section 2 were used in the Noble et al. studies (1999; 2001); all of the items in Section 6 were new. Exploratory factor analysis within a confirmatory

maximum likelihood factor analysis framework was used to analyze student's responses to questions in these three sections of the questionnaire.

A ten-factor maximum likelihood solution provided the best fit; items were not allowed to cross-load on multiple factors. These factors were identified as self concept, counselor support, positive attributions, parent support, effort, goal directedness, study skills, self-efficacy, problem solving skills, and interpersonal communications skills. Two items indicated self concept. Each of the other factors was indicated by three items. Five of these factors were included in the model development: self concept, positive attributions, self-efficacy, problem solving, and interpersonal communication skills.

Education-related accomplishments and activities. The SPS section of the ACT Assessment provides information about the extracurricular activities students participated in high school, as well as the number of out-of-class accomplishments students had completed in seven areas. Five of these accomplishment areas could be considered education-related; three were combined into one area, due to limited variability in students' responses. The number of education-related extracurricular activities; and the number of accomplishments in science, writing, and the arts (music, speech, and art) comprised the accomplishments and activities factor.

Background characteristics. Section 6 of the survey collected information about the educational backgrounds of students' parents/guardians. Due to the high correlation between mother's and father's level of education, the rank values (eight levels of formal education; other was treated as missing) for both parents/guardians were averaged together to create a combined indicator of parents' level of education.

Additional survey items (Section 5) solicited "yes," "no," or "uncertain" responses to a series of questions about the negative situations present in the home, such as serious health problems,

family discord, and financial difficulty. These were summed (yes = 1, no = 0) to create the number of negative situations in the home.

The SPS section of the ACT Assessment includes items about family income and race/ethnicity (African American or Caucasian American). Family income, the number of negative situations in the home, and parents' level of education were included as student and school-level covariates in the model. Race/ethnicity was used as the grouping variable in the multi-group portion of the model.

High school attended. Each high school was identified using its ACT Assessment high school code. High schools were used for the between-groups (second level) portion of the structural model.

Method

Missing Data Analysis and Imputation

All students were required to have valid data for race/ethnicity and ACT Composite score. Data were missing for at least one case for all other variables in the model. However, the rate of missing values for those variables was less than 8% for all but four variables (accomplishments in writing = 12%, accomplishments in science = 12%, accomplishments in arts = 12%, family income = 14%). Schafer and Olson (1998) noted that missing data can be problematic in structural modeling. Some of the more highly regarded methods for dealing with missing data are multiple imputation methods, as described by Rubin (1996). Multiple imputation methods are advantageous in that: a) the estimates they produce are generally robust in the face of nonnormal data, b) they are efficient (usually requiring only a few imputed data sets), and c) they allow the researcher to use complete-data methods (Schafer, 1999; Schafer and Olsen, 1998).

For this study, we used SAS 8 PROC MI to impute missing data, and created ten imputed

data sets. We used the initial imputed data set for our model fitting analyses, and used all ten data sets to produce ten sets of unstandardized parameter estimates and standard errors based on the final structural model. These parameter estimates and standard errors were then combined, as specified by Schafer and Olsen (1998). The parameters and their corresponding standard errors from the initial imputation fell well within the 95% confidence intervals constructed around the combined estimates. Means, standard deviations, and unstandardized and standardized parameters reported here are therefore based on the first imputed data set. A comparison of the initial and combined estimates and standard errors may be obtained from the first author.

Structural Model Development

All structural modeling analyses were performed using MPlus software, Version 2.12 (Muthen and Muthen, 2002). A total-group model ignoring race/ethnicity was first developed to establish the measurement model. Based on this analysis, selected indicator variables for the accomplishment and activities factor and the achievement factor were dropped from the model, due to lack of statistical significance (p < .05) and/or low reliabilities. In addition, the self concept and self efficacy factors were highly collinear with each other and with all other factors in the model, creating model estimation problems. These two factors were therefore dropped from the model. Lastly, based on further factor analysis of the remaining survey items, the problem solving skills and interpersonal communication skills indicators were combined into one factor. As a result, the two remaining psychosocial factors were perceptions of coping skills and positive attributions.

The total-group model was used to test a multi-group (African American vs. Caucasian American), multi-level (student level and high school level) model. However, there were insufficient numbers of schools with African American students to be able to test for measurement invariance across racial/ethnic groups at both the between and within levels. The measurement model was

therefore tested using a pooled-within matrix where the effects of high school were removed. The approach outlined in Muthen, Khoo, and Gustafsson (1997) was followed to test for measurement invariance across racial/ethnic groups. Once pooled-within measurement invariance was demonstrated across these groups, a measurement invariant multi-level, multi-group model was developed.

We did not hypothesize a model for the between portion of the multi-level model. To quantify the variance explained at the between level, we developed a simple model. Model reduction is typical of between-level models; the same structure at the between level as the within level cannot be expected (Muthen, 1994). A path model was used where observed ACT Composite score was predicted from high school GPA and parents' level of education.

For Caucasian American students, the sample included 61 schools and 2,289 students (average school size 37.5). For African American students, the sample included 48 schools and 361 students (average school size 7.5). To verify that the results were not biased due to using differing schools for African American and Caucasian American students, we calculated structural model parameter estimates and fit statistics for the 46 schools that had both African American and Caucasian American students. The results showed virtually no differences in fit statistics, and all resulting parameter estimates were within ±.02 of the original parameter estimates.

Results

Weighted means and standard deviations based on the initial imputed data set are shown in Table 2. The correlation matrix is shown in Appendix B.

As shown in Table 2, average ACT Composite scores were higher for Caucasian American students than for African American students. The mean ACT Composite scores of both Caucasian American and African American students were slightly higher than those of similar students

nationally (21.7 and 16.8, respectively; ACT, 2002).

On average, parents' level of education and family income were lower for African American students than for Caucasian American students. The average number of negative situations in the home was higher for African American students. For the education-related accomplishments and activities and academic achievement variables, Caucasian American students had higher averages than did African American students. Consistent with ACT-tested students nationally (ACT, 2001), African American students had lower average high school GPAs than Caucasian American students.

For the psychosocial factors, Caucasian American students were more likely to have positive attributions than African American students (lower means were associated with more positive attributions), as shown by two of the three indicators. In contrast, African American students had similar or somewhat higher average responses than Caucasian American students for all coping strategies indicators.

Measurement Model

The measurement model portion of a structural model consists of the relationships among the indicator variables, their respective factors, and their corresponding residual variances. We estimated four models to determine the plausibility of assuming measurement invariance across groups. Each model had successively more restrictive constraints. All four models were estimated using the multi-group pooled within covariance matrix; the fourth model included a non-empty multi-group, multi-level model. After this series of tests, the latent variables were conditioned by introducing covariates into the model.

TABLE 2

Weighted, Within-Schools Means and Standard Deviations of Measured Variables, by Race/Ethnicity

Variable (scale)	Within-schools mean		Within-schools SD	
	Cauc. Amer.	African Amer.	Cauc. Amer.	African Amer.
ACT score Composite (1-36)	22.1	17.5	4.45	3.82
Background characteristics				
Parents' level of education (1-8)	4.34	3.56	1.73	1.57
Family income (1-10)	5.52	3.03	2.50	2.43
Number of negative situations in the home (0-9)	.98	1.69	1.10	1.34
Education-related accomplishments and activities				
Number of academic extracurricular activities (0-7)	1.23	.97	1.06	1.02
Number of accomplishments in writing (0-7)	1.03	.98	1.30	1.22
Number of accomplishments in science (0-7)	.66	.60	1.11	.94
Number of accomplishments in arts (0-7)	3.42	3.00	2.93	2.70
Academic achievement				
Number of years of math courses taken (0-5)	3.16	3.03	.75	.78
High school GPA (0.0-4.0)	3.37	2.95	.53	.59
Number of subjects of honors, accelerated, or AP course work (0-4)	1.70	1.45	1.51	1.54
Positive attributions (Section 2; 1-5)				
x24 When challenged by an assignment, I feel like giving up	3.78	3.66	1.01	1.22
x25 My performance won't get much better, no matter how hard I try	4.12	4.28	.94	1.00
x30 When I don't do well, it's because I'm not smart enough	4.09	4.37	.93	.91
Coping strategies (Section 7, Parts B and C; 1-6)				
x1 When confronted by a problem I take time to figure out what the problem is	4.61	4.69	1.06	1.17
x2 When confronted by a problem, I collect information about it so I can understand it better	4.29	4.40	1.17	1.44
x2 When speaking or listening to people, I use practical examples to support my message	4.56	4.57	1.09	1.24
x3 When speaking or listening to people, I decide what I want to say and say it	4.66	4.79	1.13	1.14
x9 When speaking or listening to people, I'm open to others' needs without losing sight of my own in reaching an agreement	4.90	5.08	1.03	1.13

With the large sample size, it was expected that the χ^2 test would be rejected for all four models. Greater emphasis was therefore placed on the other fit statistics and the change in these statistics across the models. χ^2 values for all four models, and factor means and variances for Model 4, may be obtained from the first author.

CFI (Comparative Fit Statistic) and RMSEA (Root Mean Square Error of Approximation) were used as fit statistics. CFI measures the proportional improvement in fit by comparing the hypothesized model with a more restrictive baseline model that has uncorrelated errors. An acceptable CFI index is greater than .95 for continuous observed data. RMSEA has no comparison model, but adjusts the χ^2 statistic for model complexity (random error and sample size). A cutoff criterion of less than .06 is used to evaluate model fit (Hu and Bentler, 1999).

In Model 1, all parameters were allowed to vary across the two groups with no constraints on the within factor loadings or indicator intercepts. CFI (.960) and RMSEA (.037) indicated reasonable fit of the measurement model. For Model 2, the within factor loadings were constrained to be equal across the two racial/ethnic groups to test measurement invariance between the groups. There was virtually no change in CFI (.958) and RMSEA (.035). In Model 3, the intercepts of the indicator variables were constrained to be equal across the two racial/ethnic groups, with some reduction in CFI (.914) and a small increase in RMSEA (.048). This suggests that the variables used in the model behave in a similar way for both racial/ethnic groups in capturing student-level variability in ACT performance (i.e., group differences are a function of measurement error or differences in factor variances). This invariance permits the comparison of the within-level structural model across the two groups, where any differences in the structural paths would be a function of the factors, and not individual variables.

Model 4 expanded the measurement invariant pooled within model to include variables at

both the between and within levels. The between level included correlated ACT Composite score and high school GPA indicators, with no covariates. The model resulted in CFI (.946) and RMSEA (.039) values, both showing adequate model fit, supporting the use of a measurement invariant multi-group, multi-level model.

We estimated the reliabilities of the factors using coefficient H (Hancock and Mueller, 2001). Coefficient H represents the proportion of variability in the latent construct that is explained by the optimum linear composite of the indicator variables. Given Hancock and Mueller's definition, we were able to explain about 70% of the variance in the accomplishments and activities factor, about 66% of the variance in the positive attributions factor, about 80% of the variance in the coping strategies factor, and about 72% of the variance in the academic achievement factor. Individual item reliabilities are available from the first author.

Structural Model

The final within-level structural models for both racial/ethnic groups are shown in Figures 2a and 2b. Figure 2c includes the between-level models for the two racial/ethnic groups. All factor

FIGURE 2*a*. Final Within-High School Model for Caucasian American Students
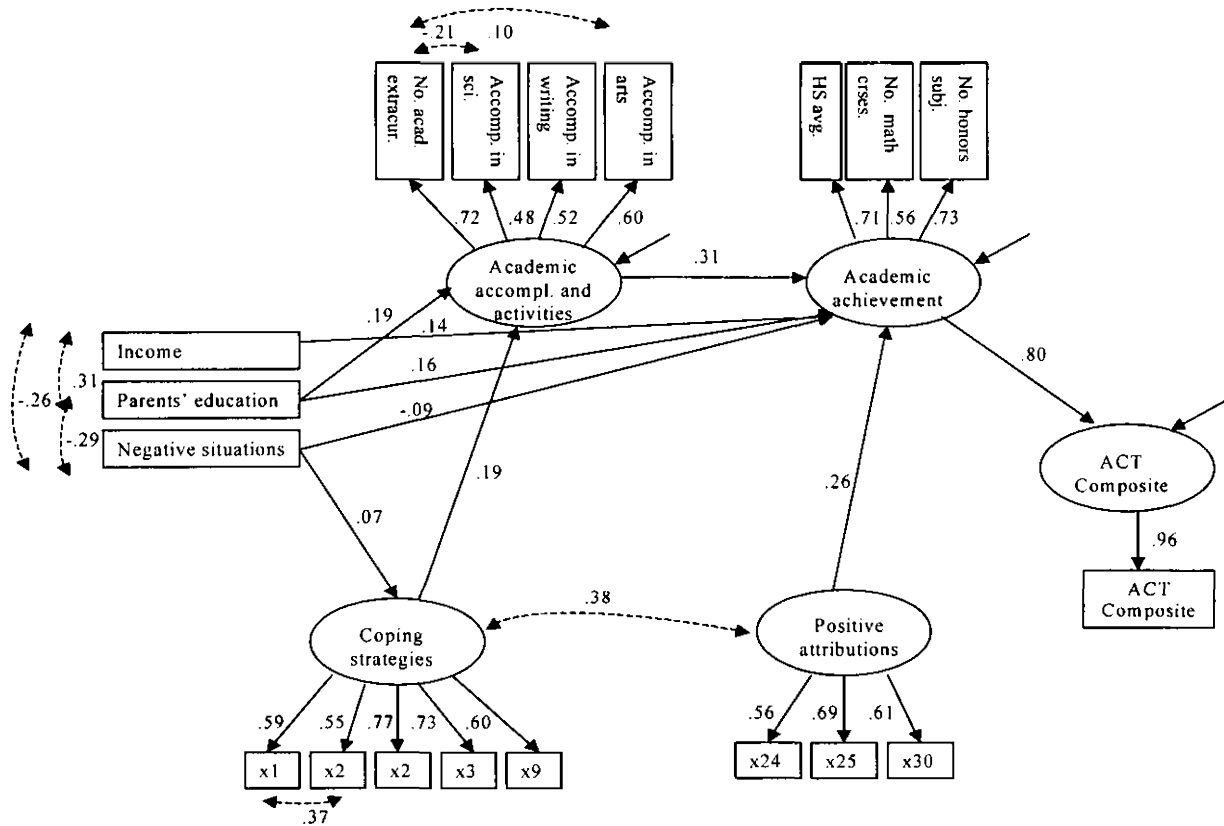
FIGURE 2*b*. Final Within-High School Model for African American Students
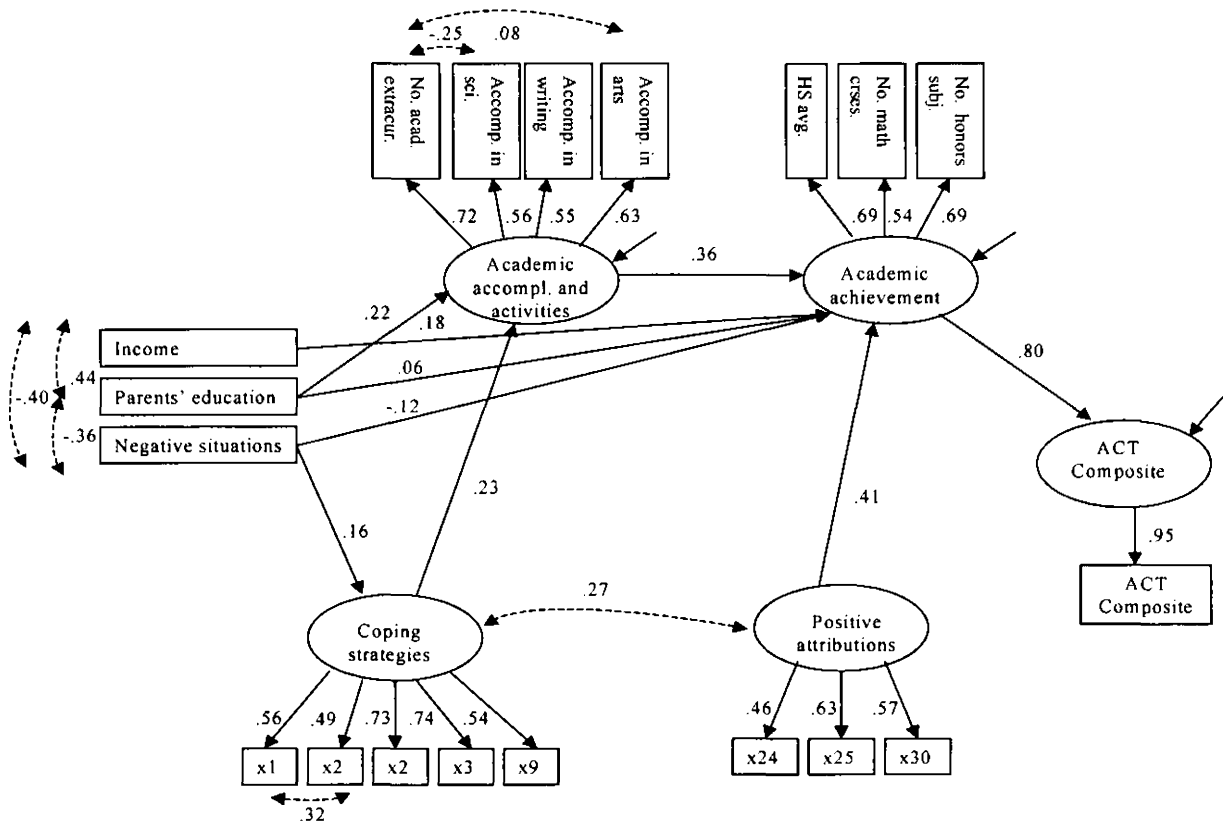
FIGURE 2c. Final Between-High School Model for Caucasian American and African American Students

Caucasian American Students

African American Students
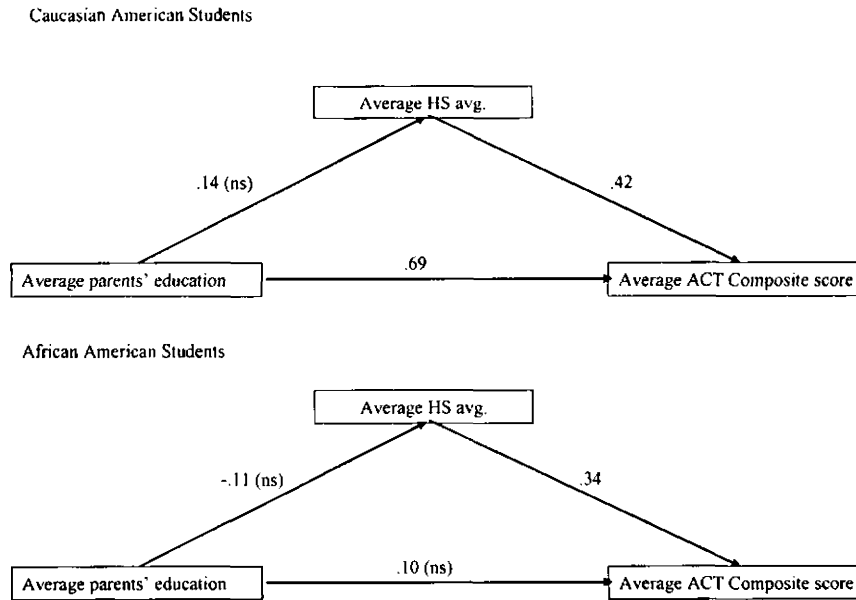
loadings and within-level structural paths were statistically significant (p < .05). Standardized factor loadings, residual covariances, and structural paths are reported in each figure. Corresponding unstandardized estimates and standard errors, as well as the unstandardized factor loadings, are reported in Appendix C.

As shown in Figures 2a and 2b, the final within structural model was similar to the original hypothesized model, with four exceptions:

1. The number of negative situations in the home was not directly related to students' accomplishments and activities.

2. Coping strategies was not directly related to academic achievement.

3. Positive attributions was not directly related to students' accomplishments and activities.

4. Correlated residual variances were found between selected accomplishments and activities indicators, and between selected coping strategies indicators.

As expected, the only factor or observed variable directly related to the ACT Composite score

factor was Academic Achievement. All other factors and indicatorvariables were indirectly related.

Table 3 summarizes the direct and total indirect effects for all factors in the model, and includes the variance in each factor explained by the model (R^2) at the bottom of the table. Both structural (factor to factor) and covariate (background variable to factor) paths are provided in the table. For Caucasian American students, the final model explained 64% of within-school variance in ACT Composite score and 74% of between-school variance in ACT Composite score. The corresponding R^2 values were 63% and 12% for African American students.

For both the within-school and between-school levels of the model, the majority of the direct paths were similar for African American students and Caucasian Americans. Within-school path differences that appeared relatively large (e.g., accomplishment and activities on coping strategies) also had relatively large standard errors. At the between-school level, the paths between average high school GPA and average ACT Composite score were similar for Caucasian American and African American students (.42 and .34, respectively); the path from average parents' levels of education and average high school average was not statistically significant for either group.

To test model differences for African American and Caucasian American students, a more restrictive model was developed that constrained all within-school structural and covariate paths to be equal for the two groups. Using Sartorra and Bentler's (1999) procedure for testing differences between two robust chi-square variates, the models were not found to differ ($p > .05$; $\chi^2 = 9.29$, df = 9). An additional test was conducted where both the within-school and the between-school structural paths and the covariance were constrained for the two groups. Although differences between the original and constrained models were statistically significant ($\chi^2 = 41.207$, df = 12), the CFI and RMSEA for the constrained model were almost identical to those for the original model (CFI = .946, RMSEA = .035).

TABLE 3

Standardized Direct and Indirect Structural and Covariate Paths

Effect	Caucasian American students	African American students
Path		
Within		
ACT Composite on:		
Direct		
Academic achievement	.80	.80
Total indirect		
Accomplishments & activities	.25	.27
Coping strategies	.13	.15
Positive attributions	.23	.33
Income	.11	.08
Parents' education	.18	.17
No. negative situations at home	-.06	-.06
Academic achievement on:		
Direct		
Accomplishments & activities	.31	.36
Positive attributions	.26	.41
Income	.14	.18
Parents' education	.16	.06
No. negative situations at home	-.09	-.12
Total indirect		
Coping strategies	.16	.19
Positive attributions	.02	.02
Parents' education	.05	.08
No. negative situations at home	.01	.03
Accomplishments & activities on:		
Direct		
Coping strategies	.19	.23
Parents' education	.19	.22
Total indirect		
Positive attributions	.07	.06
Coping strategies on:		
Direct		
No. negative situations at home	.07	.16

TABLE 3 (cont.)

Effect	Caucasian American students	African American students
Path		
Between		
ACT Composite on:		
Direct		
High school GPA	.42	.34
Parents' education	.69	.10
Indirect		
Parents' education	.06	-.04
High school GPA on:		
Direct		
Parents' education	.14	-.11
R^2		
Within		
ACT Composite	.64	.63
Accomplishments & activities	.07	.10
Academic achievement	.28	.42
Coping strategies	.01	.03
Between		
ACT Composite score	.74	.12
High school GPA	.02	.01

For both African American and Caucasian American students, academic achievement in high school had a strong, positive, and direct effect on ACT Composite score. Both the academic accomplishments and activities and positive attributions factors had moderate indirect effects on ACT Composite score through academic achievement. The effects of family income, parents' level of education, number of negative situations in the home, and coping strategies on ACT Composite score were weaker, and were manifested only indirectly through academic accomplishments and activities, academic achievement in high school, and coping strategies.

Similarly, accomplishments and activities and positive attributions had moderate, positive, and direct effects on academic achievement. Family income, parents' level of education, and number

of negative situations in the home had smaller direct effects on academic achievement. Total indirect effects for these variables were small.

Coping strategies only had an indirect effect on academic achievement, through accomplishments and activities. However, it had a moderately strong, direct effect on accomplishments and activities, as did parents' level of education. Positive attributions had a smaller, total indirect effect on accomplishments and activities, through coping strategies. It is also interesting to note that the relationship between coping strategies and number of negative situations in the home was positive, but the relationship between negative situations and academic achievement was negative.

Across schools, high school GPA was strongly and positively related to ACT Composite score for both Caucasian American and African American students. Parents' education across schools was also strongly related to ACT Composite score for Caucasian American students, but not for African American students. Moreover, this relationship was considerably larger at the between level than at the corresponding relationship at the within level. In comparison, the relationship between parents' education and high school GPA was not statistically significant.

Discussion

The model developed for this study showed a strong direct relationship between academic achievement and ACT Composite score for both African American and Caucasian American students. Students' academic accomplishments and activities, perceptions of their coping strategies and positive attributions, and background characteristics (i.e., family income, parents' level of education, and number of negative situations in the home) were indirectly related to their ACT Composite scores, through academic achievement in high school. Thus, the actual influence of these factors on students' ACT Composite score cannot be evaluated appropriately without considering the

mediating effects of other variables, particularly academic achievement.

The relationships among ACT Composite, academic accomplishments and activities, coping skills, positive attributions, and the three background characteristics were also similar for African American and Caucasian American students. Performance on the ACT Assessment did not appear to be differentially influenced by any of the factors or covariates studied, relative to group membership. Thus, those factors that benefit student achievement, as measured by the ACT Composite, do so for all students, irrespective of ethnic group membership.

At the between-school level, average parents' level of education was directly related to average ACT Composite score for Caucasian American students, but not for African American students. Average education of parents might be a proxy for school quality, the financial status of the school, as well as the college-bound orientation of the school and the homes of students comprising the school population. We did not have in this study the data required to investigate these hypotheses. Due to the limited number of students within schools, especially for African Americans, interpretation of these relationships at the school level is limited. The variance of average parents' level of education was three times larger for Caucasian American students than for African American students. Larger numbers of students and schools would help to clarify the interrelationships among the indicators and covariates studied here.

An important consideration in interpreting the results shown here is that the analyses were exploratory, and need to be replicated to validate the model. Moreover, due to software constraints, we were unable to include all of the factors we hoped to consider in this study. With additional data, and with more recent editions of MPlus and SAS, we hope to be able to include these factors in the model to help identify factors related to student achievement. Additional factors and/or structural paths might achieve a better-fitting model.

Implications

Regardless of their race/ethnicity, students can increase their chances of doing well on the ACT Assessment, and thus increase their chances of enrolling in and succeeding in college, by focussing on academic achievement in high school (e.g., taking rigorous course work and obtaining good grades). To some extent, their educational achievement can benefit from time spent out of school on educationally-related activities and accomplishments. Moreover, action on the part of parents, counselors, teachers, and schools can help students develop positive coping skills and realistic expectations of themselves, and help them overcome background conditions that might otherwise affect their chances of being successful in school.

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Appendix A

Directions: Please respond to each of the following items. All responses will be kept strictly confidential and will be used only for research purposes. They will in no way affect your ACT Assessment scores. If you prefer not to respond to an item, simply leave it blank.

SECTION 1. Indicate how important it is to you to accomplish each of the following goals by checking the appropriate response.

```
┌── Very important
│  ┌── Moderately important
│  │  ┌── Slightly important
│  │  │  ┌── Not important
▼  ▼  ▼  ▼
```

□	□	□	□	1.	To have a steady, secure job.
□	□	□	□	2.	To be active in my community (organizations, programs, etc.).
□	□	□	□	3.	To make a lot of money.
□	□	□	□	4.	To be married or in a long-term personal relationship.
□	□	□	□	5.	To be a parent.
□	□	□	□	6.	To meet new and interesting people.
□	□	□	□	7.	To travel and see new places.
□	□	□	□	8.	To be physically fit.
□	□	□	□	9.	To be accepted by my peers.
□	□	□	□	10.	To be self-reliant.
□	□	□	□	11.	To have time for my personal interests.
□	□	□	□	12.	To help others who are in need.
□	□	□	□	13.	To have the opportunity to use my creative skills.
□	□	□	□	14.	To acquire the knowledge and skills I need for a career.

SECTION 2. Indicate your level of agreement with each statement by checking the appropriate response.

```
┌── Strongly agree
│  ┌── Agree
│  │  ┌── Neutral (Neither Agree Nor Disagree)
│  │  │  ┌── Disagree
│  │  │  │  ┌── Strongly disagree
│  │  │  │  │  ┌── Don't know/does not apply
▼  ▼  ▼  ▼  ▼  ▼
```

□	□	□	□	□	□	1.	I consider myself to be a leader.
□	□	□	□	□	□	2.	My friends plan to go to college.
□	□	□	□	□	□	3.	My school counselor(s) help me complete applications to colleges.
□	□	□	□	□	□	4.	I am a confident and capable person.
□	□	□	□	□	□	5.	My parent(s)/guardian(s) attend school functions in which I am involved.
□	□	□	□	□	□	6.	I'm a fast learner.
□	□	□	□	□	□	7.	My teachers encourage me to take easier courses.
□	□	□	□	□	□	8.	I do well on school assignments because I'm lucky.
□	□	□	□	□	□	9.	I worry about my personal security/safety in my neighborhood.
□	□	□	□	□	□	10.	I attend classes regularly, unless I am ill or have a family emergency.
□	□	□	□	□	□	11.	My parent(s)/guardian(s) don't want me to leave home for college.
□	□	□	□	□	□	12.	The skills and knowledge I'm learning in high school will help in a *job situation*.
□	□	□	□	□	□	13.	I only read books or magazine articles if they are homework assignments.
□	□	□	□	□	□	14.	My friends seem confused about how to prepare for college.
□	□	□	□	□	□	15.	My favorite classes are those in which I am expected to study and work hard.

Strongly agree
Agree
Neutral (Neither Agree Nor Disagree)
Disagree
Strongly disagree
Don't know/does not apply

☐	☐	☐	☐	☐	☐	16.	It's ok to cut class.
☐	☐	☐	☐	☐	☐	17.	My school counselor(s) don't advise me on the best colleges to attend.
☐	☐	☐	☐	☐	☐	18.	I regularly use a computer at school to do my schoolwork.
☐	☐	☐	☐	☐	☐	19.	My school counselor(s) help me find out about and apply for financial aid for college.
☐	☐	☐	☐	☐	☐	20.	Most of my classes are boring.
☐	☐	☐	☐	☐	☐	21.	When I'm given a homework assignment, I usually do as little work as possible to complete it.
☐	☐	☐	☐	☐	☐	22.	If I get good grades, my friends tease me.
☐	☐	☐	☐	☐	☐	23.	My teachers show me the best ways to study so I can get good grades.
☐	☐	☐	☐	☐	☐	24.	When I'm given a very challenging school assignment or task, I usually feel like giving up.
☐	☐	☐	☐	☐	☐	25.	My performance in school isn't likely to get much better, no matter how hard I try.
☐	☐	☐	☐	☐	☐	26.	I would cheat on a test if I knew I wouldn't get caught.
☐	☐	☐	☐	☐	☐	27.	My school has enough computers for students to use when they need them.
☐	☐	☐	☐	☐	☐	28.	I do not like some assignments or tasks because I'm afraid I'll do them wrong.
☐	☐	☐	☐	☐	☐	29.	My parent(s)/guardian(s) don't help me with my homework.
☐	☐	☐	☐	☐	☐	30.	When I *don't* do well on school assignments, it's because I'm not smart enough.
☐	☐	☐	☐	☐	☐	31.	My school counselor(s) advise me on possible careers that fit my interests and abilities.
☐	☐	☐	☐	☐	☐	32.	I worry about my personal security/safety at school.
☐	☐	☐	☐	☐	☐	33.	My school counselor(s) work with me outside of class time when I need help.
☐	☐	☐	☐	☐	☐	34.	My parent(s)/guardian(s) sometimes make me choose between school and family priorities.
☐	☐	☐	☐	☐	☐	35.	I avoid school assignments that require careful and precise work, like solving hard math problems or writing computer programs.
☐	☐	☐	☐	☐	☐	36.	When I *don't* do well on school assignments, it's because I don't work hard enough.
☐	☐	☐	☐	☐	☐	37.	My teachers advise me on the courses I need to take to be ready for college.
☐	☐	☐	☐	☐	☐	38.	Compared to other students my age, I rank in the top 20% in overall academic ability.
☐	☐	☐	☐	☐	☐	39.	My friends get good grades in high school.
☐	☐	☐	☐	☐	☐	40.	My school counselor(s) help me to prepare for college admissions tests like the ACT.
☐	☐	☐	☐	☐	☐	41.	My parent(s)/guardian(s) talk about the importance of a college education.
☐	☐	☐	☐	☐	☐	42.	The skills and knowledge I'm learning in high school will help me in *college*.
☐	☐	☐	☐	☐	☐	43.	I do well on school assignments because the work is easy.
☐	☐	☐	☐	☐	☐	44.	My teachers work with me outside of class time when I need help.
☐	☐	☐	☐	☐	☐	45.	My parent(s)/guardian(s) know what I need to do to prepare for college.

SECTION 3. What is the highest level of education completed by your parents/guardians? Please complete Column A and Column B.

Column A. Father/Male Guardian (check one)	Column B. Mother/Female Guardian (check one)	Highest Level of Education
☐	☐	1. Less than high school diploma or GED equivalent
☐	☐	2. High school diploma or GED equivalent
☐	☐	3. Some college-level work completed, no degree/certificate
☐	☐	4. Vocational/technical program certificate or diploma
☐	☐	5. Associate's degree (2-year program)
☐	☐	6. Bachelor's degree
☐	☐	7. Master's degree (MS, MA, MBA)
☐	☐	8. Doctoral or Professional degree (Ph.D., MD, JD, Ed.D.)
☐	☐	9. Other: _____

SECTION 4. Estimate the average number of hours you spend per week during the school year on each type of activity listed below by checking the appropriate response.

Number of hours per week

0	1-5	6-10	11-15	16-20	More than 20	Does not apply	Activity
☐	☐	☐	☐	☐	☐	☐	1. Doing homework/studying outside of class time.
☐	☐	☐	☐	☐	☐	☐	2. Participating in educational activities outside of school (taking college courses, using a home computer (not for homework), visiting the library or museum, attending cultural events, etc.).
☐	☐	☐	☐	☐	☐	☐	3. Participating in social/recreational activities outside of school (community sports, using the community center, Boy/Girl Scouts, 4-H Club, volunteer work, church/religion-related activities, spending time with friends, etc.).
☐	☐	☐	☐	☐	☐	☐	4. Working at a job for pay.
☐	☐	☐	☐	☐	☐	☐	5. Reading for fun (not for homework).
☐	☐	☐	☐	☐	☐	☐	6. Watching TV.
☐	☐	☐	☐	☐	☐	☐	7. Participating in school-related extracurricular activities (athletics, organizations).
☐	☐	☐	☐	☐	☐	☐	8. Family responsibilities (caring for family members, chores, etc.).

SECTION 5. Please respond to each item by checking the appropriate response.

Yes	Uncertain	No	Item
☐	☐	☐	1. I have moved to a different home three or more times within the last two years.
☐	☐	☐	2. I will be the first person in my immediate family (including parents) to graduate from high school.
☐	☐	☐	3. I will be the first person in my immediate family (including parents) to attend college.
☐	☐	☐	4. I have a chronic health problem or serious physical illness.
☐	☐	☐	5. I work during the school year to help pay for my family's living expenses (rent, food, etc.).
☐	☐	☐	6. I work during the school year to help pay for my college education.
			Someone in my immediate family...
☐	☐	☐	1. ...has a chronic health problem or serious physical illness.
☐	☐	☐	2. ...has died in the past two years.
☐	☐	☐	3. ...has divorced or separated in the past two years.
☐	☐	☐	4. ...has been unemployed for two months or longer in the past two years.

SECTION 6. Indicate your level of agreement with each statement by checking the appropriate response.

```
┌── Strongly agree
│   ┌── Moderately agree
│   │   ┌── Slightly agree
│   │   │   ┌── Slightly disagree
│   │   │   │   ┌── Moderately disagree
│   │   │   │   │   ┌── Strongly disagree
▼   ▼   ▼   ▼   ▼   ▼
```

☐	☐	☐	☐	☐	☐	1.	It's hard to find a reason for working.
☐	☐	☐	☐	☐	☐	2.	I don't seem to make decisions by myself.
☐	☐	☐	☐	☐	☐	3.	I have confusion about who I am.
☐	☐	☐	☐	☐	☐	4.	I have more ideas than energy.
☐	☐	☐	☐	☐	☐	5.	I lose my sense of direction.
☐	☐	☐	☐	☐	☐	6.	It's easier for me to start than to finish projects.
☐	☐	☐	☐	☐	☐	7.	I don't seem to get going on anything important.
☐	☐	☐	☐	☐	☐	8.	I wonder where my life is headed.
☐	☐	☐	☐	☐	☐	9.	I don't seem to have the drive to get my work done.
☐	☐	☐	☐	☐	☐	10.	After a while I lose sight of my goals.

```
┌──── Always
│ ┌──── Almost always
│ │ ┌──── Often
│ │ │ ┌──── Sometimes
│ │ │ │ ┌──── Hardly ever
│ │ │ │ │ ┌──── Never
▼ ▼ ▼ ▼ ▼ ▼
```
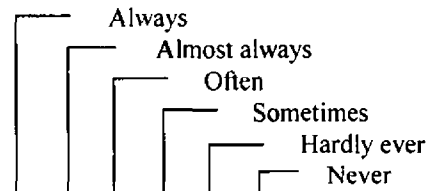
☐ ☐ ☐ ☐ ☐ ☐ 1. I use a variety of strategies to remember information when I study.
☐ ☐ ☐ ☐ ☐ ☐ 2. I highlight or summarize key terms when I read assigned materials.
☐ ☐ ☐ ☐ ☐ ☐ 3. I finish my assignments even when I don't like them.
☐ ☐ ☐ ☐ ☐ ☐ 4. I pay attention in class.
☐ ☐ ☐ ☐ ☐ ☐ 5. I ask questions when I don't understand something.
☐ ☐ ☐ ☐ ☐ ☐ 6. I don't let distractions or daydreams get in the way of my work.
☐ ☐ ☐ ☐ ☐ ☐ 7. I express myself clearly when writing a paper.
☐ ☐ ☐ ☐ ☐ ☐ 8. I am well-prepared for tests.
☐ ☐ ☐ ☐ ☐ ☐ 9. I turn in my assignments on time.
☐ ☐ ☐ ☐ ☐ ☐ 10. I believe in my own ability to succeed in college.
☐ ☐ ☐ ☐ ☐ ☐ 11. I stay optimistic in times of disappointment as well as success.
☐ ☐ ☐ ☐ ☐ ☐ 12. I bounce back after facing disappointment or failure.
☐ ☐ ☐ ☐ ☐ ☐ 13. I work hard to improve when I have a personal shortcoming.
☐ ☐ ☐ ☐ ☐ ☐ 14. I am confident that I will succeed even if I need help and support.
☐ ☐ ☐ ☐ ☐ ☐ 15. I have a positive view of myself.
☐ ☐ ☐ ☐ ☐ ☐ 16. I focus on my own goals instead of comparing myself with others.

When confronted with a problem or obstacle, I tend to...

☐ ☐ ☐ ☐ ☐ ☐ 1. Take time to figure out what the problem is.
☐ ☐ ☐ ☐ ☐ ☐ 2. Collect information about the problem so that I can understand it better.
☐ ☐ ☐ ☐ ☐ ☐ 3. Step back and think about the big picture of the problem before I do anything.
☐ ☐ ☐ ☐ ☐ ☐ 4. Weigh the pros and cons of various solutions.
☐ ☐ ☐ ☐ ☐ ☐ 5. Choose a solution that works best for me.
☐ ☐ ☐ ☐ ☐ ☐ 6. Consider a solution that will not cause additional problems for other people.
☐ ☐ ☐ ☐ ☐ ☐ 7. Be willing to *do* something rather than to forget about it.
☐ ☐ ☐ ☐ ☐ ☐ 8. Think about what was right and was wrong with my solution.
☐ ☐ ☐ ☐ ☐ ☐ 9. Learn from the experience by understanding what to do or *not* to do in a similar situation next time.

When speaking or listening to other people, I tend to...

☐ ☐ ☐ ☐ ☐ ☐ 1. Say clearly and directly what I mean.
☐ ☐ ☐ ☐ ☐ ☐ 2. Use practical examples to support my message.
☐ ☐ ☐ ☐ ☐ ☐ 3. Decide what I want to say and say it.
☐ ☐ ☐ ☐ ☐ ☐ 4. Listen attentively to others.
☐ ☐ ☐ ☐ ☐ ☐ 5. Respect others' points of view.
☐ ☐ ☐ ☐ ☐ ☐ 6. Persuade others to do something while maintaining a friendly relationship.
☐ ☐ ☐ ☐ ☐ ☐ 7. Be willing to give and take when resolving a conflict.
☐ ☐ ☐ ☐ ☐ ☐ 8. Try to consider the views of others.
☐ ☐ ☐ ☐ ☐ ☐ 9. Be open to others' needs without losing sight of my own in reaching an agreement.

SECTION 8. Please describe below any other activities or conditions in your home, school, or community that you think affect your ability to do well in school.

_____

_____

_____

* * * THANK YOU FOR COMPLETING THIS SURVEY * * *
PLEASE RETURN YOUR COMPLETED SURVEY TO ACT

Simple Correlations Among Final Model Variables*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. ACT Composite		.31	.20	-.15	.18	.14	.15	.15	.45	.52	.51	.13	.13	.20	.09	.04	.09	.01	-.02
2. Parents' level of education	.26		.32	-.30	.15	.06	.09	.12	.19	.18	.22	.03	-.00	.04	.00	-.00	.04	.01	-.05
3. Family income	.27	.44		.26	.02	-.04	.03	-.01	.14	.16	.17	.04	.02	.02	.00	-.01	.00	-.02	-.08
4. Number of neg. situations in the home	-.19	-.35	-.40		-.02	.08	-.02	.02	-.11	-.13	-.14	.00	-.04	-.04	.05	.04	.01	.04	.07
5. Number of academic extracurricular activities	.28	.13	.00	-.04		.39	.14	.54	.11	.23	.20	.04	.09	.02	.03	.03	.09	.08	.07
6. Number of accomplishments in writing	.28	.04	.03	.06	.10		.23	.34	.04	.11	.16	.04	.10	.04	.05	.08	.11	.10	.09
7. Number of accomplishments in science	.10	.20	.01	-.12	.17	.31		.29	.10	.16	.22	.10	.06	.07	.08	.09	.09	.07	.04
8. Number of accomplishments in arts	.11	.14	.04	-.01	.52	.33	.39		.04	.15	.16	.06	.07	.07	.08	.10	.11	.09	.10
9. Number of years of math courses taken	.35	.10	.10	-.18	.14	.10	.10	.08		.41	.40	.05	.08	.10	.08	.04	.04	-.01	.00
10. High school GPA	.56	.20	.15	-.17	.28	.22	.19	.13	.42		.48	.18	.15	.14	.10	.05	.09	.02	.04
11. Number of subjects of honors, accel., or AP course work	.41	.16	.16	-.17	.23	.21	.20	.14	.31	.48		.15	.13	.16	.11	.09	.11	.07	.03
12. When challenged by an assignment, I feel like giving up	.16	.04	.02	.01	.05	.09	.05	.06	.07	.13	.09		.38	.31	.27	.25	.23	.18	.20
13. My performance won't get much better, no matter how hard I try	.18	-.01	-.04	-.03	.05	-.04	-.03	-.03	.05	.23	.12	.39		.45	.17	.13	.20	.11	.13
14. When I don't do well, it's because I'm not smart enough	.21	.03	-.04	-.07	.06	-.01	.12	-.02	.18	.20	.14	.24	.32		.15	.10	.16	.12	.09
15. When confronted by a problem I take time to figure out what the problem is	.07	.04	.07	.08	.03	.16	.18	.03	.16	.16	.13	.24	.11	.12		.69	.42	.42	.40
16. When confronted by a problem, I collect information about it so I can understand it better	.05	.02	.02	.16	.05	.18	.12	.03	.11	.12	.10	.15	.01	.06	.61		.40	.36	.41
17. When speaking or listening to people, I use practical examples to support my message	.05	-.06	-.06	.20	.08	.24	.09	.14	.18	.18	.14	.18	.06	.02	.45	.51		.59	.44
18. When speaking or listening to people, I decide what I want to say and say it	.05	-.06	-.07	.17	.04	.16	.10	.14	.17	.13	.10	.14	.06	.06	.39	.35	.56		.43
19. When speaking or listening to people, I'm open to others' needs without losing sight of my own in reaching an agreement	.08	-.03	-.02	.05	.14	.17	-.05	.14	.10	.18	.04	.14	.15	.04	.33	.22	.32	.35	

* The upper diagonal includes correlations for Caucasian American students; the lower diagonal includes correlations for African American students.

Appendix C

TABLE C1

Unstandardized Factor Loadings and Their Standard Errors, Constrained to be Equal Across Racial/Ethnic Groups

Factor loadings (standard errors)	ACT Comp	Accomp & activ	Academic achieve.	Coping	Posit. attrib.
Within					
ACT Composite	1.00 (0.0)				
No. academic extracurricular activities		1.00 (0.0)			
No. science accomplishments		.70 (.05)			
No. writing accomplishments		.89 (.07)			
No. arts accomplishments		2.32 (.14)			
High school GPA			.89 (.05)		
No. honors subjects			2.63 (.21)		
No. years of math			1.00 (0.0)		
Section 2, x24					.88 (.06)
Section 2, x25					1.00 (0.0)
Section 2, x30					.87 (.06)
Section 7, Part B, x1				1.00 (0.0)	
Section 7, Part B, x2				1.04 (.04)	
Section 7, Part C, x2				1.35 (.06)	
Section 7, Part C, x3				1.31 (.06)	
Section 7, Part C, x9				.97 (.05)	

TABLE C2

Unstandardized Path Coefficients, Disturbance Terms, Latent Factor Covariances, and Their Standard Errors, by Racial/Ethnic Group

Statistic	Caucasian American students		African American students	
	Value	Standard error	Value	Standard error
Paths				
Within				
ACT Composite on:				
Academic achievement	7.87	.48	6.41	.62
Academic achievement on:				
Accomplishments and activities	.17	.02	.21	.05
Positive attributions	.16	.02	.28	.07
Parents' education	.04	.01	.02	.02
Income	.02	.01	.03	.01
No. of negative situations at home	-.04	.01	-.04	.02
Accomplishments and activities on:				
Coping strategies	.24	.03	.26	.07
Parents' education	.09	.01	.11	.03
Positive attributions on:				
No. of negative situations at home	.04	.01	.08	.02
Between				
ACT Composite score on:				
Parents' education	1.88	.30	.47	1.20
High school GPA	3.97	.81	4.74	1.88
High school GPA on:				
Parents' education	.04	.05	-.04	.04
Disturbance terms (prediction error variances)				
Within				
Latent factors				
ACT Composite	5.87	.35	4.43	.79
Accomplishments and activities	.54	.04	.50	.09
Academic achievement	.12	.02	.11	.02
Positive attributions	.43	.04	.40	.08
Coping strategies	.39	.04	.41	.05
Latent factor covariances				
Within				
Positive attributions with coping strategies	.16	.02	.11	.05

TABLE C3

Unstandardized Residual Variances, Indicator Covariances, and Their Standard Errors, by Racial/Ethnic Group

Statistic	Caucasian American students		African American students	
	Value	Standard error	Value	Standard error
Residual variances (Measurement error variances)				
Within				
Indicator variables				
ACT Composite	1.40	0	1.40	0
No. academic extracurricular activities	.54	.06	.08	.08
No. science accomplishments	.94	.08	.60	.08
No. writing accomplishments	1.23	.08	1.04	.16
No. arts accomplishments	5.43	.27	4.47	.56
High school GPA	.13	.01	.16	.02
No. honors subjects	1.06	.07	1.38	.13
No. years of math	.38	.02	.45	.06
Section 2, x24	.71	.04	1.17	.10
Section 2, x25	.46	.03	.61	.08
Section 2, x30	.55	.03	.63	.10
Section 7, Part B, x1	.74	.04	.91	.08
Section 7, Part B, x2	.96	.04	1.48	.16
Section 7, Part C, x2	.49	.04	.69	.09
Section 7, Part C, x3	.61	.04	.61	.05
Section 7, Part C, x9	.68	.03	.98	.18
Between				
Indicator variables				
ACT Composite	.59	.19	1.56	.45
High school GPA	.02	.01	.01	.01
Indicator covariances				
Within				
Section 7, Part B, x1 with x2	.46	.03	.51	.09
No. academic extracurricular activities with no. science accomplishments	-.25	.03	-.24	.06
No. academic extracurricular activities with no. art accomplishments	.31	.10	.24	.20